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Collaborative Agricultural Development Framework for the Global south

A. Sivasena Reddy

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Abstract: Agricultural productivity in the tropical and subtropical regions of the Global South faces critical challenges due to suboptimal natural resource management practices and heightened environmental vulnerabilities. This paper examines key challenges and the current agricultural landscape in the Global South, focusing on critical areas such as climate change, water scarcity, and technological adoption, while synthesizing insights from existing literature. The paper proposes an agricultural development framework which offers a comprehensive strategy to enhance food security and build climate resilience across the Global South, leveraging Best Management Practices (BMPs) derived from India's successful flagship programmes. It highlights the potential of BMPs in areas such as sustainable agriculture, digital solutions in agriculture, climate-resilient practices, watershed management, Integrated Farming Systems, and agro-forestry, which can be advanced through South-South Cooperation (SSC). Grounded in the pillars of Science, Technology and Innovation (STI), Scale, and Sustainability (SSS), the framework ensures scientifically rigorous, scalable, and sustainable agricultural interventions. The STIpillar focuses on the meticulous evaluation of methodologies, the optimal placement of instruments, and the integration of indigenous knowledge for locally tailored solutions. The Scale pillar emphasizes strong institutional frameworks, multi-stakeholder partnerships, and community adaptability, ensuring scalability across diverse agro-ecological zones. The Sustainability pillar fosters long-term resilience through environmental, economic, and social strategies, ensuring the availability of resources, financial support, and adaptive management for enduring agricultural impact. This paper discusses these factors and the framework to present a schema, supported by illustrative evidence from BMPs derived from Indian programmes, designed to be adaptive, inclusive, and agro-ecologically sync.

Keywords: STI, Scale, Sustainability, Global South, India's Best Management Practices, Agro-ecology.

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1. Introduction

Agricultural productivity in the tropics and sub-tropics of the Global South faces numerous challenges due to poor natural resource management (NRM) practices and harsh climatic conditions. As highlighted by Ananda and Herath (2013), resource poor small landholders often lack access to the technology and inputs necessary to enhance productivity, leading to inefficient and extractive farming practices. These practices result in low agronomic productivity and contribute to persistent food insecurity. This observation is supported by Labriere et al. (2017), which noted that low crop yields, inefficient water management, and inadequate soil fertility management are widespread in developing countries. High rainfall variability and wind erosivity in Global South countries, as discussed by Panagos et al. (2017), exacerbate these issues, causing significant economic losses.

Climate change further aggravates these challenges, particularly in semi-arid and coastal areas, where increased risks of drought, soil salinization, floods and extreme weather events pose formidable threats to agricultural sustainability (Lal, 2014; Dasgupta et al., 2018). To mitigate these effects, the adoption of Best Management Practices (BMPs) is essential. Practices such as conservation agriculture (CA), sustainable intensification (SI), agroforestry, watershed management (WM), digital agriculture, and restoration of soil health through soil organic carbon (SOC) sequestration are critical. Lal (2014) and Teh and Koh (2016) highlight the principles of CA, including crop residue mulch, minimal soil disturbance, cover cropping, and integrated nutrient management (INM), while SI focuses on enhancing productivity per unit input. Watershed Management, with a focus on efficient water use, aims at achieving "more crop per drop," providing proven strategies for improving agricultural outcomes.

Promoting BMPs in the Global South is particularly important, given the region's vulnerability to environmental stressors. Regions such as Sub-Saharan Africa and South Asia face significant challenges due to low SOC levels, degraded soil structures, and limited availability of water and nutrients. Montanarella et al. (2018) report that water scarcity affects approximately 40 per cent of Sub-Saharan Africa's population,

and this situation is exacerbated by climate change, leading to more frequent and severe droughts that hinder agricultural productivity and sustainability (FAO, 2018).

Innovative approaches such as sustainable land management (SLM) and achieving land degradation neutrality (LDN) offer frameworks for improving agricultural practices. Smyth and Dumanski (2005) emphasize that SLM focuses on minimizing land degradation risks while ensuring optimal land use and promoting sustainable practices to enhance ecosystem services. Similarly, Banuri and Opschoor (2017) highlight that LDN aims for no net loss of land-based natural capital by promoting the sustainable use of resources and rehabilitating degraded lands to support agricultural productivity and resilience.

Successful examples of BMP adoption can be found in various international projects. de Freitas and Landers (2016) document Brazil's widespread adoption of CA, which integrates crop residue management, cover crops, and INM to improve soil and crop outcomes. Similarly, the adoption of sustainable intensification and other BMPs in countries like India and China has demonstrated the potential for significant agricultural improvements through effective NRM practices (Kassam et al., 2015; Garrity et al., 2022). Digital agriculture also plays a critical role in advancing these practices. For instance, India has implemented several digital agriculture initiatives, such as the e-NAM (National Agriculture Market) platform, which facilitates better price discovery and market access, and the Pradhan Mantri Fasal Bima Yojana (PMFBY) app, which provides farmers with information on crop insurance and weather forecasts (India Digital Agriculture, 2020). In this regard, Chaturvedi (2024) underscores the pivotal role of technology in fostering equitable development, positioning India's experience as a model for the Global South. Watershed management, another important BMP, ensures sustainable water use through practices like rainwater harvesting and afforestation, enhancing water availability and productivity (World Bank, 2020). The table below outlines the key challenges and current status of agriculture in the Global South, highlighting significant areas such as climate change, water scarcity, and technological adoption, while incorporating insights from relevant literature.

Table 1 : Key challenges and Current Status of Agriculture in the Global South

Key Area	Challenges in Agriculture	Current Status and Literature Insights
Climate Change	Rising temperatures, erratic rainfall, droughts, and floods affecting crop yields. Increased risks of extreme weather events.	Unpredictable monsoons in South Asia, prolonged droughts in Sub-Saharan Africa, and frequent floods in Southeast Asia. Lal (2014) – Climate change threats in arid regions. Dasgupta et al. (2018) – Coastal salinization impacts on farming.
Water Scarcity	Over-dependence on rain-fed agriculture. Inefficient water management and irrigation. Water scarcity exacerbated by climate change.	40 per cent of Sub-Saharan Africa suffers from water scarcity. Severe groundwater depletion in South Asia and parts of Africa. FAO (2018) – Water scarcity challenges in developing nations. Kumar et al. (2019) – Groundwater management issues in South Asia.
Soil Degradation	Severe soil erosion due to unsustainable farming practices. Declining soil fertility and organic matter. Overuse of chemical fertilizers.	65 per cent of Africa's arable land is degraded. Decreasing soil organic carbon (SOC) levels in South Asia impacting crop productivity. Montanarella et al. (2018) – Causes and extent of soil degradation. Teh and Koh (2016) – Conservation practices for soil health.

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Technology Access and Adoption	Limited access to modern agricultural technologies for smallholders. Digital illiteracy, limited internet infrastructure.	Slow adoption of digital tools like precision agriculture in SSA. Increasing use of digital platforms like e NAM in India for market linkages. Garrity et al. (2022) – Barriers to technology adoption in smallholders. India Digital Agriculture (2020) – India's e-NAM platform success.
Market Access and Infrastructure	Poor rural infrastructure (roads, storage, transportation). Inconsistent access to market information and price volatility.	Post-harvest losses of 30-40 per cent in SSA due to infrastructure gaps. Successful integration of digital platforms in India through e-NAM. World Bank (2020) – Infrastructure gaps leading to post-harvest losses. Kassam et al. (2015) – Digital agriculture for improved market access.
Smallholder Farmer Vulnerabilities	Land fragmentation. Lack of access to affordable credit and insurance schemes. Heavy reliance on subsistence farming.	70-80 per cent of farms in SSA are smallholdings. Slow progress in financial services like crop insurance for smallholders. Moyo et al. (2021) – Financial inclusion challenges for smallholders. du Freitas and Landers (2016) – CA practices supporting smallholders in Brazil.

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Natural Resource Management	Non-Optimal use of land and water resources. Forest degradation and deforestation for agricultural expansion.	Agroforestry and watershed management gaining traction in India. Adoption of Land Degradation Neutrality (LDN) programmes in Africa. Smyth and Dumanski (2005) – Sustainable land management strategies. Banuri and Opschoor (2017) – LDN as a solution for land management in developing countries.
Institutional and Policy Challenges	Disjointed agricultural policy frameworks. Ineffective governance and poor implementation capacity.	Collaborative efforts like South-South Cooperation (SSC) bridging policy gaps. Brazil and India are leading SSC in agriculture. Chaturvedi (2016) – SSC fostering policy cohesion and cooperation. Ssegane et al. (2022) – Need for integrated agricultural policies in SSA. Chaturvedi (2024) – Equitable Development Transformation with Technology: Relevance of the Indian Experience for Global South.

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Climate-Resilient Practices	Low awareness of sustainable practices like conservation agriculture (CA). Limited adoption of climate-smart agriculture (CSA).	CA widely adopted in Brazil and India. CSA initiatives growing in SSA but adoption remains slow. Lal (2014) – Importance of CA in enhancing resilience to climate change. Garrity et al. (2022) – CSA practices expanding but slowly in SSA.

Source: Author own Contribution

The objective of this paperis to explore the potential of promoting BMPs such as sustainable agriculture, Integrated Farming Systems, digital solutions in agriculture, Watershed management, Natural Resource Management practicesand LDN through strategies like South-South Cooperation (SSC) and triangular cooperation (TrC). It aims to outline a framework of strategies in developing countries, considering regional differences in biological, socio-economic, scientific, institutional, sustainable, and cultural factors that influence the adoption of BMPs. By building on technological advances and translating knowledge into action, developing countries can enhance agricultural productivity, ensure food security, and achieve sustainable development.A key initiative in this context is Development And Knowledge Sharing Initiative(DAKSHIN), which serves as a platform to advance these goals. By fostering partnerships and facilitating the exchange of expertise, DAKSHIN plays a crucial role in enabling the adoption and replication of BMPs across the Global South.

1.1 Dakshin

The Development AndKnowledge Sharing Initiative (DAKSHIN) is a promising effort aimed at addressing the multifaceted challenges faced by the Global South. Through its mandate of fostering knowledge sharing and mutual learning, DAKSHIN seeks to promote inclusive growth and sustainable development across the region. In line with its vision,

DAKSHIN serves as a platform for collaborative efforts among countries of the Global South to overcome developmental challenges and achieve socio-economic prosperity.India, as a prominent member of the Global South, plays a pivotal role in advancing the objectives of South-South Cooperation, including in the realm of agriculture. With a rich agricultural heritage and a track record of implementing successful developmental initiatives, India stands poised to offer valuable assistance and expertise to its counterparts in the Global South as part of the initiatives being undertaken at DAKSHIN. This paper presents a framework for replicating India's successful agricultural initiatives across the Global South. A framework, in this context, refers to a structured approach that identifies strategic pillars, necessary resources, and enabling conditions required for successful adaptation and implementation of BMPs. The framework highlights the ecosystem needed for effective execution, aligning with DAKSHIN's overarching vision of empowering the Global South through cooperative development.

2. Successful Agricultural Initiatives by India

India's advancements in agricultural technology, sustainable farming practices, natural resources management, farmer welfare schemes, market linkages, and rural infrastructure provide valuable insights for countries in the Global South seeking comprehensive rural progress. To further catalyse agricultural development, DAKSHIN prioritizes three key areas: agricultural innovation, natural resources management and farmer empowerment through digital technologies,

Indian agriculture, which beganmillenniaago with the domestication of animals and early cultivation of plants, holds a rich heritage deeply embedded in the country's cultural and historical fabric. Found in ancient scripts such as the Vedas, Upanishads, agriculture in India has evolved as a complex mosaic of distinct agro-ecosystems, differentiated by climatic, soil, vegetation, and other natural features. Despite its diversity, Indian agriculture has historically faced challenges such as monsoon dependence and natural calamities, leading to food shortages in pre-independent India. Recognizing the pivotal role of agriculture in national development, post-independence India prioritized the sector as being the primary source of

livelihood for majority of India's population. Despite uncertainties like declining soil health and emerging pest and pathogen threats, India's agriculture sector achieved significant milestones, particularly in ensuring food security. From being a food-deficit nation, India transformed into a food surplus and net exporter, with food grain production increasing from 51 million tons (Mt) in 1950/51 to over 314 Mt in 2022, achieving a CAGR of approximately 3.1 per cent over this period.

Today, India holds the distinction of being the largest producer of milk, pulses, and jute, while also ranking as the second-largest producer of rice, wheat, cotton, fruits, and vegetables globally. It stands as a significant player in the global agriculture sector, with a population of 1.39 billion and 160 million hectares of arable land.Agriculture serves as the primary livelihood for approximately 55 per cent of its population. The agricultural landscape of India is characterized by its vastness, diversity, and complexity, with the country experiencing all 15 prominent climates and hosting 46 out of the 60 soil types found on earth. However, Indian agriculture faces formidable challenges including the impacts of climate change, water scarcity, and vulnerabilities of smallholder farmers, soil degradation, and issues with market access. To tackle these issues, the Indian government has mandated a holistic approach, involving policy reforms, technological innovations, and community participation. Strategies encompass promoting climate-smart agricultural practices, improving irrigation efficiency, bolstering rural credit institutions, advocating soil conservation techniques, and investing in market infrastructure.

2.1 Flagship Programmes in Agriculture

Recognizing the shared challenges faced by many countries in the Global South, DAKSHIN endeavours to compile and disseminatethe Indian best practices in addressing common agricultural issues. Emphasizing collaborative approaches, DAKSHIN seeks inclusive solutions to foster sustainable development. Noteworthy flagship initiatives by the Indian government aimed at revitalizing the agricultural sector include the National Agriculture Development Programme (Rashtriya Krishi Vikas Yojana -RKVY), National Mission for Sustainable Agriculture (NMSA),

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), Crop Insurance Scheme (Pradhan Mantri FasalBima Yojana - PMFBY), Soil Health Card, Agriculture Infrastructure Fund (AIF), Watershed development programme, Agri-Stack, and National Agriculture Market (eNAM). These initiatives aim to enhance farmer incomes, boost resilience, improve soil health, optimize natural resource management, and facilitate market access, thereby contributing significantly to the overall sustainability and prosperity of Indian agriculture.The achievements of these initiatives contribute to increased agricultural productivity, improved market access, enhanced resilience against climate change/natural calamities, and the adoption of sustainable farming practices. These outcomes not only benefit Indian farmers but also serve as a blueprint for other countries in the Global South seeking to overcome similar challenges. Key programmes include:

2.1.1 National Agriculture Development Programme (Rashtriya Krishi Vikas Yojana -RKVY)

Objective: Enhance agricultural growth and farmers welfare.

Key features

- RKVY, aims to augment public investment in the agriculture sector, focusing on infrastructure development, technology adoption, and farmer welfare schemes.
- The scheme emphasizes innovation in agricultural practices, encouraging the adoption of modern technologies, high-yielding crop varieties, and sustainable farming methods to enhance productivity and income levels.
- RKVY aims to strengthen market linkages for farmers by facilitating access to markets, storage facilities, and value chains.
- The scheme focuses on empowering farmers through capacity building initiatives, training programmes, and extension services to equip them with the knowledge and skills needed to adopt best agricultural practices and make informed decisions.
- RKVY supports the creation of critical agricultural infrastructure such as irrigation systems, rural roads, market yards, and storage facilities to enhance productivity, market access, and overall agricultural development.

- Sustainability is a key focus of RKVY, with initiatives aimed at promoting ecological sync practices, soil conservation, water management, and biodiversity conservation to ensure the long-term viability of agricultural activities.
- The scheme aims to promote social inclusion by prioritizing the needs of small and marginal farmers, women farmers, and other vulnerable groups, ensuring that they benefit equitably from agricultural development initiatives.

Achievements (RKVY, 2024)

- RKVY projects have created over 2 million direct and indirect employment opportunities in agriculture and allied sectors, with a special focus on engaging rural youth and women.
- Skill development programs under RKVY have trained more than 600,000 rural youth in modern agricultural practices, enhancing their employability and income prospects.
- Crop yields have increased by an average of 20-25 per cent in states like Punjab and Haryana since the implementation of RKVY.
- In Gujarat, RKVY-supported initiatives have led to a 30 per cent increase in the production of high-value crops such as fruits and vegetables.
- Horticulture production has witnessed a remarkable growth of 35 per cent in states like Maharashtra and Andhra Pradesh, supported by RKVY initiatives.
- RKVY has facilitated the construction of over 10,000 km of rural roads, improving connectivity to agricultural markets and reducing transportation costs.
- More than 500 modern market yards and storage facilities have been established, resulting in a significant reduction in post-harvest losses, estimated at 25-30 per cent.
- Over 1,000 Farmer Producer Organizations (FPOs) have been formed with RKVY support, benefiting over 1.5 million farmers across the country.
- Access to credit has increased by 40 per cent for small and marginal farmers, leading to higher investments in agricultural inputs and technology adoption.

- Adoption of integrated farming systems has resulted in a 25 per cent increase in income for farmers engaged in allied activities such as dairy, poultry, and fisheries.
- Water conservation measures, including drip irrigation and rainwater harvesting, have resulted in a 30 per cent reduction in agriculture water usage per hectare in states like Rajasthan and Madhya Pradesh.

Best Practices which can be shared

RKVY aims to augment public investment in the agriculture sector, focusing on infrastructure development, technology adoption, and farmer welfare schemes. The following best practices followed and adapted in the programme can be shared for Global South

- Success stories in post-harvest management and storage facilities under RKVY can be shared to enhance market access and reduce losses.
- Development of drought-resistant and high-yielding cultivars, such as hybrid millets, drought-tolerant maize, and improved pulse varieties, supports productivity in semi-arid and arid regions.
- Integrated Pest Management (IPM) strategies in RKVY include the use of bio-control agents, pheromone traps, and pest-resistant crop varieties, reducing dependency on chemical pesticides.
- Innovations in solar-powered cold storage units, low-cost hermetic storage bags, and modular food processing units under RKVY help minimize post-harvest losses for perishable commodities.
- The Mega Food Parks initiative within RKVY enhances infrastructure for post-harvest processing, providing integrated cold storage, processing facilities, and logistics support for efficient market access.
- Advanced grading and packaging solutions developed under RKVY ensure produce is sorted by quality, reducing wastage and improving marketability.
- Cost-effective, small-scale, multi-functional machinery, including combined seed drill and fertilizer applicators, multi-crop threshers, and mini-harvesters, are part of RKVY's support for smallholder farms facing capital constraints.

- Implementation of innovative agricultural practices developed under RKVY, such as post-harvest management practices, high-yielding crop varieties and resource-use efficiency, enhancing productivity.
- Social inclusion models targeting small and marginal farmers, women, and other vulnerable groups under RKVY which ensures equitable access to resources and opportunities.
- Knowledge exchange on water conservation, soil health practices, and ecological synchronization methods of RKVY which increases climate resilience and sustainability.

2.1.2 National Mission for Sustainable Agriculture (NMSA)

Objective: Promote sustainable agriculture practices.

Key Features

- NMSA promotes the adoption of climate-resilient practices, including conservation agriculture, integrated farming systems, and sustainable land and water management techniques.
- The mission emphasizes the efficient use of water through micro-irrigation technologies, such as drip and sprinkler systems, to enhance water use efficiency and productivity.
- NMSA supports the creation of assets and infrastructure for water conservation, such as rainwater harvesting structures, farm ponds, and check dams, to ensure the availability of water for agricultural activities.
- Soil health management is a core focus, with initiatives aimed at enhancing soil fertility through balanced use of organic and inorganic fertilizers, green manuring, and agro-forestry practices.
- The mission encourages the use of bio-fertilizers and bio-pesticides to reduce the dependency on chemical inputs and promote eco-friendly farming practices.
- NMSA includes capacity-building and training programmes for farmers to equip them with knowledge and skills on sustainable agricultural practices and climate-smart agriculture.
- Financial support is provided to farmers for adopting sustainable practices, including subsidies for micro-irrigation systems, soil health management, and water conservation structures.

Achievements (NMSA, 2024)

- Over 1 million hectares of land have been brought under micro-irrigation systems, improving water use efficiency and crop productivity.
- NMSA-supported initiatives have led to a 15-20 per cent increase in crop yields in areas adopting conservation agriculture and integrated farming systems.
- Soil health management practices promoted under NMSA have resulted in improved soil fertility and a 10-15 per cent reduction in the use of chemical fertilizers.
- Water conservation projects under NMSA have created additional water storage capacity, benefiting over 2 million farmers and ensuring water availability during dry periods.
- The mission has facilitated the establishment of over 500,000 vermicompost units, promoting the use of organic manure and enhancing soil health.
- Training and capacity-building programmes for 2 million farmers, increasing their awareness and adoption of sustainable agricultural practices.

Best Practices which can be shared

NMSA promotes the adoption of sustainable and climate-resilient agricultural practices. These include conservation agriculture, integrated farming systems, and sustainable land and water management techniques. The following best practices, developed and adapted under NMSA, can be shared with countries in the Global South to enhance agricultural resilience and sustainability.

- Water-saving technologies like micro-irrigation (drip and sprinkler systems) and rainwater harvesting, critical for arid and semi-arid regions of the Global South.
- Soil health management strategies, including the use of bio-fertilizers and organic amendments to maintain soil fertility and productivity.
- Integrated Farming Systems (IFS) models developed under NMSA that combine crop/horticulture-livestock systems, beneficial for small and marginal farmers. These models integrate conservation practices like zero-tillage and crop rotation, alongside climate-resilient technologies and climate data analytics to mitigate risks.

- Watershed-based landscape approaches developed under NMSA that enhance rainwater capture, mitigate soil erosion, and recharge groundwater, combining physical infrastructure with community engagement and agro-ecological practices to optimize water resources and agricultural productivity.
- Agroforestry models adapted under NMSA that combine economically valuable tree species with food crops, improving ecological balance, enhancing biodiversity, and providing additional income for farmers. These models can be adapted for the Global South to aid in land restoration and promote sustainable agriculture.
- Capacity building initiatives for farmers on climate-smart and sustainable practices to adapt to erratic weather patterns and resource constraints.

2.1.3 Crop Insurance Scheme (Pradhan Mantri Fasal Bima Yojana - PMFBY)

Objective: Provide comprehensive crop insurance to farmers.

Key Features:

- PMFBY offers farmers a simplified and minimum premium structure, making crop insurance coverage accessible and affordable. The premium rates are subsidized by both the central and state governments, ensuring that farmers pay nominal amounts for comprehensive insurance protection.
- The scheme provides coverage against various risks, including drought, flood, cyclone, hailstorm, pest infestation, and other natural calamities.
- PMFBY leverages digital technology, including mobile-based applications and remote sensing/satellite imagery, for efficient crop assessment, premium calculation, and claim settlement processes.
- While participation in PMFBY is voluntary for farmers, the scheme encourages maximum enrolment by providing attractive insurance coverage and premium subsidies. It accommodates all categories of farmers, including tenant farmers and sharecroppers, promoting inclusivity and equitable access to insurance benefits.
- PMFBY emphasizes prompt claim settlement to provide timely financial relief to affected farmers. By streamlining claim

processing procedures and adopting technology-driven approaches, the scheme ensures that farmers receive their rightful compensation without undue delays.

Achievements (PMFBY, 2024)

- 291.9 million farmer applications have insured their crops under the PMFBY since 2016
- More than Rs 95000 million worth of claims have been provided to farmers since the launch of the scheme in the year 2016, against the total premium of Rs 170000 million paid by them
- PMFBY offers the lowest premiums nationwide: 2 per cent for Kharif (monsoon) Food & Oilseeds crops, 1.5 per cent for Rabi(winter) Food & Oilseeds crops, and 5 per cent for Annual Commercial/ Horticultural Crops, ensuring affordability for all farmers.
- The number of farmer applications has grown 33.4 per cent and 41 per cent year-on-year during 2021-22 and 2022-23, respectively. Further, during the year 2023-24, there in an increase of 27 per cent in terms of farmers enrolled under the scheme so far. Also 42 per cent of total farmers insured under the scheme in FY 2023-24 are non-loanee farmers.

Best Practices which can be shared

- Knowledge sharing on insurance models and the use of digital technology for crop assessment, premium calculation, and claim settlement, which can benefit other countries facing climate-induced risks.
- Adoption of the simplified premium structure and subsidization model of PMFBY, ensuring that crop insurance is accessible to small and marginal farmers in other Global South nations.
- Promoting digital innovations like remote sensing and satellite imagery to improve claim processing and increase trust in insurance systems.

2.1.4 Soil Health Card Scheme

Objective: Assess and improve soil health across India.

Key features

- Under the scheme/initiative, soil samples are collected from farmers' fields and tested for various parameters such as pH levels,

electrical conductivity, organic carbon content, and nutrient levels (nitrogen, phosphorus, potassium, etc.).

- Based on the soil test results, personalized Soil Health Cards are prepared for each farmer. These cards provide recommendations on the type and quantity of fertilizers and soil amendments needed to improve soil health and maximize crop yields.
- Soil Health Cards are typically valid for a few years, after which farmers can request a renewal of their cards by submitting new soil samples for testing.
- The government subsidizes the cost of soil testing and issuance of updated Soil Health Cards with the requirement of farmers.
- The scheme is implemented through a digital platform where farmers can access their Soil Health Cards online and receive recommendations via mobile applications or web portals.

Achievements (Soil Health, 2024)

- Since its launch in 2015, over 23.68 crore (223.6 million) Soil Health Cards have been distributed to farmers across the nation
- The Government has allocated over Rs. 810 crores (81.0 million) for the Soil Health Card scheme since its inception.
- The scheme has facilitated the establishment of 429 new static Soil Testing Labs (STLs), 102 new mobile STLs, 8752 mini STLs, and 1562 village-level STLs. Out of these, 129 new static STLs, 86 new mobile STLs, 6498 mini STLs, and 179 village-level STLs have already been established.
- The SHC scheme aims to issue soil health cards every two years to address nutritional deficiencies in fertilization practices, reduce cultivation costs, increase yields, promote sustainable farming, and improve soil health and fertility.
- Alongside the SHC scheme, the government is implementing the Nutrient Based Subsidy (NBS) scheme and promoting customized and fortified fertilizers for balanced fertilizer use.
- A pilot project called ‘Development of Model Villages’ involves soil sample collection at individual farm holdings with farmer participation. This project aims to organize demonstrations and distribute soil health cards directly to farmers.
- Over the next five years, the plan includes covering four lakh villages under individual farm holding soil sampling and testing,

organizing 2.5 lakh demonstrations, setting up 250 village-level soil testing labs, strengthening 200 soil testing labs with Intensively Coupled Plasma (ICP) spectrophotometer, and promoting micro-nutrients in a designated area.

- A study by the National Productivity Council (NPC) found that the SHC scheme has led to sustainable farming practices and a decrease in chemical fertilizer use by 8-10 per cent. Additionally, there has been an overall increase in crop yields by 5-6 per cent due to the application of fertilizer and micro-nutrients as per Soil Health Card recommendations.
- The SHC portal provides farmers with access to their soil health information, recommendations for fertilizer use, and the ability to print their Soil Health Cards. The portal is available in 21 regional languages for the convenience of farmers

Best Practices which can be shared

- Design and implementation of soil health card schemes to improve nutrient management, reduce chemical fertilizer use, and promote sustainable farming practices.
- Sharing methodologies and experiences in establishing soil testing labs, mobile units, and village-level labs, which could significantly benefit other developing countries lacking soil health infrastructure.
- Capacity building on soil sampling, testing, and personalized recommendations for balanced fertilizer use, potentially improving yields and promoting sustainable agriculture across the Global South.

2.1.5 National Agriculture Market (eNAM)

Objective: Create a unified national market for agricultural commodities.

Key Features:

- Integrates physical mandis through a virtual platform.
- Provides real-time price information and electronic payment settlement.
- Reduces transaction costs and bridges information gaps.

Best Practices which can be shared

- Sharing the operational and governance frameworks of eNAM to help other countries create unified agricultural markets, enhancing price transparency and reducing transaction costs.

- Promoting the integration of local markets with digital platforms to improve farmer access to real-time price information and market opportunities.
- Capacity building on electronic payment systems and price discovery mechanisms to enhance the efficiency of agricultural markets.

2.1.6 Agriculture Infrastructure Fund (AIF)

Objective: Develop post-harvest management infrastructure and community farming assets.

Key Features:

- Provides financial support for cold storage, processing units, and marketing infrastructure.
- Offers concessional loans and subsidies for beneficiaries.
- Focuses on reducing post-harvest losses and improving market access.

Best Practices which can be shared

- Sharing the financing models and operational best practices for setting up cold storage, processing units, and marketing infrastructure to reduce post-harvest losses and enhance value addition in agricultural products.
- Establishing concessional loan systems for agriculture infrastructure development, which can help other Global South nations improve food security and market access.

2.1.7 Agri-Stack

A visionary open-source digital agriculture initiative by the Government of India, Agri-Stack aims to create a comprehensive ecosystem comprising databases, frameworks, and IT systems. It aims to open up agricultural data through interoperable systems with key features like open standards, federated architecture, and data privacy prioritization.

Achievements include:

- Strategic partnerships and data integration.
- Empowerment of farmers through enhanced access to information.
- Revolutionizing agricultural processes to enhance productivity and stakeholder empowerment.

Best Practices which can be shared

- Collaborating on the development of open-source digital ecosystems for agriculture, enabling data-driven decision-making for farmers and stakeholders across the Global South.
- Sharing the Agri-Stack model of integrating strategic partnerships and data systems to enhance farmer access to market information, productivity tools, and advisory services.
- Capacity building on data privacy frameworks and interoperable systems to ensure secure and efficient use of agricultural data.

3. Need for a Structured Framework

Agricultural and natural resource management programmes often face significant challenges due to the absence of a well-defined structural framework for implementation of best practices. According to the Asian Development Bank (ADB, 2020), resources are frequently misaligned and ineffectively utilized, resulting in interventions that are restricted to specific regions and selective in nature. This approach neglects vulnerable hotspots and integrated farming systems (IFS) that require comprehensive attention and support. The ADB report highlights the critical need for a cohesive framework to ensure equitable resource distribution and address the diverse needs of all agricultural areas. The Doubling Farmers' Income Committee (DFI, 2021) further underscores the absence of a replicable framework for agricultural initiatives. Despite extensive documentation of best practices, there is a significant gap in driving programmes or schemes that can be scaled and replicated effectively across different contexts. The DFI emphasizes that without such a framework, efforts to improve agricultural productivity and farmer incomes remain fragmented and limited in scope. The Parliament Standing Committee on Agriculture, Animal Husbandry, and Food Processing (SCAAF, 2023) identifies the lack of a concrete framework tailored to diverse agro-climatic regions as a primary obstacle hindering the performance of agricultural programmes. SCAAF underscore the critical need for regional specificity to address unique challenges related to agro-ecology, administration, political dynamics, livelihoods, and community engagement. A research study by Ssegane et al. (2022) suggests the development of frameworks that

integrate agro-ecological, physical, land use, and dynamic characteristics across various sub-Saharan African regions. Such comprehensive frameworks would enhance the capacity to support sustainable land management practices and bolster the resilience of agricultural systems against environmental and socio-economic stresses.

Several critical issues require immediate attention to effectively replicate best practices for sustainable agriculture management and develop a robust framework for Agricultural Development programmes (ADP). Barbara et al. (2016) noted that the parameters and attributes considered for exchanging best management practices vary widely across studies and literature. This variation necessitates an initial subjective judgment to identify which parameters will significantly impact the agricultural development responses of interest. Stefan (2017) emphasized that the classification and regionalization of parameters for best management practices are typically based on physical, demand-driven, and land use factors. Understanding local agro-ecological processes and simulating critical parameters are essential for identifying key regions and conservation hotspots. This approach ensures that interventions are both targeted and effective. Tracy et al. (2018) highlighted that the attributes used in frameworks for replicating best practices should characterize the factors driving agro-ecological responses while balancing livelihood parameters. These attributes must be representative of soil conditions, agronomical science, and socioeconomic factors to ensure comprehensive and relevant interventions. Smith et al. (2019) underscored the importance of community involvement and stakeholder engagement in developing and implementing frameworks for best management practices. Engaging local communities and stakeholders is crucial for enhancing the sustainability and local relevance of agricultural development initiatives. By incorporating local knowledge and ensuring community buy-in, frameworks can be more effectively tailored to meet the specific needs and conditions of different regions. Gupta et al. (2018) advocated for the integration of indigenous knowledge systems to develop culturally appropriate strategies in the replication of best practices. Jones et al. (2020) underscored the necessity of embedding

climate change adaptation mechanisms to enhance long-term resilience. Kumar et al. (2019) emphasized implementing gender-sensitive methodologies to ensure equitable access to resources for women farmers. Chowdhury et al. (2021) highlighted the critical role of incorporating technological innovations, such as precision agriculture, to improve productivity and resource efficiency. Nguyen et al. (2020) focused on enhancing market access and strengthening agricultural value chains to significantly increase farmers' incomes and overall livelihoods. Smith and Brown (2019) underlined the importance of aligning best practices with national agricultural policies and agendas, emphasizing community engagement for coherence and effective implementation. Li et al. (2021) suggested integrating ecosystem services assessment into best practices to balance productivity with environmental conservation, promoting sustainable land use. Moyo et al. (2021) highlighted the necessity of fostering partnerships and collaboration among stakeholders, including government agencies, NGOs, and the private sector, to enhance the scalability and sustainability of best practices.

The development of a comprehensive structured framework is essential for overcoming the challenges in effectively implementing and adapting agricultural best practices/programs. A well-designed comprehensive framework would enable the scaling of successful initiatives by ensuring they are adaptable to diverse regions, responsive to local needs, and aligned with long-term sustainability objectives. Without such a cohesive structure, agricultural programmes risk remaining fragmented and unable to deliver the comprehensive transformative impact they aim to achieve. As mentioned in the above literature, there is an urgent need for a framework that integrates a comprehensive learning approach, combining diverse data sources, stakeholder perspectives, and proven success stories. This framework should encompass agro-ecological, physical, land use, and dynamic characteristics, while also addressing crucial factors such as socio-economics, livelihoods, and traditional knowledge systems. It must also consider gender-specific challenges, resource use efficiency, market access, value chain integration, and technological innovations. Furthermore, community engagement is vital

to ensure that these initiatives are rooted in local agro-ecological needs. This paper proposes an integrated agricultural development framework that offers a holistic strategy to enhance food security and build climate resilience across the Global South. Grounded in the pillars of Science, Scale, and Sustainability (SSS), the framework is designed to be adaptive, inclusive, and ecological-sync.

4. Proposed Frame work

The framework for replicating successful agricultural practices is grounded in the pillars of Science, Technology and Innovation (STI), Scale, and Sustainability (SSS), providing a multifaceted approach to ensure scientifically rigorous, scalable, and sustainable agricultural interventions.

4.1 Science, Technology and Innovation (STI) Pillar

4.1.1 Quantitative and Qualitative Assessment:

1. Methods, Protocols, Models, and Instruments:
   - Rigorously evaluate methodologies, protocols, models, and instruments to ensure suitability, adaptability, and reliability.
   - Assess the gauge density for optimal instrument placement, sampling sites, and benchmark locations.
2. Mapping of Existing Methods, Infrastructure Knowledge, and Technologies:
   - Map existing methods, protocols, knowledge, and technologies.
   - Analyse available data, protocols, practices, and infrastructure.

4.1.2 Optimal Scales:

1. Effective Capture of Physical Processes:
   - Identify the optimal scales needed to comprehend the complexity of physical processes.
   - Ensure a balance between resolution and practical field applicability.
2. Balancing Resolution with Field Application:
   - Determine the appropriate level of detail for practical implementation across diver diverse field conditions.
3. Indigenous Knowledge, existing successful initiatives/programmes and livelihood activities:

- Understanding and Evaluation of local agricultural practices, protocols, traditional knowledge, and interventions.
- Assess the Existing data its quality, gaps, protocols, and infrastructure to inform decision-making and optimize resource utilization.
- Understanding Existing programmes and Initiatives - Evaluate and expand upon successful current programmes and livelihood initiatives, ensuring new interventions are synergistic and impactful

4.2 Scale Pillar

1. Institutional Frameworks and Financial Resources:
   - Institutional Mechanisms: Comprehensive understanding of governance structures and implementation mechanisms, including the identification of nodal agencies responsible for coordination and implementation.
   - Multi-Stakeholder Partnerships: Partnerships involving government agencies, NGOs, the private sector, and community organizations. This includes ensuring policy integration and coherence to support collaborative efforts and enhance the effectiveness of agricultural interventions at field scale.
   - Financial Resources: Mapping financial resources required and funding mechanisms (e.g., grants, loans, subsidies) and conduct economic analyses (e.g., cost-benefit analysis) to ensure financial viability.
2. Resolution and Sample Size:
   - Resolution: Selection of spatial and temporal resolutions that balance detail with practical data acquisition constraints.
   - Sample Size: Determination of appropriate sample sizes for statistical significance through power analysis.
3. Parameter Consideration:
   - Key Parameters: Identification of essential biophysical and socio-economic parameters (e.g., soil fertility, crop yield, market access) for robust analysis.
   - Feasibility and Expertise: Evaluation of resource availability, expertise requirements, and logistical feasibility for parameter measurement and analysis.

4. Community Adaptability and Technical Robustness:
    - Adaptability: Assessment of socio-cultural factors influencing community acceptance and adoption of practices.
    - Technical Robustness: Stress-testing interventions under various scenarios (e.g., climate variability, market fluctuations) to ensure resilience.
5. Agro-Ecological Suitability:
    - Agro-Ecological Zoning: Classification of models/protocols based on ecological criteria (e.g., climate zones, soil types) to tailor practices to specific contexts.

4.3 Sustainability Pillar

1. Accessibility and Longevity:
    - Post-Project Sustainability: Develop parameters to ensure continuous access to resources,manpower, training, and support systems post-project.
    - Sustainable Financing Models: Implement models such as microfinance and revolving funds to support long-term sustainability.
2. Resilience Building:
    - Environmental Resilience: Adopt practices that enhance soil health (e.g., cover cropping, no-till farming), water management (e.g., rainwater harvesting, drip irrigation), and biodiversity conservation.
    - Economic Resilience: Diversify income sources (e.g., value-added products, Secondary agriculture activities, Post harvest Technologies, agro-tourism) and develop risk management tools (e.g., crop insurance).
    - Social and Political Resilience: Strengthen social capital (e.g., farmer groups –FPO'S, CBo'scooperatives) and advocate for supportive policies.
    - Convergence with other existing schemes/programmes: Factors need to be established for synergy with other existing schemes/programmes and NRM activities, like Watershed developmentprogrammemes and Rural employment schemes. Utilizing resources allocated for drought/disasters and climate change mitigation within these initiatives, the programmes

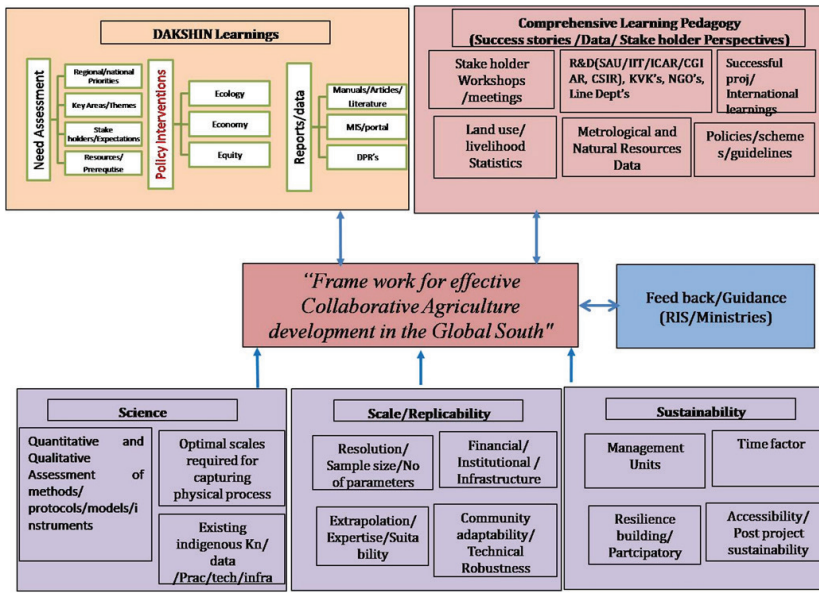
can be optimized at the saturation level, fostering synergy to effectively address diverse challenges in various agro-ecological regions.

3. Time Factor:
    - Temporal Planning: Factors for timelines for project phases (e.g., initiation, mid-term review, final evaluation) with milestones and deliverables.
    - Execution and Implementation: Use agile project management methodologies (e.g., iterative planning, continuous feedback loops) to adapt to changing conditions.
    - Evaluation Processes: Conduct longitudinal studies and impact assessments to monitor and evaluate outcomes over time.
4. Management Units:
    - Monitoring and Evaluation Units: Delineating administrative units and establish dedicated units with specific roles for M and E, analysis, and reporting.
    - Adaptive Management: Develop frameworks for continuous learning and improvement, incorporating feedback mechanisms to refine and adjust practices as needed.

This framework must be integrated with a comprehensive learning pedagogy designed to enhance agricultural practices through the amalgamation of diverse data sources, stakeholder perspectives, and success stories. India boasts a rich and diverse agricultural research and extension system, comprising State Agricultural Universities (SAUs), Indian Institutes of Technology (IITs), the Indian Council of Agricultural Research (ICAR), and various international and national organizations like CGIAR and CSIR. These institutions contribute cutting-edge research, innovative technologies, and best practices that can be tailored to local contexts, complemented by field-level extension institutions such as Krishi Vigyan Kendras (KVKs), Agricultural Technology Management Agencies (ATMA), and Agricultural Technology Research Institutes (ATRI). In parallel, successful projects and international learnings offer a wealth of knowledge and proven methodologies that can be replicated or adapted to address different regional challenges. The inclusion of land use and livelihood statistics is essential for understanding the socio-economic backdrop of agricultural communities. This data aids in

designing interventions that are both economically viable and socially equitable. Similarly, meteorological and natural resources data are crucial for developing climate-resilient practices and ensuring the sustainable use of natural resources. Integrating this strategy with the framework outputs operational guidelines and standard operating procedures (SOPs) for replicating successful initiatives.

Figure 1: Proposed Frame Work for Effective Collaborative Agriculture Development in the Global South



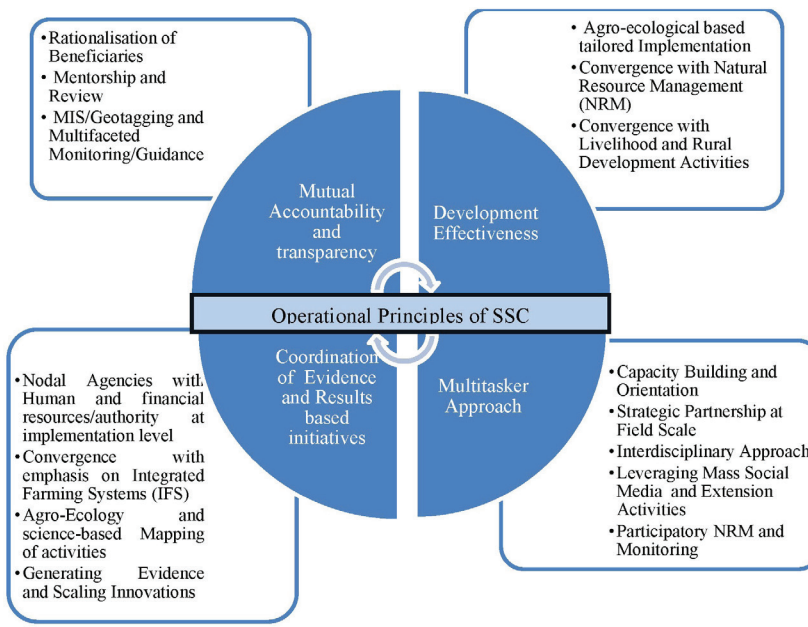
Source: Author Contribution.

5. Integrated Strategies for Framework Implementation

South-South Cooperation represents a different paradigm from North-South Cooperation (NSC). While NSC is seen as a historical responsibility, which should be continued and expanded further as a mechanism in its own right filling a specific niche, SSC should be viewed as a voluntary partnership, which has now developed into a more matured platform transcending the initial foundations of political solidarity. It should not substitute but complement traditional development cooperation wherever

possible. South-South Cooperation has been built on robust foundations, including its demand-driven approach; non-conditionality; respect for national sovereignty; national ownership and independence; and above all, mutual benefit (Chaturvedi, 2016).Based on these principles, integrated strategies are schematized and can be applied to support framework implementation.

Figure 2: Integrated Strategies based on Operational Principles of South-South Cooperation to Support Framework Implementation



Source: Author Contribution.

1. **Agro Ecological based Tailored Implementation:** Allocate resources based on the specific needs of diverse agro-ecological ecosystems, prioritizing vulnerable districts, regions, and blocks that are critically drought, flood, or disaster-prone. Emphasize cluster-based approaches, focusing on small and marginal farmers to encourage convergence and local participation.

2. **Rationalization of Beneficiaries:** Implement an online registration system for beneficiaries to ensure transparency and genuine inclusion. Develop comprehensive practice packages and integrate with existing schemes for streamlined processes. Use criteria such as landholding size, cropping patterns, socio-economic status, and vulnerability to identify eligible beneficiaries. Collaborate with local agricultural extension officers, village councils, and community leaders to accurately identify potential beneficiaries. Employ agricultural databases, land records, crop surveys, and the Crop Cutting Experiment (CCE) methodology for accurate yield estimations. Utilize banking records and digital portals for seamless enrolment, enhancing identification efforts through collaborations with cooperatives, banks, and insurance providers.
3. **Convergence with Natural Resource Management (NRM):** Establish synergy with NRM activities, leveraging watershed-based approaches under programmes like watershed development and rural employment schemes to address multifaceted agricultural challenges effectively. Optimize resources allocated for drought and climate change mitigation, fostering synergy to address diverse challenges in various agro-ecological regions.
4. **Convergence with Livelihood and Rural Development Activities:** Integrate with livelihood and rural development initiatives by Collaborate with rural employment schemes, diversify livelihoods with non-farm activities, and support self-help groups/FPO.
5. **Mentorship and Review:** Review comprehensive action plans at the cluster level under the guidance of technical committees comprising experts. Ensure timely release of funds based on approved plans. National-level technical committees, including experts from agriculture, rural development, animal husbandry, dairy, fisheries, environment, forests, tribal affairs, and food processing, will assess and prioritize activities in the action plans.
6. **MIS/Geotagging and Multifaceted Monitoring/Guidance:** Develop a robust Management Information System (MIS) dashboard for real-time tracking and intervention, enabling progress tracking, geo-tagging, and timely interventions. Allocate resources to specific nodal agencies (SNA) to engage a dedicated team for field visits and on-ground accountability. Conduct interim, concurrent, and

final evaluations by the SNA, and engage a third-party Individual Verification Agency (IVA) for objective verification of programme achievements.

7. **Nodal Agencies with Human and financial resources/authority at implementation level:** Identify and empower specific nodal agencies (SNAs) with quality human resources, institutional authority, and sufficient resources for sustained effectiveness. SNAs coordinate and implement various programme aspects, including resource allocation, monitoring, evaluation, and addressing implementation challenges. They serve as the primary contact between the government and other stakeholders, facilitating smooth communication and collaboration.
8. **Capacity Building and Orientation:** Conduct orientation and training programmes for district/block officials to familiarize them with scheme details, emphasizing community engagement and needs assessment. Develop comprehensive training modules tailored to specific agro-ecological requirements. Ensure timely capacity building for underperforming blocks and regular training sessions for effective programme implementation.
9. **Strategic Partnerships at Field Scale:** Collaborate with local NGOs and grassroots institutions to oversee scheme outcomes and monitor progress at the grassroots level. Allocate budget portions to empower these organizations for comprehensive field assessments and data collection. Actively involve local stakeholders in monitoring and evaluation processes to enhance transparency and community participation.
10. **Convergence with Emphasis on Integrated Farming Systems (IFS):** Integrate diverse agricultural practices through Integrated Farming Systems (IFS) to enhance income generation and resilience. Combine various farming activities, including crop production, animal husbandry, livestock rearing, dairying, and forestry, to create a balanced and sustainable ecosystem. Synergize with schemes like watershed development, rural employment, and livelihood initiatives for comprehensive support.
11. **Agro-Ecology and Science-Based Mapping of Activities:** Collaborate with R&D institutions to map suitable production systems and recommend integrated farming practices and sustainable

agriculture. Develop and utilize district/regional contingency plans to adjust strategies in response to changing climatic patterns.

12. **Interdisciplinary Approach:** Form interdisciplinary teams involving departments such as Animal Husbandry, Fisheries, and Rural Development. Establish interdepartmental committees at the district/block level for seamless coordination.
13. **Leveraging Mass Social Media and Extension Activities:** Promote interventions through existing extension services and use mass and social media for widespread information dissemination. Combine spatial MIS efficiency with outreach strategies for broader stakeholder engagement.
14. **Capitalizing on Indigenous Knowledge Systems:** Establish institutional arrangements to collaborate with research institutes, universities, NGOs, and civil society organizations to integrate indigenous knowledge into agricultural development. Focus on conserving indigenous landraces, standardizing indigenous technical knowledge, and promoting sensor-based smart agriculture interventions for sustainable agriculture
15. **Participatory NRM and Monitoring:** Promote participatory NRM including groundwater monitoring and community-based water mapping to encourage sustainable Resources use in agriculture. Foster water stewardship practices and adopt water-budget-based production systems at the village level for effective water management.
16. **Generating Evidence and Scaling Innovations:** Conduct multidimensional studies to generate evidence for the impact of agronomic, environmental, and market-related practices on agriculture outcomes. Encourage technology-led initiatives through partnerships with start-ups and support the incubation and scaling of innovations in agriculture.

6. Conclusion and Way forward

The proposed agricultural development framework offers a comprehensive strategy to enhance food security and build climate resilience across the Global South, drawing on India's successful flagship programmes and best management practices (BMPs). Grounded in the pillars of STI, Scale, and Sustainability (SSS), the framework ensures scientifically

rigorous, scalable, and sustainable agricultural interventions. The STIpillar focuses on the meticulous evaluation of methodologies, the optimal placement of instruments, and the integration of indigenous knowledge for locally tailored solutions. The Scale pillar emphasizes strong institutional frameworks, multi-stakeholder partnerships, and community adaptability, ensuring scalability across diverse agro-ecological zones. The Sustainability pillar fosters long-term resilience through environmental, economic, and social strategies, ensuring the availability of resources, financial support, and adaptive management for lasting agricultural impact.

The framework is based on the operational principles of South-South Cooperation (Chaturvedi, 2016) leveraging mutual learning and region-specific expertise to replicate successful strategies.The framework is based on the operational South-South Cooperation (Chaturvedi, 2016) leveraging mutual learning and region-specific expertise to replicate successful strategies.The best practices from India would of course need to be tailored to meet local needs out of the broad diverse physical, socio-economic, and agro-ecological contexts of the Global South, necessitating thorough fieldwork on selective programmes and BMPs. This requires capturing key parameters of STI, Scale, and Sustainability through local site visits, calibration of field methodologies and consultations with key stakeholders such as counterparts of state nodal officers, district officials, farmers, and Farmer Producer Organizations (FPOs). Calibrating these parameters is crucial to validate the framework, and scaling up will thus depend on unifying data collection and decision-making tools at the plot, micro, and village levels. Schematizing BMPs across agro-ecological regions is essential for national-level integration. To refine the framework, a systematic investigation of resource allocation, existing secondary data, and specific criteria is required. Integrating comprehensive learning pedagogy that synthesizes diverse data, stakeholder insights, and success stories is crucial. India's extensive agricultural research and extension systemcomprising institutions such as SAUs, IITs, ICAR, CGIAR, and CSIR offers advanced technologies tailored to local needs. Field-level institutions like KVKs, ATMA, and ATRI ensure practical

implementation and extension. By leveraging land use, livelihood, meteorological, and natural resource data, the framework can deliver region-specific, economically viable, and climate-resilient interventions, culminating in the development of operational guidelines and SOPs for replicating successful agricultural initiatives.

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BEF aims to serve as a dedicated platform for fostering dialogue on promoting the concept in the Indian Ocean and other regions. The forum focuses on conducting studies on the potential, prospects and challenges of blue economy; providing regular inputs to practitioners in the government and the private sectors; and promoting advocacy for its smooth adoption in national economic policies.

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FISD aims to harness the full potential and synergy between science and technology, diplomacy, foreign policy and development cooperation in order to meet India's development and security needs. It is also engaged in strengthening India's engagement with the international system and on key global issues involving science and technology.

As part of its work programme, RIS has been deeply involved in strengthening economic integration in the South Asia region. In this context, the role of the South Asia Centre for Policy Studies (SACEPS) is very important. SACEPS is a network organisation engaged in addressing regional issues of common concerns in South Asia.

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