DAKSHIN Advancing Agricultural Development in the Global South:
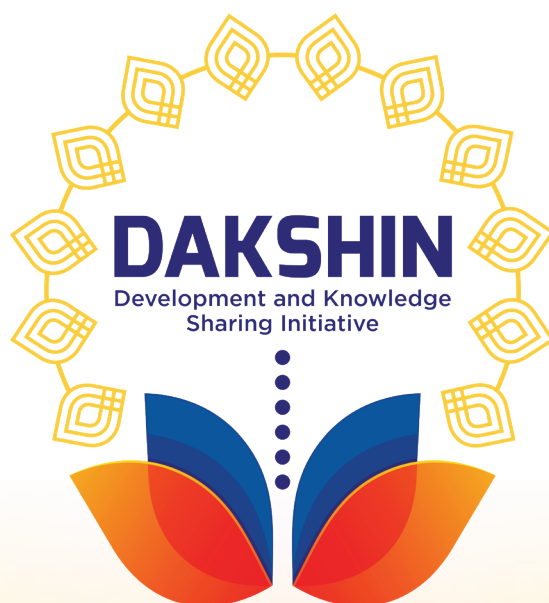
A Focus on India's Contribution through DAKSHIN

DAKSHIN
Development and Knowledge
Sharing Initiative

**GLOBAL SOUTH
CENTRE OF EXCELLENCE**

DAKSHIN Advancing Agricultural Development in the Global South:
A Focus on India's Contribution through DAKSHIN

Abstract: This paper provides an insightful view on flagship programs in the field of agriculture initiated by the Government of India for sustainable growth, farmers' welfare, and enhanced livelihoods. Noteworthy initiatives include the Rashtriya Krishi Vikas Yojana (RKVY), National Mission for Sustainable Agriculture (NMSA), Crop Insurance Scheme (Pradhan Mantri Fasal Bima Yojana - PMFBY), Soil Health Card, Agriculture Infrastructure Fund (AIF), Agri-Stack, and National Agriculture Market (eNAM). These programs aim to enhance farmer incomes, boost resilience, improve soil health, optimize natural resource management, and facilitate market access, thereby significantly contributing to the overall sustainability and prosperity of Indian agriculture. The paper presents case studies demonstrating the successful implementation of each program on the ground. It emphasizes the use of integrated farming systems customized to local agro-ecological conditions and the leveraging of digital technologies for agricultural practices such as the eNAM platform, Agri-Stack, Farmers Portal, VISTAAR, and various mobile applications. These technologies empower farmers to make informed decisions and create databases on agriculture, enhancing agricultural extension.

The paper outlines the attributes required by implementing agencies, prerequisites, and the ecosystem necessary for effective program implementation. It highlights the importance of convergence with natural resource management initiatives, mentorship and review processes, and the rationalization of beneficiaries to ensure the effective implementation of agricultural development programs in the Global South. By leveraging these strategies and learning from India's experiences, the DAKSHIN initiative aims to foster sustainable and inclusive agricultural practices across the region.

Keywords: Sustainable Agriculture, Farmers Welfare, Sustainable Agriculture, Crop Insurance, Soil Health Card, Agri-Stack, National Agriculture Market, Digital agriculture, integrated farming systems, DAKSHIN.

1. Introduction

The Development and Knowledge 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 aims to serve as a platform for collaborative efforts among countries of the Global South to overcome developmental challengeand achieve socio-economic prosperity.

In recent years, the Global South has encountered a myriad of challenges, exacerbated by the COVID-19 pandemic and geopolitical uncertainties. From disruptions in global supply chains to mounting debts and food security concerns, the vulnerabilities of developing countries have been starkly exposed. In this context, the establishment of DAKSHIN represents a significant milestone, signalling a concerted effort to address the unique needs and aspirations of the Global South.

India, as a prominent member of the Global South, plays a pivotal role in advancing the objectives of DAKSHIN, particularly 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. This paper explores how India can contribute to agricultural development in the Global South through DAKSHIN, highlighting key initiatives and strategies.

2. Successful Agricultural Initiatives by India

When unveiling the creation of a Centre of Excellence for the Global South, the Prime Minister of India emphasised the nation's achievements across diverse sectors, including agriculture. India's advancements in agricultural technology, sustainable farming practices, natural resources management, farmer welfare schemes, market linkages, and rural infrastructure have positioned it as a leader in agricultural development. These accomplishments offer valuable insights for countries in the Global South seeking comprehensive rural progress. To further catalyse agricultural development, DAKSHIN priorities three key areas: agricultural innovation, natural resources management and farmer empowerment.

Indian agriculture, which began with the domestication of animals and early cultivation of plants like in other countries, holds a rich heritage deeply embedded in the country's cultural and historical fabric. Found in ancient scripts such as the Vedas and 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-independence India. Recognising the pivotal role of agriculture in national development, post-independence India prioritised the sector, as it is the primary source of livelihood for majority India's population. Despite uncertainties like declining soil health and emerging pest and pathogen threats, India's agriculture sector achieved significant progress, particularly in ensuring food security. From being a food-deficit nation, India transformed into food surplus net exporter, with food grain production increasing over six times from 51 million tons (Mt) in 1950/51 to over 314 Mt in 2022.

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, 160 million hectares of arable land and serves as the primary livelihood for approximately 55% of its population. The agricultural landscape of India is characterised 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.

3. Flagship programmes in Agriculture

Recognising the shared challenges faced by many countries in the Global South, DAKSHIN endeavours to compile and augment the 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 Rashtriya Krishi Vikas Yojana (RKVY), National Mission for Sustainable Agriculture (NMSA), Crop Insurance Scheme (Pradhan Mantri Fasal Bima Yojana - PMFBY), Soil Health Card, Agriculture Infrastructure Fund (AIF), Agri-Stack, and National Agriculture Market (e-NAM). 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.

3.1 Rashtriya Krishi Vikas Yojana (RKVY)

Rashtriya Krishi Vikas Yojana (RKVY), is the programme for remunerative approaches for agriculture and allied sector rejuvenation. Launched in 2007, it stands as one the key flagship programme of India's agricultural development strategy, aiming to catalyse agricultural growth and enhance farmer welfare. RKVY ushered in a new era of focused public investment in agriculture and allied sectors, emphasizing infrastructure development, technology adoption, and comprehensive farmer support schemes as fundamental pillars for agricultural progress. At its core, RKVY is engineered to incentivise innovation and modernisation in agricultural practicesfor enhanced productivity and sustainability. Through targeted interventions, the scheme facilitates the integration of modern technologies, high-yielding crop varieties, and sustainable farming methods into the agricultural landscape. RKVY places a strong emphasis on strengthening market linkages for farmers, access to markets, storage facilities, and value chains. The scheme also provides states with flexibility in project design and implementation, allowing for tailored solutions to address specific agro-ecological needs for decentralised decision-making.

3.1.1 Key features

- RKVY aims to augment public investment in the agriculture sector, focusing on infrastructure development, technology adoption, and farmer welfare schemes.
- States have the flexibility to design and implement RKVY projects based on their unique agricultural needs and priorities, fostering decentralised decision-making and tailored solutions.
- 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. This helps improve price realisation, reduce post-harvest losses, and enhance market competitiveness.
- The scheme focuses on empowering farmers through capacity building initiatives, training programs, 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 prioritising the needs of small and marginal farmers, women farmers, and other vulnerable groups, ensuring that they benefit equitably from agricultural development initiatives.

3.1.2 Achievements

Outputs	Outcomes
2 million direct as well as indirect employment opportunities and training more than 600,000 rural youth in modern agricultural practices.	Better natural resource management
Increase in crop yields by 20-25% in states like Punjab and Haryana along with a 30% increase in high value crop production in the state of Gujarat. 35% growth in horticulture production in the states of Maharashtra and Andhra Pradesh.	Improved agricultural productivity and farmer income and improved agricultural productivity and farmer income.
Construction of 10,000 km of rural roads	Increased connectivity and reduction in transportation cost

Formation of over 1,000 Farmer Producer Organisations (FPOs) which benefitting over more than 1.5 million farmers.	Strengthened collective bargaining power and better access to resources for farmers
25% increase in income for farmers engaged in allied activities like dairy, poultry and fisheries apart from basic farming activities.	Diversified income sources and improved financial stability for farmers
30% reduction in water usage per hectare for states like Rajasthan and Madhya Pradesh.	Enhanced water conservation and sustainable use of resources.
RKVY increased the access to credit for most of the small and marginal farmers by almost 40%	Increased investment among farmers.

Empowering Women Farmer: A case study on impact of RKVY in Himachal Pradesh, India

The Rashtriya Krishi Vikas Yojana (RKVY) initiative in Himachal Pradesh recognised the crucial role that women play in subsistence agriculture and decided to launch a project to empower them as farmers. This initiative aimed to form self-help groups (SHGs) and enhance their productivity and revenue through technical support, capacity building, and managerial training.

The impact of this initiative has been profound. Improved agricultural practices led to a 25–30% increase in productivity. The SHGs diversified into various income-generating activities such as organic farming, dairy farming, mushroom culture, and vegetable gardening. They also began producing high-quality products like jams, pickles, and plush toys.

As a result, their revenue increased four to five times. 450 SHGs were linked to banks, facilitating access to financial resources. This financial empowerment significantly boosted the women's economic status, enhancing their self-confidence and decision-making abilities. Some participants even took on leadership roles in Panchayats and ATMA, encouraging more women to participate in development activities.

This initiative not only improved the financial standing of these women but also fostered a sense of independence and community involvement, driving broader social and economic development in the region.

3.2 National Mission for Sustainable Agriculture (NMSA)

Implemented under the umbrella of the National Action Plan on Climate Change (NAPCC), the National Mission for Sustainable Agriculture (NMSA) is a path breaking programme. The policy aims to increase resilience, sustainability, productivity and profitability of Indian farming regarding climate change. 40% of the food production in India is due to rainfed agriculture and it covers almost 60% of the net sown area, which implies that to increase the food grain production the policies should related to rain fed farming systems. NMSA follows community-based approach for prudent resource utilisation.

NMSA focusses on ten specific sectors for Indian farming that is crop variety, livestock and fish, pest and diseases, water and irrigation, nutrient, agricultural insurance and credit facilities, access to information, recommendation of better farm practices, available markets and livelihood diversification. The practices such as integrated farming system, Soil Health Management, Water Usage Efficiency and Resource Conservation are incorporated in NMSA to enhance agricultural productivity.

Extending the NMSA model to Global South Countries, in accordance with the need, it will provide a notable opportunity to improve climate adaptability strategies and advance agricultural productivity in nations that face similar challenges. NMSA takes care of context sensitivity and adaptation processes as it is a critical aspect when it comes to actualisation of practices in diverse socio-economic and environmental conditions.

3.2.1 Key Features:

- Enhance Agricultural Productivity and Sustainability: Promote integrated farming systems tailored to specific agro-climatic conditions to increase productivity and sustainability.
- Conserve Natural Resources: Implement soil and moisture conservation measures to preserve natural resources.
- Improve Soil Health: Adopt comprehensive soil health management practices, including soil fertility mapping and balanced use of fertilizers.
- Optimize Water Use: Enhance water use efficiency through advanced water management techniques to ensure more crop per drop.
- Build Capacity: Strengthen the capacities of farmers and stakeholders through training and collaboration with other national missions and programs.
- Accelerate Rainfed Farming: Improve productivity in rainfed areas by integrating rainfed technologies and leveraging resources from other schemes.
- Foster Coordination: Establish effective inter-departmental coordination to achieve NMSA's objectives under the aegis of NAPCC.

3.2.2 Achievements

OUTPUT	OUTCOME
Over 1 million hectares of land have been brought under micro-irrigation systems.	Enhanced water use efficiency.
Water conservation projects, benefiting over 2 million farmers.	Water availability during dry periods.
Expanded protective irrigation systems to 65% of rainfed areas.	Reduced crop failure by 30%.
Soil health management practices promoted	Prevention of soil erosion, boost soil fertility in long run.
Implementation of crop diversification and rotation on 70% of targeted lands.	Increment in soil organic matter by 15% and nutrient status
Adoption of conservation agriculture and integrated farming systems	Led to a 15-20% increase in crop yields and farms incomes by 20%.
Distribution of indigenous seeds to 80% of farmers.	Increase in crop resilience by 25%.
Provided small farm implements to 35000 women farmers.	Improved farm efficiency by reducing labour time by 25%.
Livestock support systems for 50,000 farmers.	Increased livestock productivity by 15%.
Establishment of over 500,000 vermicompost units.	Promotion of Eco-friendly farming practices.
Training and capacity-building programs for 2 million farmers	Improved farm management skills.
Establishment of farmer produced organisations.	Facilitating better sale of produce and strong bargaining power to farmers.
Value chain support by developing processing facilities in 150 clusters.	Improved marketability of products by 30%.
Risk Minimisation and Resilience building by risk management strategies.	Reducing agricultural losses by 20%
Increased green coverage.	Increased carbon sequestration by 10%.
Achieved 80% convergence with schemes like MGNREGA and PMKSY.	Ensuring seamless integration and co-ordination with other initiatives to achieve agricultural productivity and better rural livelihoods.

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

Crop Insurance Scheme (Pradhan Mantri Fasal Bima Yojana - PMFBY) stands as a pivotal initiative in India's agricultural landscape, aimed at providing comprehensive crop insurance coverage to farmers across the nation. Launched in 2016, PMFBY replaces the previous National Agricultural Insurance Scheme (NAIS) and National Crop Insurance Programme (NCIP), marking a significant leap towards ensuring financial security for farmers in the face of unforeseen natural calamities. By offering affordable insurance premiums and leveraging digital technology, PMFBY strives to mitigate the risks associated with crop failure and stabilise farmers' income, thereby contributing to the overall growth and sustainability of the agricultural sector.

3.3.1 Key Features:

- PMFBY offers farmers a simplified and minimum premium structure, making crop insurance coverage accessible and affordable. The premium rates are subsidised by both the central and state governments, ensuring that farmers pay nominal amounts for comprehensive insurance protection.

- Comprehensive Coverage: The scheme provides coverage against various risks, including drought, flood, cyclone, hailstorm, pest infestation, and other natural calamities. It encompasses all stages of crop production, from pre-sowing to post-harvest, offering a holistic risk management solution to farmers.

- PMFBY leverages digital technology, including mobile-based applications and remote sensing/ satellite imagery, for efficient crop assessment, premium calculation, and claim settlement processes. This ensures accuracy, transparency, and timely assistance to farmers in distress.

- 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 benefitsPMFBY emphasizes prompt claim settlement to provide timely financial relief to affected farmers. Bystreamlining claim processing procedures and adopting technology-driven approaches, the scheme ensures that farmers receive their rightful compensation without undue delays.

3.3.2 Achievements

Outputs	Outcomes
291.9 million farmer applications Insured since the year 2016	Increase in crop insurance coverage for the farmers.
95,000 million worth claims were settled.	Reduction in financial losses due to crop failure
Premium rates were made affordable at rates of 2% for Kharif crops, 1.5% for Rabi crops, 5% for Annual commercial/Horticulture Crops	Increase in affordability, accessibility and efficacy of crops insurance.
Farmers were able to leverage digital technology for crop assessment and claim settlement	Increased transparency and efficiency in the crop insurance procedures
Increase in accessibility for tenant farmers and sharecroppers promoting inclusive insurance	Fairness and inclusivity in receiving insurance benefits
Increase in the number of farmer applications which had grown from 33.4% and 41% year-on-year (2021-2022, 2022-23); to 27% increase in 2023-24.	Enhanced farmer involvement and trust in the program

A case study on the impact of PMFBY in Assam, India

In 2019, crop insurance in India achieved significant success with the Pradhan Mantri Fasal Bima Yojana (PMFBY) in Assam, managed by HDFC ERGO General Insurance Company Limited.

Through comprehensive grassroots campaigns and collaboration with local officials, the scheme saw a dramatic increase in farmer enrolment: a 14,256% rise for Kharif sowing and a 2,579% increase for the Rabi season compared to the previous year. The intervention efforts included awareness camps, training sessions, and village meetings, along with extensive promotional materials such as information leaflets, banners, and posters.

From van campaigns and newspaper advertisements increased awareness of the bookstore even further. Such endeavours led to farmer enrolment in Kharif cycle with 93,627 hectares and a total of 148975 farmers and 107,193 farmers with 47,585 hectares for Rabi cycle.

Due to these massive coverage extents, the beneficiaries of the agriculture sectors in Assam were provided with augmented financial stability through the government interventions, proving the need for intensive focused outreach education in government programmes.

3.4. Soil Health Card Scheme:

The Soil Health Card (SHC) scheme is an initiative launched by the Government of India to assess the nutrient status of soils across the country. The scheme aims to provide soil health cards to farmers, which contain detailed information about the nutrient content and health status of their soil. These cards are intended to help farmers make informed decisions about the appropriate use of fertilisers and other agricultural inputs to improve soil fertility and crop productivity

3.4.1 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, personalised Soil Health Cards are

prepared for each farmer. These cards provide recommendations on the type and quantity of fertilisers 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 subsidies 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.

3.4.2 Achievements

Output	Outcome
Since 2015, over 23.68 crore (223.6 million) Soil Health Cards have been distributed to farmers across the nation.	Improved soil health and fertility across nation by assessing status of soil. Overall increase in crop yields by 5-6%.
Allocation of over Rs. 810 crores (81.0 million) for the Soil Health Card scheme since its inception.	Growth in infrastructure and capacity for soil testing.
establishment of 429 new static Soil Testing Labs (STLs), 102 new mobile STLs, 8752 mini STLs, and 1562 village-level STLs.	Decrease in chemical fertiliser use by 8-10%.
Issuance of SHC every two years	Adoption of sustainable farming practices
Implementation of Nutrient Based Subsidy (NBS) scheme.	Balanced fertiliser uses and promotion of customised and fortified fertilisers.
Soil sample collection at individual farm holdings with farmers participation.	Development of model villages
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.	Judicious nutrient management practices, better soil health, improved crop yields, increased farmer's profitability.
SHC portal provides farmers with access to their soil health information in 21 regional languages.	Promoting inclusivity in agriculture sector through digital solutions.

An example showcasing the effectiveness of the Soil Health Card Scheme

Soil health card (SHC) scheme implemented Orvakal and Banaganapalli blocks of Andra Pradesh, a state in India was an initiative which aimed to distribute SHCs to farmers, that included provisions of providing information on soil nutrient status and its fertiliser use.

A study from 20 villages involving 300 farmers revealed 83% farmers had good knowledge about soil health management and almost half of them have followed the recommendations of SHC consistently for five years. This improved understanding about soil benefited them significantly with improved financial returns.

This programme has its own challenges such as insufficient follow up and complex recommendations. To overcome the following, faster distribution of SHC and regular visits of Extension staff/experts to the fields with thorough training sessions is done. Soil health card scheme has been a beacon of positive change for the people of Andra Pradesh underscoring the importance of ongoing support and education in sustaining agricultural advancements and improving farmer's livelihoods.

3.5 Agriculture Infrastructure Fund

The Agriculture Infrastructure Fund (AIF) scheme is an initiative launched by the Government of India to accelerate the development of post-harvest management infrastructure and community farming assets such as cold storage, collection centres, and processing units. The scheme aims to strengthen the agricultural supply chain and enhance farmers' income by reducing post-harvest losses and improving market access.

3.5.1 Key features

- The primary objective of the AIF scheme is to provide financial support to eligible entities for the establishment of infrastructure that facilitates post-harvest management and marketing of agricultural produce.
- The government allocated a substantial fund (1 trillion INR) to the AIF scheme to provide loans and credit facilities to eligible beneficiaries at concessional rates.
- The scheme is open to a wide range of beneficiaries including farmers, farmer producer organisations (FPOs), agri-entrepreneurs, start-ups, and agricultural marketing cooperatives.
- The AIF scheme focuses on various aspects of post-harvest management infrastructure such as cold storage, warehousing, grading and sorting facilities, packaging units, processing units, and marketing infrastructure.

- Beneficiaries can avail loans under the AIF scheme through various financing institutions including banks, non-banking financial companies (NBFCs), and other eligible financial institutions.
- The government provides subsidies and interest subvention to eligible beneficiaries to make loans more affordable and encourage investment in agricultural infrastructure.
- The tenure and repayment terms for loans under the AIF scheme are structured to suit the financial capabilities and requirements of the beneficiaries, thereby facilitating smooth implementation of projects.
- The scheme includes mechanisms for monitoring and evaluating the progress and impact of funded projects to ensure effective utilization of resources and achievement of objectives.

3.6 Agri Stack

Agri Stack stands as a visionary digital agriculture initiative by the Government of India. It represents a comprehensive ecosystem comprising databases, registries, frameworks, standards, data schema, APIs, and IT systems meticulously crafted to open up agricultural data through interoperable systems. This initiative aims to catalyse the development of innovative services and solutions by both government entities and private sector stakeholders. Agri Stack embodies a convergence of technological solutions, tools, and services, seamlessly integrating open-source platforms on data analytics, precision agriculture technologies, supply chain management tools, weather forecasting, market information, financial services, and post-harvesting technologies. By harnessing the power of these integrated resources, Agri Stack is poised to revolutionise agricultural processes, enhance productivity, foster sustainability, and empower stakeholders with enhanced decision-making capabilities throughout the agricultural value chain.

3.6.1 Key Features

- Agri Stack is founded on open standards, featuring a federated architecture that ensures inclusivity and participation from specialised line Ministries, state governments, and private Agri-tech players. This approach fosters collaborative evolution within the agriculture sector.
- Agri Stack comprises core components such as Farmer Registries, Geo-referenced Village Maps, Crop Sown Registry, Unified Farmer Service Interface (UFSI), Agri Stack Sandbox, Consent Manager, Agri Data Exchange, Agri Stack Website, Reference Applications for States, and support Registries. These components form the foundation for seamless data exchange and service delivery.
- Data Privacy and Consent Management: At its core, Agri Stack prioritises data privacy, adhering to the principles of Data Empowerment and Protection Architectures. Personal data of farmers is collected with purpose limitation and shared only with their explicit consent, ensuring privacy and security.
- Agri Stack enables a plethora of use-cases aimed at empowering farmers and enhancing agricultural productivity. These include Kisan(Farmer) Credit Card saturation, streamlined delivery of government schemes, personalised advisory services, access to quality agricultural inputs, and better connectivity to digital marketplaces for agricultural produce.

3.6.2 Achievements

Output	Outcome
Integration of diverse datasets and standardised data schemas.	Facilitated seamless interoperability and data exchange among all stakeholders.
Agri Stack has forged strategic partnerships through Memorandums of Understanding (MoUs) with key private tech organisations such as Microsoft, Amazon, JIO Platforms, Cisco, NCDEX, TCS, ESRI India, Ninja cart, Patanjali, ITC, Wadhwani AI, Agri bazaar etc.	open-source network will facilitate collaboration and innovation in the agriculture sector.
Agri Stack Sandbox	Driving continuous improvement in agricultural practices.
Providing access to personalised advisory services and financial assistance to farmers.	Empowered farmers to make informed decisions and improve their livelihoods.
Agri Stack has streamlined the delivery of government schemes such as PMKISAN, PMFBY, PMKSY, and AIF, ensuring efficient support to farmers nationwide.	Efficient delivery of government schemes and improved financial security.

3.7 National Agriculture Market (e-NAM)

The National Agriculture Market (e-NAM) is a transformative electronic trading portal designed to integrate existing physical Agricultural Produce Market Committee (APMC) mandis (markets) through a virtual platform, thereby creating a unified national market for agricultural commodities.

While e-NAM operates as a virtual market, it is supported by physical mandis at the backend. The portal offers a comprehensive suite of services, including commodity arrivals, quality assessment, price information, buy and sell offers, and electronic payment settlement directly into farmers' accounts. By facilitating online marketing, e-NAM aims to reduce transaction costs, bridge information gaps, and expand market access for farmers. Under the e-NAM scheme, a robust common e-market platform has been established and deployed in 1000 regulated wholesale markets across 23 states and 4 Union Territories of India. The Department of Agriculture &Farmers Welfare provides one-time fixed grants to APMCs for related equipment and infrastructure, with initial allocations for hardware, internet facilities, and assaying equipment. Additional grants are provided for facilities such as sorting, grading, cleaning, packaging, and bio-composting units.

3.6.1 Key Features

- Unified electronic trading platform connecting agricultural markets across India
- Real-time price discovery mechanism for farmers
- Comprehensive information on commodity arrivals, quality assessments, and market prices
- Multilingual website and mobile app for enhanced accessibility
- Mobile application features tailored for farmers' needs
- Shopping cart feature facilitating convenient bidding for traders
- Unified licensing system enabling seamless intra-state trade
- Online payment facilities for secure and efficient transactions
- MIS dashboard for performance analysis and monitoring
- Grievance redressal management system ensuring stakeholder satisfaction
- FPO & Farmgate modules empowering direct selling for farmers
- Logistic module facilitating transportation services for traders
- Integration of eNWR for warehouse trade, enhancing trade efficiency
- Interoperability with other trading platforms for expanded market access
- Introduction of Platform of Platforms(PoP), IMD weather forecasts, and other innovative features
- Timely dissemination of market information to farmers through various channels including SMS,Mobile APP and social media.

3.6.2 Achievements

Output	Outcome
Over 17.5 million farmers and 2.43 lakh traders registered on the e-NAM platform.	Increase in the volume of trading activities, worth 2.50 lakh crore trading activities conducted.
Participation of 2,575 Farmer Producer Organisations (FPOs) in agricultural trading.	Enhanced collective bargaining power of farmers thereby improving their economic viability and competitiveness.
Addition of new agriculture market nodes, like Integration of 1,361 mandis from 23 States and 4 Union Territories into the platform.	Encouraged greater market integration, improved market linkages for farmers across the country and better price discovery.

The success of e-NAM in Nizamabad,India

In the district of Nizamabad in Telangana, India, the e-NAM platform was implemented in the Mandi with a focus on automating the weighing, cleaning, and grading systems to improve price estimation. Electronic weighing machines connected to Point of Sale (PoS) machines and assaying labs were set up within the market yard for grading purposes. Infrastructure improvements included the construction of a rest house, canteen, and meeting halls. A Direct Purchase Centre (DPC) was established to facilitate commission-free trade. The market fees were regulated according to norms, and e-takpatti was introduced for the generation of e-sale bills.

This initiative aims to enhance accountability within the APMC and increase transparency in deductions made for farmer services. Electronic display boards were installed to show market rates and transaction details, while SMS alerts were integrated at each stage to improve service delivery. The initiative also facilitated access to financing for purchasers and offered interest-free loans to farmers for storing their produce in warehouses. From April 1, 2025, to December 31, 2016, these efforts resulted in significant outcomes: a total trade value of Rs 77 crores, with 100% of proposed commodities traded on the e-NAM portal and participation from 103 traders. The e-NAM scheme demonstrates the potential for enhanced efficiency, transparency, and increased farmer income through effective implementation.
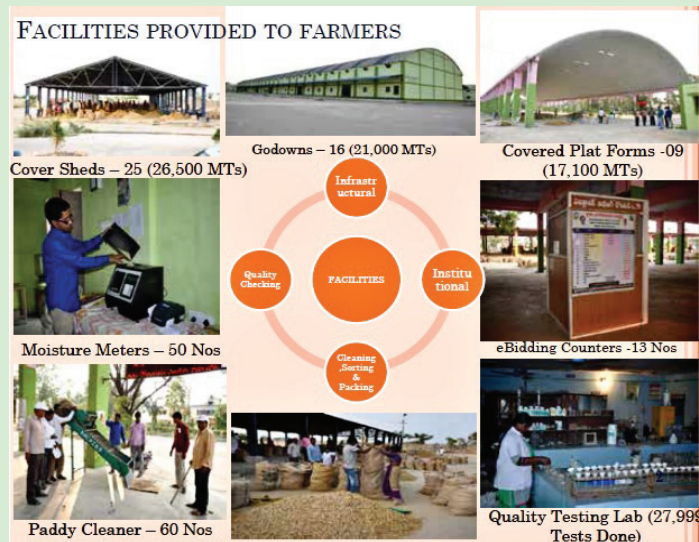
3.7 Web and Mobile Applications

The Government of India has launched a plethora of web and mobile-based applications aimed at disseminating crucial agricultural information and services free of cost, benefiting farmers and other stakeholders. These initiatives are designed to empower farmers with knowledge, access to markets, weather forecasts, expert advisories, and technological advancements. Here's an overview of some major mobile applications and web portals developed by the government:

3.6.1 Web Portals:

- VISTAAR-Virtual platform for Innovative Farmers, Science-led interventions, Technologies for Agriculture & Research (https://vistaar.da.gov.in/): VISTAAR is a initiative aimed at revolutionizing agriculture through the integration of technology, research, and innovative practices. This digital platform empowers farmers by providing access to the latest scientific

advancements, real-time information, and best practices for crop management, pest control, and resource utilization. VISTAAR fosters innovation by connecting farmers with researchers and agritech startups, facilitating the development and adoption of cutting-edge agricultural technologies. It supports research by offering a virtual space for sharing findings and collaborating on projects, thereby promoting evidence-based decision-making. The platform emphasizes sustainable agriculture, offering resources for eco-friendly farming methods, water conservation, and soil health enhancement. Key features include a comprehensive knowledge repository, virtual training sessions, interactive forums, data analytics for personalized recommendations, and market linkage information. VISTAAR aims to increase productivity, cost efficiency, and sustainability in agriculture while fostering a supportive community of farmers, researchers, and agripreneurs.

Figure: Synergistic Partnerships in VISTAAR: Farmers and Ecosystem Players in the Value Chain Journey
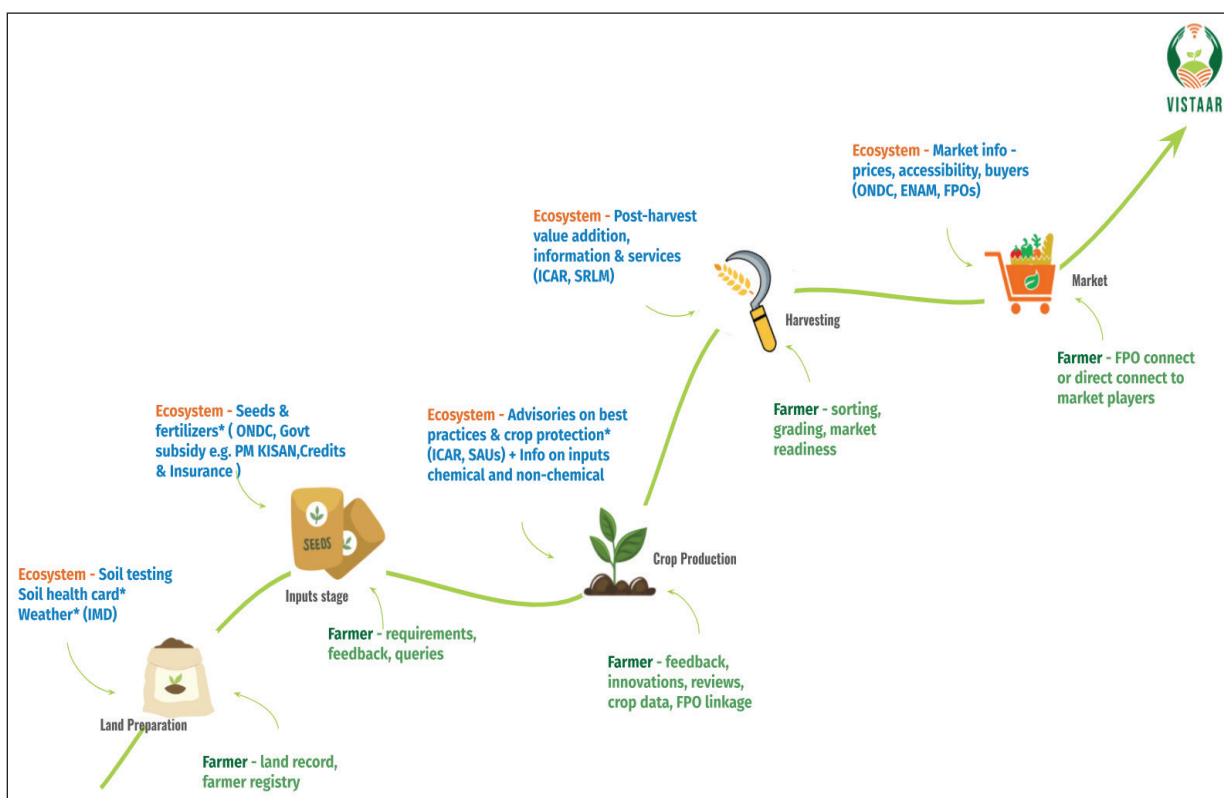
- mKisan Portal (https://mkisan.gov.in/): This unified platform enables officials and scientists to send targeted text and voice-based advisories to farmers on various issues related to agriculture and allied sectors. It facilitates the dissemination of personalized and timely information to enhance agricultural productivity and sustainability.
- Unified Portal for Agricultural Statistics (UPAg-https://upag.gov.in/) is an advanced agricultural data management platform designed to generate crop estimates and integrate with other systems generating Agriculture Statistics such as Price, Trade, Procurement, Stock

etc. It serves as a centralized hub for near real time information on crop production, market trends, pricing, and other vital agricultural data. UPAg aims to empower stakeholders in the agriculture sector, including policymakers, researchers, and farmers, by providing them with comprehensive insights to support informed decision-making.

- Agricultural Marketing Information Network (AGMARKNET-https://agmarknet.gov.in/): AGMARKNET provides real-time market information on prices, arrivals, and trends of agricultural commodities across different markets in India, aiding farmers in making informed decisions about selling their produce.

- Crop Insurance Portal (https://www.pmfby.gov.in/): Dedicated to providing complete information on crop insurance schemes implemented across the country, this portal educates farmers about the available insurance options, coverage details, premium calculations, and claim procedures, fostering risk management in agriculture.

- Participatory Guarantee System of India (PGS) Portal (https://pgsindia-ncof.gov.in/): This portal promotes a participatory approach to the certification of organic farming in India. It facilitates the certification process, fosters transparency, and builds trust among consumers regarding organic produce.

3.6.2 Mobile Applications:

- **Kisan Suvidha (Farmer Facility):** This user-friendly app offers information on five critical parameters - weather updates, nearby input dealers, market prices, plant protection measures, and expert advisories. It serves as a comprehensive resource for farmers to make informed decisions in various aspects of agriculture.

- **Pusa Krishi:** Geared towards providing the latest Agribusiness Ventures through technology development and commercialization to farmers, this app acts as a valuable tool for agriculture enter pruners for enhancing productivity and commercialising their products.

- **Crop Insurance:** Farmers can easily access information regarding insurance premiums, notified areas, and other relevant details related to crop insurance schemes through this mobile application. It simplifies the process of understanding and availing insurance benefits.

- **Agri Market:** This app facilitates farmers in obtaining real-time information on crop prices in nearby markets ('mandis'), enabling them to make informed choices regarding selling their produce.

- India Weather: Offering current weather conditions and four-day forecasts across more than 300 cities in India, this app helps farmers plan their agricultural activities effectively, mitigating risks associated with adverse weather conditions.

In conclusion, the advancing agricultural development in the Global South, with a particular focus on India's contributions through DAKSHIN, represents a significant step forward in addressing the complex challenges faced by developing nations. DAKSHIN serves as a catalyst of collaboration and knowledge sharing, aiming to foster inclusive growth and sustainable development across the region. India, with its rich agricultural heritage and proven track record of successful initiatives, stands at the forefront of agricultural development efforts. Through flagship programs like the Rashtriya Krishi Vikas Yojana (RKVY), Crop Insurance Scheme (PMFBY), Soil Health Card scheme, Agriculture Infrastructure Fund (AIF), AgriStack, and the National Agriculture Market (e-NAM), India has demonstrated its commitment to empowering farmers, enhancing productivity, and ensuring food security.

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.The digital solutions in agriculture, exemplified by initiatives like Agri Stack and various mobile/web applications, has revolutionised the way farmers access information, services, and markets. By leveraging technology and data-driven solutions, India is leading a paradigm shift in agricultural practices, driving efficiency, transparency, and inclusivity.

4. Essential Attributes for Government-Led Agricultural Development

In the dynamic landscape of agricultural development, governments play a central role in shaping policies, implementing initiatives, and driving transformative change. To adeptly navigate the intricacies of agricultural advancement and effectively execute programs and schemes as referenced/outlined above, governments must possess a distinctive array of attributes that serve as the bedrock for success. These attributes encompass leadership, political will, collaboration, transparency, capacity building, flexibility, and empowerment. By embodying these pillars of progress, governments can propel agricultural sectors towards sustainability, resilience, and inclusive growth, thereby laying the groundwork for a prosperous future in the Global South. Governments and implementing agencies should possess several key attributes to effectively drive these initiatives and are briefly outlined below:

- Leadership and Vision: Strong leadership and a clear vision are essential to guide agricultural development efforts, inspire stakeholders, and mobilize resources effectively.
- Political Will and Commitment: Governments must demonstrate political will and unwavering commitment to prioritize agricultural development, even in the face of competing priorities.
- Collaboration and Partnerships: Building collaborative partnerships with diverse stakeholders, including farmers, civil society organisations, research institutions, and the private sector, is crucial for leveraging collective expertise and resources.
- Transparency and Accountability: Ensuring transparency and accountability in all aspects of program implementation, including beneficiary selection, resource allocation, and monitoring and evaluation, is vital for building trust and credibility.
- Capacity Building: Investing in the capacity building of government officials, extension workers, and farmers is essential to ensure effective implementation and sustainability of agricultural programs and schemes
- Flexibility and Adaptability: Governments should remain flexible and adaptable to changing circumstances, including evolving agricultural practices, market dynamics, and climate conditions, to optimize the impact of their interventions.
- Empowerment and Participation: Empowering farmers and rural communities through meaningful participation in decision-making processes and ownership of agricultural development initiatives is critical for ensuring their success and sustainability.
- Open to Technological Innovation: Access to and adoption of appropriate technologies, including climate-smart practices, precision agriculture, and digital solutions, improve productivity, resilience, and sustainability in agriculture.

- Commitment to Environmental Sustainability: Governments should commit to programs that promote sustainable land management, water conservation, biodiversity conservation, and climate resilience ensure the long-term viability of agricultural systems and contribute to broader environmental goals.
- Market Access and Value Chains: Strengthening market linkages, improving access to finance, and promoting value addition enhance farmers' incomes, incentivize adoption of improved practices, and sustain program impact.
- Social Inclusion and Equity: Addressing gender disparities, empowering marginalized groups, and ensuring equitable access to resources and benefits are essential for the success and sustainability of agricultural programs.
- Adaptability and Flexibility: Programs that are responsive to changing contexts, market dynamics, and climatic conditions can better meet the evolving needs of farmers and communities over time.
- Policy Coherence and Integration: Coherence and coordination among agricultural, environmental, trade, and social policies prevent conflicts, maximize synergies, and optimize the overall impact of interventions on agricultural development.
- Risk Management and Resilience: Building resilience to shocks and stresses, including climate variability, pests, and market fluctuations, through risk management strategies and safety nets enhances the sustainability and effectiveness of agricultural programs.

Moreover, substantial financial resources are essential to fuel these initiatives, necessitating allocation from national budgets and the pooling of resources from banks, institutions, and private partners. Leveraging private partnerships further enhances the reach and impact of agricultural development efforts, fostering innovation, efficiency, and sustainability. By embodying these pillars of progress and harnessing diverse resources, governments can propel agricultural sectors towards sustainability, resilience, and inclusive growth, thereby laying the groundwork for a prosperous future in the Global South.

5. Pre-requisites and Ecosystem for Program Implementation

Along with essential attributes, the effective implementation of agricultural programs and schemes requires meticulous planning, strategic resource allocation, and collaboration. In this context, the prerequisites and ecosystem necessary for program implementation are outlined below.

Tailored Implementation:

Allocate resources based on the distinct needs of different agro-ecological ecosystems, focusing on vulnerable districts/regions/blocks classified as critically drought/flood/disaster-prone. Emphasize cluster-based approaches, particularly targeting small and marginal farmers for convergence and local participation.

Rationalisation of Beneficiaries:

Implement an online-based registration system for beneficiaries, ensuring transparency and genuine inclusion. Generate comprehensive packages of practices and integrate with ongoing schemes to streamline the process. Utilise various criteria such as landholding size, cropping pattern, socio-economic status, and vulnerability to determine eligible beneficiaries for each

scheme. Collaborate with local agricultural extension officers, village councils, and community leaders to identify potential beneficiaries accurately. The selection criteria are typically based on a combination of factors, including the socio-economic status of the farmers, the level of vulnerability to climate change and environmental degradation, and the agricultural practices currently being employed.

Government agencies need to employ a multifaceted approach to identify potential beneficiaries for schemes like the crop insurance scheme (Pradhan Mantri Fasal Bima Yojana -PMFBY). Comprehensive agricultural databases, land records, and extensive crop surveys provide valuable insights into landholdings, crop types, and farmer demographics. The Crop Cutting Experiment (CCE) methodology ensures accurate yield estimations. Banking records, reflecting loan disbursements, aid in identifying eligible farmers. Digital portals and mobile applications facilitate seamless enrolment, with over 70% of new enrolments in the current fiscal year in India. Collaborations with cooperatives, banks, and insurance providers enhance identification efforts, leveraging their networks and data analytics capabilities. Local administrative bodies, including village councils and district authorities, play an active role in beneficiary identification, verifying farmer information and ensuring the inclusion of marginalised communities. Geographical considerations may prioritize farms in dry land or disaster-prone areas, targeting interventions where they have the most significant impact. Consultation with agricultural extension officers and farmer groups ensures interventions align with community needs.

For schemes like Agriculture Infrastructure Fund, beneficiaries undergo a qualitative assessment, considering factors like project impact, innovation, and sustainability. Projects enhancing post-harvest management, market access, and community development receive priority. Applicant credibility, technological leverage, and commitment to sustainable practices influence selection. In the schemes like Soil Health Card (SHC) scheme, a systematic approach ensures equitable access and maximum coverage among farmers nationwide. Identification begins with assessing regions and communities where soil health improvement is vital for sustainable farming. Criteria include factors such as agricultural practices, soil health assessment, and community needs.

Convergence with Natural Resource Management (NRM):

Establish synergy with NRM activities, leveraging watershed-based approaches under programs like Watershed development programmes and Rural employment schemes to address multifaceted challenges in agriculture effectively. Utilising resources allocated for drought and climate change mitigation within these initiatives, the programs can be optimised at the saturation level, fostering synergy to effectively address diverse challenges in various agro-ecological regions.

Mentorship and Review:

Review comprehensive action plans at the cluster level under the guidance of technical committees comprising experts. Ensure timely release of funds for implementation based on approved plans. States will submit detailed action plans outlining all interventions at the cluster level. These plans will be reviewed by a national-level technical committee chaired by experts from diverse fields including agriculture, rural development, animal husbandry, dairy, fisheries, environment, forests, tribal affairs, and food processing. The committee will assess the plans in terms of operational areas and prioritize activities accordingly.

Multifaceted Monitoring and Guidance:

Developing a robust Management Information System (MIS) dashboard for real-time tracking and intervention is crucial for effective monitoring of programs. This dashboard enables progress tracking, geo-tagging, identification of potential challenges, and timely interventions. To enhance the existing MIS, allocating resources to specific nodal agencies (SNA) to engage a dedicated team is recommended. Field visits conducted by the SNA team are essential for on-ground accountability and collecting qualitative data, allowing for real-time adjustments and improvements during program implementation. Comprehensive interim, concurrent, and final evaluations conducted by the SNA will provide a comprehensive overview of the program's outcomes and impact. Engaging a third-party Individual Verification Agency (IVA) is essential to enhance transparency and credibility by objectively verifying program achievements, ensuring accountability and effectiveness.

Specific nodal / Implementation agencies:

Identifying and empowering specific nodal agencies (SNAs) is critical for the successful execution of programs and schemes. These SNAs must be strategically aligned with relevant administrative, technology, and extension institutions, each possessing robust institutional mechanisms. Strengthening SNAs requires the allocation of quality human resources, institutional authority, and sufficient resources for sustained effectiveness. These agencies play a pivotal role in coordinating and implementing various aspects of the programs, including resource allocation, monitoring, evaluation, and addressing any implementation challenges. SNAs serve as the primary point of contact between the government and other stakeholders involved in the implementation process, facilitating smooth communication and collaboration for efficient program delivery.

Capacity Building and Orientation:

Conduct orientation-cum-training programs for district/block officials to acquaint them with the scheme details, emphasizing community engagement and needs assessment. Collaborate with relevant local institutions to develop comprehensive training modules tailored to specific agro-ecological requirements. It is crucial to curate training modules that address the diverse needs of different regions. Timely capacity building for underperforming blocks and regular training sessions are essential to ensure the effective implementation of the programs.

Strategic Partnerships at Field Scale:

Collaborate with local NGOs and grassroots institutions to facilitate oversight of scheme outcomes and monitor progress at the grassroots level. Allocate a designated portion of the budget to empower these organisations for comprehensive field assessments and data collection efforts. Ensure that local stakeholders are actively involved in monitoring and evaluation processes, enhancing transparency and community participation in program implementation.

Convergence with Emphasis on Integrated Farming Systems (IFS):

Integrate diverse agricultural practices through Integrated Farming Systems (IFS) to enhance income generation and resilience in agriculture. This holistic approach combines various farming activities, including crop production, animal husbandry, livestock rearing, dairying, and forestry, to create a balanced and sustainable ecosystem. Emphasize synergy with schemes like watershed

development, rural employment, and livelihood initiatives to optimize outcomes and ensure comprehensive support for farmers.

Agro-Ecology and Science-Based Mapping of Activities:

Collaborate with R&D institutions to map suitable production systems and recommend for the adoption of integrated farming practices and sustainable agriculture. Develop and Utilize district/regional contingency plans for adjusting strategies in response to changing climatic patterns.
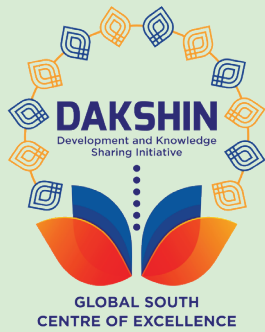
Interdisciplinary Approach:

Form interdisciplinary teams involving departments like Animal Husbandry, Fisheries, and Rural Development. Establish interdepartmental committees at the district/block level for seamless coordination.

Leveraging Mass Social Media and Extension Activities:

Promote interventions through existing extension services and utilise mass and social media for widespread dissemination of information. Combine spatial MIS efficiency with outreach strategies for broader stakeholder engagement.

The successful implementation of government-led agricultural development programs in the Global South requires a multifaceted approach that encompasses leadership, collaboration, transparency, and adaptability. By prioritising tailored implementation strategies, rationalising beneficiary selection processes, and fostering convergence with natural resource management initiatives, governments can effectively address the diverse challenges facing agricultural sectors. Robust monitoring and guidance mechanisms empowered nodal agencies, and strategic partnerships at the field level are essential for ensuring accountability, transparency, and community participation. Embracing an interdisciplinary approach, leveraging technological innovations, and promoting social inclusion are critical for driving transformative change and fostering sustainable agricultural practices. Through concerted efforts and strategic investments, governments can build resilient agricultural ecosystems that empower farmers, enhance food security, and contribute to the overall prosperity of nations in the Global South.