Discussion Paper

Rethinking Agricultural Extension:

What Alternative Models from India Teach Us about Participation, Inclusion, and Sustainability

G V Ramanjaneyulu

CARING FOR THOSE WHO FEED THE NATION
CSA
SINCE 2004

aesa
Sharing, learning and networking for innovation
Agricultural Extension in South Asia

Published by:

Agricultural Extension South Asia (AESA) Network
www.aesanetwork.org
C/o Centre for Research on Innovation and Science Policy (CRISP), Road No. 10, Banjara Hills, Hyderabad-500 034, INDIA
www.crispindia.org

In collaboration with:

Centre For Sustainable Agriculture
www.csa-india.org
#12-13-568, Street No. 14, Near Uni Rail, Lakshmi Starch Colony, Nagarjuna Nagar Colony, Tarnaka, Secunderabad, Telangana 500017
Phone: 8500683300 | Email: csa@csa-india.org |
www.grameenacademy.org | www.sahajaaharam.com | www.ekrishi.in

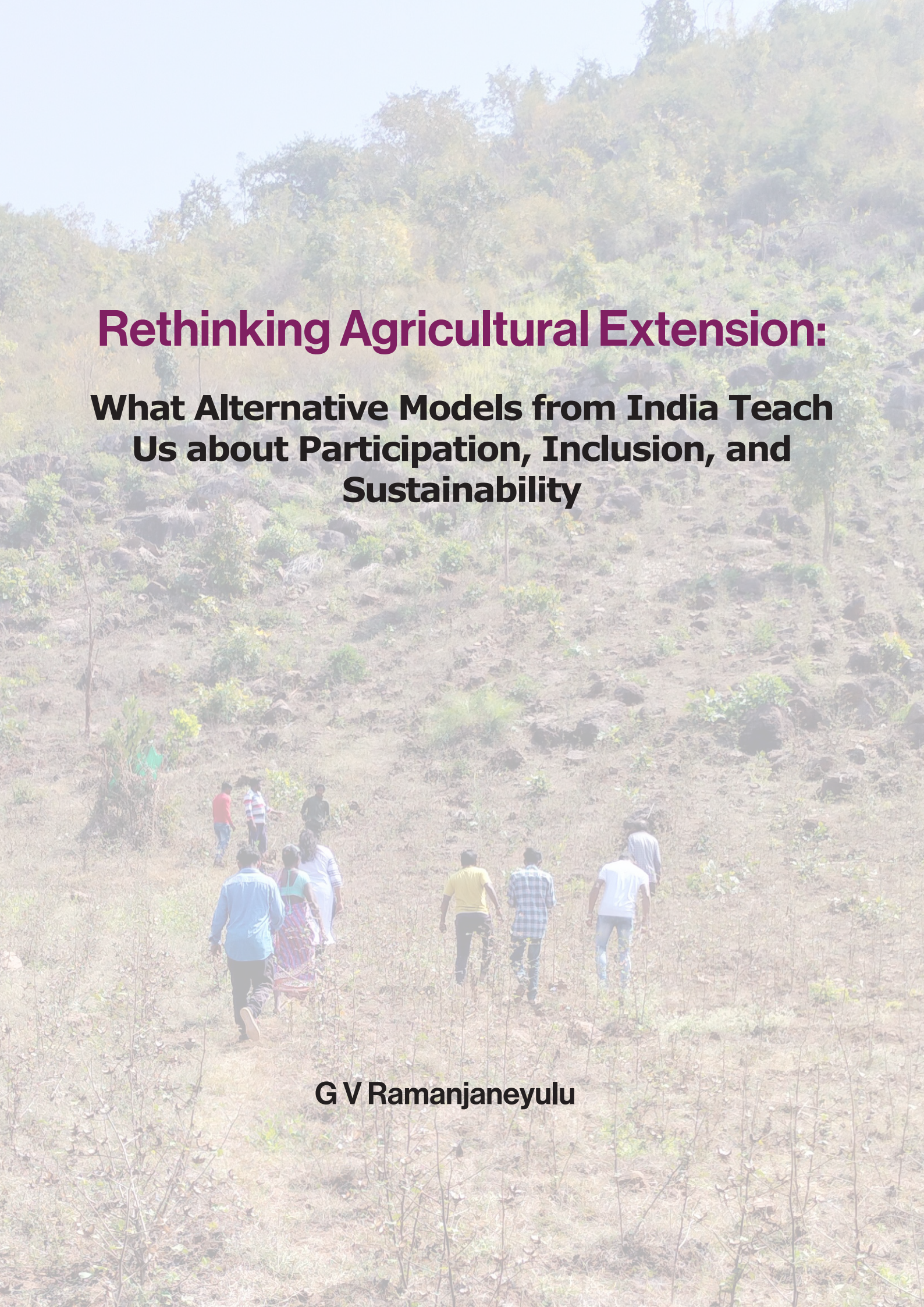
March 2026

About the Author

Dr G.V. Ramanjaneyulu is the founder and Executive Director of the Centre for Sustainable Agriculture (CSA), Hyderabad. With a PhD in Agricultural Extension from the ICAR-Indian Agricultural Research Institute (IARI) and while working with ICAR, he chose to initiate an independent institution, CSA. He has spent two decades building and learning from one of India's most extensive community-managed agricultural extension networks. His work on Non-Pesticidal Management, PGS organic certification, open-source seeds, and Farmer Producer Organisations (FPOs) has informed state and national programmes. He writes on sustainability matters, agrarian reform, farmer knowledge systems, and the politics of agricultural science, and has contributed to public conversations through films, TEDx, and Satyamev Jayate.

Rethinking Agricultural Extension:

What Alternative Models from India Teach Us about Participation, Inclusion, and Sustainability



G V Ramanjaneyulu

A Note on the Spirit of this Critique

This paper argues that India's public extension system has failed the Indian farmer, not through lack of effort, but through design. It has evolved into a compliance-driven system rather than one focused on learning. ICAR's research has drifted away from the questions farmers actually ask. Krishi Vigyan Kendras (KVKs) and Agricultural Technology Management Agencies (ATMAs) have been reduced to mere paperwork machines. And the whole apparatus has stopped being accountable for whether farmers are better off. These are hard things to say, but they need saying — because the cost of not saying them is paid by farmers, every season.

This is a critique from inside the family, not from outside it. India's public agricultural research and extension system is one of the largest in the world. It carried the country through the food crisis of the 1960s. It trained the scientists and field staff who built every state's agriculture. It established the idea that extension is a public good. Almost every alternative model described in this paper has, at some point, stood on the shoulders of a public scientist, a KVK, or a government scheme. This system laid the foundations, and they still matter.

Inside these institutions today are thousands of scientists, extension officers, and field staff who continue to do serious work, often with shrinking budgets, more paperwork, and too little recognition. The argument here is not that they have failed. It is that the system around them has stopped them from doing their best work. Naming its design flaws, wrong incentives, and outdated thinking is therefore not an attack on colleagues; it is solidarity with them, and with the farmers they are meant to serve.

Reform debates in Indian agriculture too often swing between defending the system at all costs and rejecting it altogether. Neither has helped the farmer. What is needed is an honest diagnosis followed by serious rebuilding — clear about what has gone wrong, clear about what only the public system can still do (scale, legitimacy, public accountability, long-term research), and unapologetic about learning from the community, enterprise, and digital models that have grown up alongside it.

Read these pages as a partner's critique, not an outsider's complaint.

Acknowledgement

This Discussion Paper has drawn on the work, experience, and institutional learning of a wide community of practitioners, farmer organisations, and development actors across India. I am grateful to each of them.

I thank the **Agricultural Extension in South Asia (AESA)** Network for publishing this paper, and for sustaining a platform that consistently brings critical reflection to bear on extension and advisory services in the region. My particular thanks to the team at the **Centre for Research on Innovation and Science Policy (CRISP)**, which hosts the AESA Secretariat, for their editorial guidance and for keeping AESA a space for honest conversation on extension reform. I also thank my colleagues at the **Centre for Sustainable Agriculture (CSA)**, Hyderabad, for their collaboration in bringing this paper to publication, and for two decades of shared field engagement that have shaped much of the thinking reflected here.

The paper would not have been possible without the organisations whose extension work forms its substantive core. I acknowledge with gratitude:

- **Rythu Sadhikara Samstha (RySS)** and the Government of Andhra Pradesh, for the APCNF experience in scaling community-managed natural farming.
- **Paani Foundation, Pune**, for demonstrating how movement-based mobilisation can transform watershed and farming practice at scale.
- **PRADAN (Professional Assistance for Development Action)**, for pioneering the Community Service Provider and Agricultural Production Cluster model anchored in women's collectives.
- **Digital Green**, for building the video-mediated and AI-assisted extension architecture now embedded in many public systems.
- **Access Agriculture**, for the Entrepreneurs for Rural Access (ERA) model and the global library of farmer-to-farmer videos.
- **Syngenta Foundation for Sustainable Agriculture and the Agri-Entrepreneur Growth Foundation (AEGF),** for institutionalising the Agri-Entrepreneur model.
- **The Goat Trust**, for the Pashu Sakhi cadre and women-led livestock extension.
- **Deccan Development Society (DDS)**, for four decades of sangham-based agroecology, seed sovereignty, and community media work.
- **Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM) and the State Rural Livelihoods Missions (SRLMs)**, for institutionalising community cadre-based extension at the national scale.

I am equally grateful to the agri-tech enterprises — including DeHaat, AgroStar, Gramophone, NinjaCart, WayCool, Fasal, Cropin, SatSure, BigHaat, Krishi Network, and Samhitha Crop Care — whose work illustrates how digital, data-driven, and enterprise-led extension is reshaping the Indian landscape. Their publicly available documentation, annual reports, and case studies have informed the discussion in this paper.

The most important debt, however, is to the **farmers, women's collectives, Community Resource Persons, Krishi Sakhis, Pashu Sakhis, Natural Farming Fellows, Jal Doots, Agri-Entrepreneurs, ERAs, and sangham members** whose daily practice, innovation, and courage are the real foundation of every model described in this paper. Extension, as this paper argues, is ultimately their work. My role has only been to listen, learn, and attempt to organise what they have taught.

I also thank the peer reviewers and colleagues who read and commented on earlier drafts, especially **Rasheed Sulaiman V** and **D. Alagu Niranjan** from CRISP. Special thanks to **Anthony Christopher** from CRISP for designing this document.

The views expressed in this paper, and any errors or missions, remain my own.

G V Ramanjaneyulu

Executive Summary

India's public agricultural extension system has failed the Indian farmer, not for lack of effort, but by design. Built on a top-down technology-transfer paradigm inherited from the Green Revolution, it has survived decades of "reform" without shedding the core assumption that research generates recommendations, extension transmits them, and farmers adopt. That assumption no longer holds — if it ever did. The 120 million smallholders who make up Indian agriculture, and particularly women, tenant cultivators, and socially excluded communities, are worse served than the system's own paperwork suggests.

How the system fails

The failure is institutional, not financial. Extension has become an administrative pipeline for delivering input schemes and meeting compliance targets, rather than a learning and risk-management system oriented toward how farmers actually decide. Four failures compound:

- **It misreads farmers**. Smallholders are risk managers, not yield-maximisers. Standardised packages designed for irrigated 5-hectare farms do not fit 0.5-hectare rainfed holdings financed on borrowed money. When smallholders decline such advice, the system labels them "non-adopters."
- **It excludes women.** The primary agricultural workforce is invisible to a system anchored to land titles, run in male-dominated spaces, and oriented to cash crops and machinery rather than the crops, tools, and decisions that women actually manage.
- **It ignores ecology.** Decades of input intensification without attention to soil biology, groundwater, or pest resistance have produced a long-term productivity trap.
- **It has no accountability for outcomes.** Success is measured in the number of trainings conducted and demonstrations organised — never in reductions in cultivation costs, yield stability, soil health, or inclusion.

This is not only a service-delivery problem. It is a matter of justice and risk distribution. Women's labour has risen without corresponding gains in income or control. Smallholders face rising costs and shrinking margins. Crises concentrate among those least able to recover.

What the alternatives show

Against this backdrop, ten alternative extension models — community-led, enterprise-based, digital, and agroecological — are already redefining how knowledge and services reach farmers. They include CSA's community-managed agroecology system, Andhra Pradesh's APCNF programme under RySS, PRADAN's community service providers, the Goat Trust's Pashu Sakhi network, Digital Green's video-mediated approach, Access Agriculture's youth-led ERAs, and NRLM's federated cadre model.

Despite their diversity, they converge on a common logic. Farmers are co-creators of knowledge, not passive recipients. Extension is embedded in community institutions — SHGs, sanghams, FPOs, and cooperatives — providing governance and continuity beyond project cycles. Inclusion of women, smallholders, and excluded groups is treated as a design standard, not a good-to-have. Digital tools amplify human-centred learning; they do not replace it.

The cost evidence is striking. Digital peer-learning systems (Digital Green, Access Agriculture) operate at ₹250–₹500 per farmer, roughly one-tenth the cost of conventional extension. Community cadre models (NRLM, PRADAN) cost ₹700–₹1,500 per household per year, with progressive cost recovery through fee-for-service and collective marketing. Enterprise-driven models achieve financial sustainability within three years through input and output margins.

The agritech dimension

India's agritech sector — DeHaat, AgroStar, Gramophone, Fasal, and others — has introduced transaction-linked, data-driven private extension at scale and low unit cost. Their strengths are real: reach, personalisation, and market orientation. So are their risks: advice biased toward product sales, digital divides that exclude the resource-poor, and shallow accountability. The most promising direction is hybrid — pairing the community trust of NGO systems with the technology and scale of private platforms.

What has to change

India's next-generation extension ecosystem will not be a single model. It will be a governed, multi-layered system: a community cadre layer for inclusion and trust; a service-centre and enterprise layer for bundled services and sustainability; a digital layer for scale and personalisation; and a rights-based agroecological layer for seed sovereignty and climate resilience.

The mandate itself has to widen. Disseminating agronomic advice is not enough to address agrarian distress. Extension must handle risk management, climate adaptation, cost reduction, market and value-chain intelligence, and the deliberate empowerment of women and marginalised communities. Accountability must shift from outputs — trainings, demonstrations, farmers "reached" — to outcomes: income stability, soil health, water footprint, pesticide load, and inclusion.

Extension failed not because farmers are hard to reach, but because institutions tried to reach them without understanding them or respecting them as knowledge producers. In the climate era, a one-way system is not just outdated; it is dangerous. Fixing it requires a fundamental rethink of institutional design — not simply more money.

Table of Content

1. Introduction

The landscape of agricultural extension in India is undergoing a profound transformation. Traditional top-down, public sector systems, especially led by the state Departments of Agriculture with their uniform technology transfer approach, once dominated extension provision. However, persistent challenges such as limited human resources, poor research–extension–farmer linkages, and weak relevance to smallholders have considerably weakened their operations. They continue to follow the same transfer of technology approach in most cases, but are increasingly challenged with alternative approaches promoted by NGOs, farmer institutions, private enterprises, and digital startups.

These alternative approaches are currently redefining how knowledge, services, and motivation reach farmers. Instead of treating farmers as passive recipients, these approaches view farmers as innovators, partners, and market actors, combining ecological, social, and commercial dimensions. They reflect three broad shifts:

- From top-down instruction to participatory facilitation – where knowledge is co-created through demonstration, peer learning, and community resource persons.
- From uniform packages to contextual solutions – tailoring advice to local agroecologies, gender roles, and livelihood diversity.
- From subsidy-based delivery to self-sustaining systems – embedding cost recovery via enter-prise, federation, or digital business models.

To fully understand and appreciate these models, there is a need to understand what is currently wrong with India's agricultural extension, primarily led by the public sector agencies at the central and state levels, and therefore, this paper is organized as follows. The next section (Section 2) presents an analysis of the key factors behind the poor design and delivery of agricultural extension services in India and its implication for small and marginal farmers including women and landless farmers who dominate farming in India. Section 3 illustrates the features of ten alternative extension approaches and discusses their key features. The varied extension approaches used by startups are discussed in Section 4. The key lessons from alternative extension approaches are discussed in Section 5. The final Ways Forward Section discusses how the next-generation extension ecosystem in India could be designed.

2. Failure of Extension and Advisory Services in India

Historically, public agricultural extension in India was designed as a bridge between public science and farm-level practice—translating research into context-specific decisions, strengthening farmer capability, and reducing risk. Yet, over time, this extension apparatus evolved as a delivery channel for inputs, schemes, and targets rather than a learning-and-support system for farmers. This failure is not merely about "insufficient staff" or "low budgets"—though these also matter. It is a deeper institutional breakdown: the system failed to understand farmers, failed to read ecological and resource realities, failed to anticipate technological and market consequences, and failed to carry accountability for outcomes. The result was predictable: farmers were often left with risk without protection —risk that became a crisis.

Large-scale national surveys and reviews consistently show uneven coverage and limited access to relevant advisory services, especially for marginal farmers, despite decades of reforms and "pluralistic" extension approaches.

The Situation Assessment Surveys (NSSO) remain among the most important sources documenting how farmer livelihoods and access to services have evolved, and they highlight persistent gaps in advisory reach and usefulness. "The failure is most visible among women farmers, small and marginal farmers, and socially excluded communities who constitute a major part of India's cultivators and agricultural workforce."

The key factors that led to this failure are discussed below:

2.1 Transfer of technology paradigm" in a world of complexity

India's mainstream extension logic was shaped by the green revolution era, when the primary objective was yield enhancement; the technology package was relatively uniform (HYVs + fertilizer + irrigation + plant protection), markets were less complex and the ecological stress had not yet reached current levels. This encouraged linear thinking: research generates a recommendation; extension transmits the same, and farmers adopt it. It worked reasonably well in irrigated zones for a time.

But contemporary agriculture is non-linear, location-specific, and risk-intensive. Farmers now operate under: climate volatility, degraded soils, groundwater decline, pest and disease shifts, price instability and market power asymmetry, fragmented landholdings and labour constraints. To address these shifts, Extension should have evolved into a systems advisory function that focuses on risk management, climate adaptation, soil health stewardship, enterprise planning, and market intelligence. Instead, in many regions, it remained stuck in the older paradigm. Global extension reviews emphasise that performance collapses when extension is not structured around farmer demand, feedback loops, and aligned incentives.

2.2 Extension misunderstood farmers—their resources, constraints, and behavior

Many extension programs assume farmers behave like rational adopters maximizing yields once infor-mation is provided. But farmers are risk managers, not just yield maximizers. They weigh liquidity and credit constraints, family labor availability, social norms and peer influence, land tenure insecurity, the probability of failure (not just average yield) and market timing and price risk.

Smallholders are not simply "small versions of big farmers." Their farming is structurally different. They often purchase inputs in tiny quantities at higher unit costs and access credit at higher rates from informal sources. Quite often limited market access constrains them from diversifying their farms. Moreover, risk from a single shock (rainfall failure, pest outbreak, price crash) can push such small holders into distress.

Small and marginal holdings dominate India's farm structure. What works on 5–10 hectares with irrigation and capital does not work on 0.5–1 hectare with uncertain water and borrowed money. Yet advisory often remained standardised.

Yet extension advice is often based on the assumption of adequate irrigation, the ability to buy inputs on time, the capacity to tolerate failures and the ability to store, transport, and negotiate markets. When extension advice ignored these realities, adoption failed—or worse, adoption happened but created vulnerability (debt-driven input intensification without risk) for farmers—especially women, smallholders, tenant cultivators, and socially excluded communities. When smallholders follow such advice, they incur higher cultivation costs (without stable returns) and become increasingly vulnerable. When they do not follow such advice, they are labelled as "non-adopters," reinforcing an unfair narrative.

A central reason for Extension's failure "to understand farmers" is that it rarely built institutional mechanisms to listen structurally: Extension services have poor tools to diagnose problems, limited capacity to understand social realities, rarely use participatory planning tools, and very few incentives to report bad news upward. Instead of a learning system, extension has increasingly become a compliance system.

2.3 Exclusion of women farmers and socially excluded communities

A foundational blind spot in India's extension system has been the implicit assumption of a "default farmer": a male landowner with recognised land records, some access to irrigation, well-connected to markets, and the mobility to attend trainings and visit offices.

But India's agrarian reality is different:

- Women are central to agriculture (sowing, weeding, harvesting, post-harvest, livestock care), yet often treated as "helpers" rather than farmers.
- Small and marginal farmers dominate the farm structure and face severe constraints in capital, risk absorption, bargaining power, and access to services.

- Tenant farmers, sharecroppers, landless cultivators, Adivasi communities, Dalits, and other socially excluded groups frequently operate without secure land titles, reliable institutional support, or political voice.

Extension largely remained anchored in the needs and realities of the most visible, connected, and administratively eligible farmers (possessing land titles in their names) —rather than the majority who cultivate under constraints.

Women farmers have historically been systematically overlooked and denied recognition for their contributions, as most women do not have land titles or their names on land records, which affects their access to: formal credit, subsidies, crop insurance, and eligibility for training and input support. Moreover, extension meetings are often held at times that conflict with household labour, in male-dominated spaces; with male trainers speaking to male audiences; and with content oriented toward cash crops and machinery, rather than women's agricultural roles (seed selection, weeding strategies, kitchen gardens, livestock health, post-harvest processing, nutrition).

Even when good technologies exist, they are often not designed to address women's labour burden, reduce drudgery, improve access to tools, ensure affordability, or give women control over income. All these result in a paradox: the extension system claims "farmer reach," but it has miserably failed to reach the primary agricultural workforce.

Extension systems are also shaped strongly by social hierarchies, often unintentionally. For instance, tenant cultivators and sharecroppers may be excluded from extension services because they are not visible in official land-based beneficiary lists. Adivasi farmers often farm in ecologically sensitive and remote contexts, where mainstream crop packages are inappropriate. Dalit communities often face limited access to productive land, irrigation, and institutional networks, and may not be part of dominant village structures where extension activities occur.

This is not only a technical failure; it is an institutional design failure. Extension, by remaining dependent on formal land records and social networks, has built a systematic pipeline of exclusion.

When extension fails to reach women, smallholders, tenants, and socially excluded communities, the gap is filled by input dealers, informal advice networks, social media and WhatsApp forward chains, and local power brokers. These sources may provide quick guidance, but they are often biased toward sales and can increase ecological and financial risk. The excluded groups then become the most vulnerable to misinformation, overuse of chemicals, and debt-driven intensification.

The consequences are far from neutral. When inclusion is weak, extension services can become a multiplier of structural inequality: women's labour increases without corresponding gains in empowerment or control over income; smallholders face rising costs and shrinking margins; socially excluded cultivators shoulder greater climate risks with fewer safety nets; tenant farmers remain systematically excluded from protection mechanisms; and crises become increasingly concentrated among those least able to recover. In this sense, extension failure is not only about inefficient service delivery—it is about justice and distribution of risk.

2.4 Limited understanding of natural resources and ecological processes

Extension messages for decades promoted NPK-driven productivity without comparable focus on organic matter decline, emerging micronutrient deficiencies, soil biology, structure and erosion; increasing salinity/alkalinity and carbon loss. This created a long-term productivity trap—yield gains plateaued while input needs rose.

Groundwater depletion in large parts of India is now one of the major silent drivers of agrarian distress. Yet extension systems were poorly equipped to provide water-budgeting services, promote cropping-system redesign at scale, negotiate community water governance, and integrate hydrology into advisory services. Instead, extension promoted high-water crops and input packages where they were ecologically mismatched. The ecological costs were externalised to farmers (through rising pumping costs and crop failures) and to future generations.

In many areas, extension advice blurred into product promotion. Over-reliance on chemical control without ecological pest management led to: pesticide resistance, pest resurgence, loss of beneficial insects, rising costs, and adverse health impacts. The extension system's weak ecological grounding and weak regulation of private advisory—meant farmers often received "spray calendars" instead of integrated pest management adapted to local pest dynamics.

2.5 Technology push without impact assessment

Technology was treated as neutral, while it is not, and farmers absorbed the downside. Agricultural technologies are not just technical; they reconfigure labour demand, cash flow patterns, gender roles, debt exposure, market dependence and ecological footprints. Yet extension seldom assessed these impacts ex ante.

Input intensification was promoted without providing any risk protection to resource-poor farmers.

Technology packages often require upfront cash, reliance on credit, timely irrigation, and precise management. In volatile rainfed settings and among resource-poor farmers, this meant that a single shock—rain failure, pest outbreak, price crash—could convert "modernisation" into a debt spiral.

Similarly, farmers were given production advice but no robust price intelligence, post-harvest and storage strategies, literacy in contract negotiation, information on quality standards, or knowledge of hedging risks. So, productivity improvements did not reliably translate into income stability. Many extension reforms globally emphasise the need to integrate enterprise and market advisory, not only agronomy, but such strategies were not put into practice.

2.6 Pluralism without coordination and lack of accountability

India now has a pluralistic extension environment comprising agriculture and allied departments of the state at the district and block level (and in a few cases even below), Krishi Vigyan Kendras (KVKs) supported by the ICAR at the district level, extension units established by the agricultural universities at the regional and district level, private input dealers, Non-Government Organisations, Media, agri-tech companies and Farmer Producer Organisations (FPOs).

While pluralism has its value, the problem is poor coordination that has resulted in conflicting messages, inconsistent quality, misaligned incentives and with no actor responsible for outcomes. Scholarly reviews and policy analyses document how pluralistic extension, without governance and quality assurance, leads to patchy coverage and uneven service quality.

In other words, extension had targets but no responsibility for outcomes. Extension agencies are often assessed on the number of trainings conducted, the number of demonstrations organised, the number of soil samples collected, and the number of farmers "reached", which are outputs rather than outcomes. Ideally, extension should be assessed on outcome indicators, such as reductions in cultivation costs, yield stability (variance reduction), improvements in soil organic carbon, reductions in groundwater extraction, reductions in pesticide load, resilience of net farm income, and adoption persistence beyond subsidy windows. As extension is not evaluated on these metrics, the system can succeed administratively while failing farmers economically and ecologically. Unfortunately, extension is also not accountable for inclusion outcomes, for instance, who was reached, who benefited, and who was excluded.

If extension advice fails and causes loss, farmers rarely have formal complaint pathways and compensation frameworks. There are no mechanisms for independent audits, either. The result is asymmetry: farmers bear the risk while institutions remain insulated. Global extension scholarship highlights that agency incentives and political realities shape extension performance—if incentives reward compliance and visibility rather than learning and service, quality deteriorates.

3. ALTERNATIVE EXTENSION MODELS

3.1 Why alternative extension models matter?

India's 120 million smallholders vary in the crops they grow, the resources they can access and the aspirations they have. No single extension agency can meet all its support needs. Having multiple models lets farmers choose what aligns with their socio-economic and ecological realities. Alternative extension models act as laboratories that continuously test new forms of learning, from women-led livestock cadres to AI-driven agri-advisories. They nurture institutional innovation that the public system can later mainstream. Models built on cost-sharing, farmer enterprises, and federated structures encourage local financial and managerial ownership—thereby reducing dependence on donor or government budgets. Models built around community systems ensure inclusion and trust; enterprise models provide efficiency and markets; digital networks scale information rapidly; and agroecology initiatives sustain local ecosystems. When connected, they create hybrid ecosystems that combine reach, depth, and resilience. Some of these promising models are discussed in detail below.

3.1.1 Centre for Sustainable Agriculture (CSA), Hyderabad

The CSA has developed one of India's most comprehensive participatory agroecological extension systems, integrating farmer-led innovation, diagnostics, digital tools, and institutional support. This model evolved from decades of field experience across Andhra Pradesh, Telangana, Chhattisgarh, and Maharashtra.

Core Design of the Extension System

CSA's system is built on the Community Managed Sustainable Agriculture (CMSA) framework, conceived during its collaboration with state governments and farmer cooperatives. It redefines conventional extension into a community-based learning and management system that prioritises farmer knowledge, ecological literacy, and institutional development over top-down input delivery. Its key features are as follows:

- **Farmer-Centric Extension:** CSA uses trained practising farmers and community resource persons (CRPs) as the primary extension agents. These individuals serve as local agroecology educators and facilitators, conducting demonstrations, field schools, and peer-learning sessions in their own villages.
- **Cluster-Based Organisation:** Villages are grouped into clusters managed by local institutions like Farmer-Producer Organisations (FPOs), which serve as hubs for extension, input supply, and collective marketing.
- **Participatory Advisory Services:** Decisions on pest management, seed diversity, and soil health are taken collectively through farmer field schools and diagnostic sessions, using real-time data from field observations, weather systems, and pest surveillance.
- **Farmer Service Centres (FSCs):** CSA's Farmer Service Centres serve as one-stop hubs that integrate extension, input supply, diagnostics, credit facilitation, and market access under one roof. They are run either by Farmer-Producer Organisations (FPOs), local entrepreneurs, or NGOs, with CSA offering backend technical support.

Functions and Services

CSA provides the following functions and services

- **Extension & Training:** Continuous mentoring and farmer field training on organic/natural farming, pest management, beekeeping, and livestock rearing.
- **Diagnostics:** Soil and water testing, pest surveillance, farm-level advisories.
- **Input Delivery:** Seeds, bio-inputs, implements, farm tools.
- **Financial Services:** Credit linkages, insurance, and farmer data management.
- **Market Linkages:** Aggregation, quality management, and buyer connections through the FPOHub digital platform.

Approach: The FSCs act as community-managed extension service platforms, integrating technical, financial, and institutional support.

Components and Tools

CSA's extension ecosystem operates at multiple functional levels to ensure science-based yet locally owned transitions:

- **Training and Capacity Building:** Through Grameen Academy and field workshops, CSA conducts structured training on agroecology, natural farming, seed conservation, FPO management, and rural enterprise design.
- **Diagnostics and Surveillance:** Soil test–based advisories, pest and disease identification, and weather-based early warnings are supported by the eKrishi Pestoscope, a digital platform developed by CSA.
- **Digital Knowledge Platforms:** Krishi TV, a YouTube channel; weekly digital farm schools and kisan mitra mobile advisory and helpline; FPOHub as FPO management platform; Grameen Academy as online learning platform; and Online support through remote training, data management, and participatory traceability systems for organic products.
- **PGS Certification Support:** CSA serves as a regional council for Participatory Guarantee System (PGS) India, ensuring peer-based certification that strengthens community credibility and market trust.
- **Institutional Design Support:** CSA helps in building social enterprises, legal structures, and cooperative systems around farmer groups and FPOs to sustain extension delivery beyond project cycles.

Principles and Methodology

CSA's extension system rests on three interlinked principles:

1. **Democratizing Knowledge –** making scientific knowledge accessible through local media, field experimentation, and peer learning.
2. **Building Self-Reliance –** empowering farmers to diagnose problems, generate local solutions, and manage agroecosystems ecologically.
3. **Institutional Embeddedness –** linking farmer groups to state and market institutions through FPOs, organic councils, and cooperatives.

Extension Reach and Impact

As of 2025, CSA directly supports about 50,000 farmers and indirectly reaches over 200,000 farmers through its extension and advisory networks. The organisation aims to reach 500,000 farmers by 2030, supported by partnerships with state governments and multilateral programmes.

3.1.2 Rytu Sadhikara Samstha (RySS), Guntur, Government of Andhra Pradesh.

Rythu Sadhikara Samstha (RySS), the autonomous parastatal institution under the Government of Andhra Pradesh, has built a community-managed extension system for promoting natural Farming across the state. This model, known as the Andhra Pradesh Community-Managed Natural Farming (APCNF) system, combines scientific agroecological principles with community-led governance and scaled training mechanisms.

Conceptual Foundation

RySS's extension system is built on the philosophy of "Community as the Extension Agency", shifting from external experts to empowered local networks. The approach aims to regenerate soil health, reduce chemical dependency, and build climate-resilient village ecosystems through democratised agroecological learning.

It evolved from the scaling up of Non-Pesticidal Management promoted by the Centre for Sustainable Agriculture from 2004 to 2008 and from Subhash Palekar's Zero Budget Natural Farming starting in 2017. Over time, it developed into a broader agroecological system based on nine universal natural farming principles, such as maintaining continuous soil cover, fostering crop diversity, minimising disturbance, integrating livestock, and relying on biological inoculants rather than chemical fertilisers or pesticides.

Core Structure of the Extension System

- **Multi-tiered Community Cadre:** Knowledge dissemination operates through a large pyramid of trained local facilitators.
- **Natural Farming Fellows (NFFs)** – young graduates who model field practices and mentor local clusters.
- **Internal Community Resource Persons (iCRPs)** – experienced farmer practitioners providing direct support and monitoring.
- **Master Farmers** – exemplary practitioners who mentor clusters of 100–200 farmers through demonstration farms.
- **Village Resource Persons (VRPs)** – act as field level trainers and liaison agents for timely dissemination and adoption.
- **Women-Led Institutions:** The backbone of the system is the Self-Help Group (SHG) network and its federations (Village Organisations and Mandal Samakhyas). Each SHG adopts "Saptasutra" (seven principles) to lead transitions—internal consumption of natural food, kitchen gardens, provision of biological inputs, and facilitation of peer learning.
- **Cluster and FPO Integration:** RySS encourages natural farming clusters around FPOs and Panchayats, enabling decentralised decision-making, aggregation of produce, and market linkages.
- **Farmer-to-Farmer Learning:** Extension relies heavily on horizontal dissemination through champion farmers and on-farm demonstrations rather than conventional top-down instruction. Field schools, exposure visits, and peer-led workshops are organised continuously.

Methods and Tools for Extension

- **Participatory Training Framework:** Through over 3,000 hands-on field level training facilities, farmers receive iterative learning on soil health, microbial inoculants, and diversified cropping models.
- **Digital Knowledge Systems:** Mobile-based advisories, geotagging, and the APCNF data platform track adoption, yield, and soil indicators. The Indo-German Global Academy for Agroecology Research and Learning supports E-learning modules.
- **Community Science Integration:** Science-based field experiments and adaptive research link farmers' observations with formal research institutions, ensuring continuous refinement of practices.
- **Monitoring and Evaluation Loops:** SHGs and CRPs co-monitor results, using digital dashboards to guide extension planning and adaptive management.

Extension Philosophy and Governance

The RySS extension model embodies "Community Managed Extension", resting on four interdependent pillars:

1. **Empowered community institutions** – SHGs and federations act as governance anchors.
2. **Decentralised knowledge systems** – farmers and CRPs co-create and spread innovations.
3. **Scientific grounding** – local practices guided by soil biology, ecology, and crop diversification science.
4. **Public–community partnership** – the state acts as facilitator and enabler, not as provider.

Scale and Impact

Until 2025, RySS's extension network has mobilised over 1.03 million farmers covering 486,000 hectares, with plans to reach 4 million households within five years. The system has become a global model for large-scale agroecology transitions through collective learning and ecological governance.

3.1.3 Paani Foundation, Pune, Maharashtra

Paani Foundation's extension system for sustainable agriculture operates through a highly participatory, competition-based and knowledge-driven model that transforms farmer learning, collective action, and ecological outcomes across Maharashtra. It integrates watershed management principles with a movement-oriented extension approach that promotes self-reliance and empowers village-level leadership.

Core Structure of the Extension System

Paani Foundation runs two flagship programmes—the Satyamev Jayate Water Cup and the Satyamev Jayate Farmer Cup—each functioning as a large-scale farmer training and community mobilisation platform.

- **Water Cup:** Villages compete over 45 days to complete watershed development works before the monsoon, guided by trained local representatives called Jal Doots. These individuals receive training in technical watershed design and social mobilisation, and then lead their communities in undertaking shramdaan (voluntary labour) and collective planning.
- **Farmer Cup:** This newer initiative extends the same community-driven model into sustainable agriculture. Farmer collectives compete to adopt climate-resilient, water-smart, and low-cost farming practices, using shared resources, joint marketing, and peer learning networks.

Key Components of the Extension Approach

- **Immersive Training Framework:** Farmers undergo a three-day residential training and multiple field sessions grounded in films, games, and case studies that integrate technical knowledge with social capacity development.
- **Collective Organisation:** Villages and farmers are grouped into gats (collectives) to encourage peer learning, shared labour, and coordinated decision-making. These groups often include women-led collectives to amplify gender inclusion in sustainable farming transitions.
- **Knowledge Partnerships and Expert Support:** Technical backstopping is provided through collaboration with expert organisations like the Watershed Organisation Trust (WOTR) and other NGOs for content development, implementation guidance, and training facilitation.
- **Competition as a Motivational Tool:** The incentive-driven model (Water Cup and Farmer Cup) acts as a social catalyst that creates enthusiasm, accountability, and pride at the community level, replacing subsidy-driven approaches with ownership-led transformation.
- **Digital and Media Integration:** Farming schools and digital education platforms disseminate knowledge using audiovisual content in Marathi, ensuring last-mile reach through assisted learning and continuous engagement beyond physical training camps.
- **Systems Integration:** The approach links soil health, water management, crop diversification, community governance, and market connections as interconnected levers for sustainable rural transformation.

Extension Outcomes

Since its inception, Paani Foundation has trained over 50,000 farmers, mobilised across more than 6,000 villages, and facilitated the creation of more than 500 billion litres of water storage. The Farmer Cup has scaled to 3,000 collectives by 2023, with plans for state-wide coverage by 2026.

3.1.4 PRADAN (Professional Assistance for Development Action)

PRADAN has pioneered a community-based extension model that empowers rural women and smallholder farmers to become agents of agricultural and livelihood transformation. Its system blends social mobilisation, capacity building, and production clustering with decentralised technical services and institutional linkages.

Core Design of PRADAN's Extension Model

The backbone of PRADAN's extension philosophy is the "Community Service Provider (CSP) model" integrated within Agricultural Production Clusters (APCs) of self-help groups (SHGs), producer groups, and farmer-producer organisations (FPOs).This approach decentralises agricultural advisory services to trained local youth and women's institutions.

- **Agricultural Production Clusters (APCs):** Each cluster organises 3,000–4,000 families in contiguous villages to pursue integrated farm-based livelihoods. Clusters become hubs for extension, input delivery, aggregation, and market access. They bring convergence of allied services (credit, irrigation, storage, marketing) around collective institutions.
- **Community Service Providers (CSPs):** These are local para-extension workers—youth or progressive farmers—selected and trained by SHGs to deliver technical advisory services. CSPs provide field guidance on crop planning, soil fertility, integrated pest management, livestock care, and water management. CSPs function as village extension entrepreneurs, accountable to SHGs or FPOs and progressively compensated by them for their services, replacing dependency on external staff.
- **Women's Self-Help Federations:** PRADAN strengthens SHGs as institutional anchors for extension outreach. SHGs plan local agricultural calendars, mobilise credit, manage input supply, and oversee CSP performance. Federations ensure inclusion, accountability, and cross-learning among clusters.

Methods and Tools Used in the System

- **Participatory Micro-Planning:** PRADAN facilitates participatory micro-plans to design Integrated Natural Resource Management (INRM) strategies for soil, water, and crop intensification at the hamlet level.
- **ICT and Audio-visual Extension:** ICT-based methodologies—community radio, audio-video modules, and GIS mapping—support knowledge delivery, climate advisories, and real-time monitoring. These digital tools complement face-to-face extension by community cadres.
- **Skill-based Training and Capacity Building:** PRADAN conducts tiered training for CSPs, SHG animators, and FPO leaders through learning modules and manuals on crop practices, collective marketing, and farm enterprise management.
- **Institutional Convergence and Policy Linkages:** Extension networks are aligned with government schemes (e.g., NRLM, NABARD, RKVY), enabling FPOs to access finance, inputs, and public procurement.

Unlike centralised extension, PRADAN's system merges social mobilisation and market engagement into a single continuum, where local institutions—not external experts—own agricultural knowledge and outcomes.

Scale and Impact

By 2025, PRADAN's model spans 9 Indian states (Jharkhand, Odisha, Chhattisgarh, Bihar, Madhya Pradesh, Rajasthan, Karnataka, Tamil Nadu and West Bengal), serving over 3.42 million rural households.

Its network of extension includes more than 15,000 Community Service Providers and 60 women-led FPOs, collectively enabling sustainable intensification, diversification, and women's economic empowerment.

3.1.5 Digital Green

Digital Green has built one of the world's most recognised ICT-enabled agricultural extension systems, integrating participatory video, mobile platforms, and AI tools to connect smallholder farmers with localised, trusted information. Established in 2008 as a spinoff from Microsoft Research India, Digital Green's model—known as the Video-Mediated Approach (VMA)—has been adopted by governments and NGOs across India and Africa.

Core Design: The Video-Mediated Extension Model

The Video-Mediated Approach (VMA) is the central pillar of Digital Green's system. It combines community participation and digital technology to make agricultural extension decentralised, engaging, and scalable.

The model is based on the following features:

- **Participatory Content Creation:** Videos are scripted, acted, and filmed by local farmers and extension agents in local languages to ensure relevance and cultural resonance. The content focuses on region-specific crops, soil, pest, and water management practices.
- **Community-Centric Dissemination:** Screenings are organised in villages by trained community extension agents using portable, battery-powered projectors. The videos are paused frequently for discussion and feedback, creating a peer-learning environment.
- **Feedback and Monitoring through CoCo:** CoCo (Connect Online, Connect Offline) is Digital Green's management information system for tracking video screenings, attendance, farmer adoption, and practice follow-up, even in low-connectivity areas.
- **Combines in-person video sessions with mobile messaging,** IVR (Interactive Voice Response), and AI-assisted digital platforms for constant engagement and localised advisories.

Extension Philosophy

Digital Green's model rests on three guiding pillars:

1. Participatory Knowledge Exchange – farmers learn from relatable peers.
2. Digital Amplification – technology extends the reach of community-based learning.
3. Institutional Integration – governments and rural organisations co-own the system for sustainability.

Extension Architecture and Partnership Model

Digital Green follows a "Partnership-Enabled Extension" architecture, embedding its model within government and NGO systems to strengthen existing extension networks rather than replacing them.

- **Integration with Public Systems:** Works through the National Rural Livelihoods Mission (NRLM), JEEViKA (Bihar), Andhra Pradesh Community Managed Natural Farming

(APCNF), and various state agriculture departments to train frontline extension agents (FLWs) in digital communication and participatory facilitation.

- **Community Extension Agents:** Local SHG members and farmer leaders act as mediators or "video instructors." Their social credibility and fluency in the local language greatly enhance adoption and trust.
- **Partnership with Research and AI Networks:** Collaborations with the Rockefeller Foundation, OpenAI, and governments enable scaling through emerging tools like Farmer.Chat – an AI-powered app that uses local language conversational interfaces for climate-smart and crop-specific guidance.

Tools and Digital Innovations

- **Video + Analogue Facilitation:** More than 8,000 short, locally produced videos used for training smallholders in crop, livestock, and natural resource management.
- **AI and Conversational Platforms:** The Farmer.Chat app integrates chatbots, voice recognition, and predictive analytics to deliver real-time advice and farmer feedback.
- **MarketConnect Platform:** Digital marketplace linking local producers and buyers based on quality and quantity data.
- **Weather-Linked Advisory Systems:** In collaboration with Skymet Weather Services for location-specific agronomic advice.

Outcomes and Impact

- The video-based approach has been found to be 10 times more cost-effective than traditional extension, reducing cost per farmer from around $35 to $3.50.
- Over 8.2 million (43% women) farmers reached through partnerships in India, Ethiopia, and Ghana
- Farmers adopting practices through Digital Green advisories show an average 22% yield increase and 16% income gain.

3.1.6 Access Agriculture

Access Agriculture promotes a digital, youth-led, video-based extension model that leverages participatory media and rural entrepreneurship to scale agroecological learning and knowledge co-creation among smallholder farmers in Africa, Asia, and Latin America. The model is internationally recognised for democratising extension through farmer-to-farmer videos and a social-enterprise approach known as the Entrepreneurs for Rural Access (ERA) system.

Access Agriculture's extension model blends participatory video, entrepreneurship, and digital access—transforming agricultural extension from a top-down information system into a community-driven, youth-empowered knowledge network supporting agroecological transitions and inclusive rural innovation worldwide.

Core Extension Model: The ERA (Entrepreneurs for Rural Access) System
At the heart of Access Agriculture's work is the ERA model, an innovative mechanism that combines youth entrepreneurship, solar-powered digital tools, and localised knowledge exchange.

The approach builds networks of trained young rural entrepreneurs who run micro-enterprises around knowledge dissemination and farmer learning services.

- **Entrepreneurs for Rural Access (ERAs):** Selected rural youth (often women) are trained to connect farming communities with Access Agriculture's curated library of training videos. Each entrepreneur owns a solar-powered smart projector preloaded with hundreds of multilingual videos on agroecology, livestock care, value addition, and rural enterprise development.
- **Smart Projectors and Offline Learning:** The smart projector functions without the internet, enabling learning in remote, off-grid regions. ERAs organise community screenings, farmer discussions, and training events where farmers can see practices demonstrated by peers from similar socio-ecological contexts.
- **Business and Impact Model:** ERAs sustain their activities by charging nominal fees, partnering with NGOs, or selling related services (seed sales, training contracts, and agribusiness facilitation). This entrepreneurial model turns extension delivery into a livelihood opportunity for rural youth while multiplying access to validated agroecological knowledge.

Video-Mediated Learning System

Access Agriculture's content is built around the principles of "Seeing, Believing, and Doing", reflecting a fully participatory communication approach:

- **Farmer-to-Farmer Videos:** Farmers featured in the videos demonstrate locally tested good practices—ranging from crop diversification to water harvesting, sustainable livestock production, and post-harvest value chains. Over 6400+ videos in 110 languages are freely available on the global platform.
- **Localisation and Co-Creation: Videos are produced in collaboration with farmer groups, research centres,** and development partners to ensure context-specificity. The aim is to bridge traditional knowledge and scientific innovation through relatable visual storytelling.
- **Agtube and Access Agriculture App:** A complementary digital ecosystem—Agtube.org and the Access Agriculture mobile app—enables anyone to upload, translate, and share training videos, effectively making extension horizontal and peer-driven.

Digital Tools and Support Ecosystem

- **Solar Smart Projector:** Portable, solar-powered toolkit serving as a mobile extension lab for rural youth.
- **Access Agriculture App:** Offline app giving farmers instant access to downloadable video libraries.
- **Agtube Platform:** Video-sharing platform functioning as a social media space for farmers, extension agents, and entrepreneurs.
- **Youth Coaching and Mentoring:** Continuous support for ERAs through business incubation and digital learning cohorts.

Extension Philosophy and Approach

Access Agriculture's extension philosophy is grounded in five interlinked pillars:

1. Farmer-to-Farmer Learning – authentic, experience-based communication fosters trust and adoption.

2. Youth and Women Leadership – turning digital access into income opportunities for rural changemakers.
3. Agroecological Knowledge – emphasis on nature-based, low-cost, and climate-resilient practices.
4. South–South Learning – cross-country exchange where farmers learn from peers in similar environments.
5. Sustainability through Enterprise – delivery of extension services linked to viable rural businesses.

Scale and Global Reach

- As of 2025, Access Agriculture operates in over 100 countries, with active ERA programs across Africa, South Asia, and Latin America.
- The network includes over 450 ERAs and more than 2,000 partner organisations, together reaching an estimated 100 million viewers through offline and online channels.
- Independent assessments show high adoption rates due to visual learning's relatability and the trust fostered by peer teaching.

3.1.7 Syngenta Foundation for Sustainable Agriculture

The Syngenta Foundation for Sustainable Agriculture (SFSA) promotes a market-led rural enterprise–based extension system built around Agri-Entrepreneurs (AEs) and Farmers' Hubs (FHs). This model moves away from subsidy-driven or purely state-led extension, using entrepreneurship and market access as drivers of sustainable smallholder transformation. This model replaces conventional top-down extension with a decentralised, entrepreneur-led ecosystem in which trained local youth—equipped with science, business acumen, and digital tools—serve as enduring partners in the journey toward sustainable, profitable, and climate-resilient smallholder agriculture.

Core Model: The Agri-Entrepreneur (AE) System

At the heart of Syngenta Foundation's approach is the Agri-Entrepreneur (AE) model, launched in 2014 and institutionalised through the Agri-Entrepreneur Growth Foundation (AEGF)—a joint initiative of Syngenta Foundation India, Tata Trusts, and IDH.

The AE serves as a "last-mile service provider" who delivers extension, input access, and business facilitation to smallholders in their localities.

Structure and Functioning

- **Agri-Entrepreneurs (AEs):** Rural youth trained in agronomy, business, and digital literacy. Each AE serves about 150–200 farmers, offering access to inputs, mechanisation, advisory, credit, and market linkages.
- **Cluster-Based Extension:** AEs operate in clusters of villages, guided by agri-business mentors and Foundation field teams. This ensures both peer proximity and scalability.
- **Commercial and Social Accountability:** AEs run as self-sustaining rural enterprises. They earn income through commissions on services and products, creating a blended livelihood model that embeds accountability and trust.
- **Digital Backbone:** Partnerships with digital platforms such as Kuza.one that provide continuous learning, farmer profiling, and climate-smart data-driven advisories.

Complementary Model: The Farmers' Hub and Mechanisation Centres

To support and scale the AE system, SFSA promotes additional enterprise nodes known as:

- **Farmers' Hubs (FHs):** Aggregation and service centres providing storage, input distribution, and linking smallholders to formal markets.
- **Mechanisation Service Centres:** Equipment-sharing hubs designed and operated by entrepreneurs, allowing farmers affordable access to tools for soil preparation, irrigation, and planting.

These hubs act as "business anchors" for AEs, providing logistics and infrastructure for their extension work while generating localised employment.

Key Components of the Extension Mechanism

1. **Training and Incubation:** Partnered incubation through AEGF and other skill networks—offering technical, entrepreneurial, and financial literacy courses lasting 3–6 months.
2. **Market and Financial Linkages:** AEs relate to input suppliers, banks (like IDBI), and agribusiness firms for credit, crop insurance, and output sales.
- **Climate and Technology Integration:** The system promotes climate-smart agriculture, precision agronomy, and regenerative practices supported by AI-based mobile applications and local weather data.
3. **Public–Private Partnerships (PPP):** The Foundation co-implements projects with governments, NABARD, and corporate CSR programs, ensuring institutional sustainability.

Philosophy and Design Logic

Three interlocking principles guide the Syngenta Foundation's extension approach:

1. Enterprise-driven Extension – shifting from subsidy to entrepreneurship; the AE is both service provider and role model.
2. Market Integration – linking productivity enhancement to value chain participation, ensuring farmers earn sustainable incomes.
3. Digital and Social Capital Convergence – combining digital tools with local trust networks to make learning, credit, and outputs accessible.

This positions extension as a commercially viable rural ecosystem rather than a project-dependent activity.

Scale and Impact

- As of 2024, more than 20,850 Agri-Entrepreneurs were operational across 13 Indian states, reaching over 2.4 million smallholder farmers.
- The Foundation aims to build 100,000 AEs by 2035, impacting 10 million farmers, with a targeted focus on women and climate resilience.
- Independent *assessments* report up to 25–40% income gains among farmers associated with AEs, driven by input optimisation and better price realisation.

3.1.8 The Goat Trust

The Goat Trust, based in Lucknow, Uttar Pradesh, has developed a community-led livestock extension system centred around its pioneering "Pashu Sakhi" model—a women-led, enterprise-driven, preventive livestock health and extension approach. This model has become a national reference point for pro-poor, gender-sensitive livestock service delivery across India.

Core Extension Model: The Pashu Sakhi System

The extension approach of the Goat Trust revolves around a community-based para-veterinary cadre called Pashu Sakhis (literally "friends of animals").

These are rural women trained to deliver doorstep livestock health care, financial inclusion, feed and fodder extension, and goat management practices.

This system redefines livestock extension as community-owned, low-cost, decentralised, and women-led.

Key Features

- **Community-Based Extension Agents:** Pashu Sakhis are locally selected women embedded within existing self-help groups or cooperatives.
- **Intensive Training and Certification:** They undergo training in preventive animal health care, breeding management, feeding, housing, vaccination, and basic veterinary first aid at the Goat Trust's training centres.
- **Enterprise Model:** Each Pashu Sakhi manages services for 200–250 livestock owners and earns income through fees for health care, breeding services, sale of inputs (mineral mixtures, herbal remedies), and livestock insurance facilitation.
- **Digital and Continuing Education:** Continuous learning is supported through digital tools and online courses via the Goat Trust's e-learning portal, enabling knowledge updates and performance monitoring.

Integrated Infrastructure: Livestock Business Centres (LBCs)

To institutionalise the model, the Goat Trust promotes Livestock Business Centres (LBCs) at the cluster level.

Each LBC serves as both an extension hub and social enterprise incubator, supporting local Pashu Sakhis and livestock farmers with:

- Aggregation of goat milk, meat, and manure products.
- Feed and fodder supply chains.
- Insurance and credit linkages with banks and microfinance institutions.
- Artificial insemination, breeding, and technical backstopping for improved goat productivity.

These centres also host training, quality certification, and data management systems to enhance service traceability and accountability.

Extension Mechanism and Operational Flow

- **Mobilisation:** Women from SHGs or producer groups are identified and motivated to become Pashu Sakhis.

- **Training and Deployment:** The Goat Trust trains these women through experiential field training, manuals, and live demonstrations.
- **Service Delivery:** Pashu Sakhis conduct household visits to deliver preventive and minor curative livestock services.
- **Monitoring and Quality Assurance:** Monthly review meetings and mobile-based reporting systems track animal health outcomes and earnings.
- **Market Linkage:** Livestock Business Centres aggregate animals for fair sales through transparent body weight–based pricing systems.

Thematic Extension Dimensions

- **Preventive Animal Health**: Vaccination, deworming, and balanced nutrition promotion.
- **Breed Improvement & AI Adoption:** Training Pashu Sakhis in artificial insemination and selective breeding.
- **Fodder and Feed Development:** Establishment of local fodder banks and feed innovation using local raw material.
- **Livestock Insurance and Micro-Leasing Programs:** Ensuring livestock as financial assets for rural women, managed through SHGs.
- **Digital Tools:** Use of mobile apps and audiovisual materials for record-keeping and farmer advisory.

Institutional Philosophy

The Goat Trust's extension philosophy is built on four interlinked pillars:

1. **Localisation of Knowledge:** Turning rural women into skilled livestock advisors.
2. **Enterprise Orientation:** Positioning extension as a revenue-generating livelihood for community agents.
3. **Preventive and Pro-woman Focus:** Ensuring small livestock systems support women's income and nutritional security.
4. **Institutional Embedding:** Linking Pashu Sakhis with SHGs, federations, and Livestock Business Centres for long-term sustainability.

In summary, The Goat Trust's extension system—anchored around the Pashu Sakhi model—creates a self-sustaining, gender-inclusive, and entrepreneurial livestock extension ecosystem. It bridges veterinary science, rural enterprise, and women's empowerment, demonstrating how small livestock can act as a lever for resilient agrarian livelihoods and climate-smart rural growth in India.

Scale and Impact

- **Geographic Reach:** Operates in 18 Indian states through 150 partner NGOs.
- **Cadre Development:** Over 4,700 Pashu Sakhis trained and active, reaching approximately 2.5 lakh small livestock farmers daily.
- **Livestock Coverage:** Over 1.2 million small ruminants under preventive health and breeding management.
- **Partnerships:** Collaborates with livelihood missions (such as the MSRLM, MAVIM, NRLM, and NABARD) and corporate social responsibility initiatives like SBI Foundation's LEAP integrated livestock program.

3.1.9 Deccan Development Society (DDS)

The Deccan Development Society (DDS), based in Zaheerabad, Telangana, has developed a distinctive community-led agroecology extension model centred on women's sanghams (village level collectives), seed sovereignty, and participatory communication systems. The Society's extension philosophy deliberately replaces external, expert-driven models with self-managed, experiential learning systems that democratize knowledge, empower Dalit women, and embed ecological farming within local governance structures.

Core Extension Model: Women's Sangham-Based Agroecology

The foundational structure of DDS's extension system is the network of more than 80 women's sanghams, federated into a powerful collective of smallholder farmers, primarily Dalit women. These sanghams act as the primary units of extension, governance, and innovation in agriculture.

- **Collective Learning and Farmer-Led Experiments:** Each sangham organises learning circles, on-farm demonstrations, and peer exchanges focusing on millet-based dryland farming, soil fertility restoration, and seed selection.
- **Autonomy Framework ("Five Autonomies"):** DDS frames extension within the vision of autonomy over food, seed, market, media, and natural resources—integrating extension with rights, culture, and livelihoods.
- **Participatory Decision-Making:** All innovations, from new cropping systems to seed trials, are locally discussed and validated. Scientific partners (through the DDS Krishi Vigyan Kendra) support these processes through participatory action research rather than prescriptive training.

Institutional Components of the Extension System

- **Community Gene and Grain Banks:** Seed and grain banks managed by women farmers provide local access to indigenous varieties, creating a decentralised "seed extension system." Over 100 villages maintain their own seed repositories, sustaining biodiversity and reducing dependence on external suppliers.
- **Krishi Vigyan Kendra (DDS-KVK):** DDS operates its Farm Science Centre in Zaheerabad as a people's science platform that bridges traditional knowledge and formal research. It champions participatory technology development, soil health restoration, and climate-resilient rainfed farming practices.
- **Community Media Trust (CMT):** One of DDS's hallmark innovations is using participatory video as a rural knowledge exchange medium. The Community Media Trust—run entirely by rural women—documents and circulates success stories and training films, serving as a horizontal extension mechanism through which farmers learn from other farmers, visually and linguistically.
- **Eco-Employment and Millet Extension:** Through programs like the Eco-Employment Initiative and Millet Network of India (MINI), community groups lead land rehabilitation, composting, and drought-adaptive cropping, practically turning public works into experiential agroecology schools.
- **Participatory Seed Production Technology:** DDS has institutionalised participatory seed production with farmer-scientist co-creation. Each participating farmer maintains

seed purity and varietal documentation guided by communal protocols and peer supervision, functioning as embedded village-level seed extension workers.

Communication and Extension Tools

- Participatory Rural Appraisal (PRA) and Farmer Field Schools embedded within sangham meetings.
- Community radio and visual storytelling via Pastapur Community Radio for localised knowledge diffusion.
- Field days and biodiversity exhibitions, where farmers exchange seeds, herbal formulations, and soil practices.
- Educational Outreach through *Pachasaale* (an alternative school), teaching youth ecological agriculture and nutritional science, linking education to extension outcomes
- Extension Philosophy and Approach

DDS's extension model rests on five interconnected principles:

1. **Farmer Sovereignty:** Farmers—not technicians—own the learning process and research agenda.
2. **Women's Leadership:** Extension is gendered intentionally; Dalit women serve as planners, trainers, and communicators.
3. **Cultural Reclamation:** Agricultural learning integrates local food habits, festivals, and farm cinema, making extension socio-culturally embedded.
4. **Ecological Integration:** Soil, seed, livestock, and health are treated as interlinked systems rather than silos.
5. **Media as Empowerment:** Communication tools are not used for instruction but for the co-production of knowledge and the visibility of marginalised voices.

Essence of the DDS Extension Model

The Deccan Development Society's extension system is best described as a "community knowledge commons for agroecology." It integrates farmer-to-farmer learning, women-led governance, media empowerment, and participatory research into a circular model of extension that restores knowledge, seed, and soil sovereignty. Rather than disseminating information, DDS's extension approach reconstructs democratic rural institutions—turning village collectives into living laboratories of sustainable agriculture and social justice.

Scale and Impact

- **Geographic Coverage:** Over 80 villages, involving 5,000 women farmers.
- **Seed Sovereignty:** 60 seed banks, more than 15 millet and pulse varieties conserved and re-circulated.
- **Food Security Reach:** The Alternative Public Distribution System (APDS) delivers community-produced millets to 50,000 families annually.
- **Recognition:** Awarded the UNDP Equator Prize (2019) for grassroots agroecological extension empowering marginalised women farmers.

3.1.10 National Rural Livelihoods Mission

The Deendayal Antyodaya Yojana–National Rural Livelihoods Mission (DAY-NRLM) and its State Rural Livelihood Missions (SRLMs) have institutionalised one of India's most extensive community-based agricultural extension systems, centred on women's collectives and cadre-based service delivery. This model redefines extension as a community-owned, multi-tiered system rather than an external line department function.

Core Extension Model: Community Resource Person (CRP) System

The backbone of NRLM's extension structure is the Community Resource Person (CRP) system—a cadre-based, peer-to-peer knowledge transfer mechanism embedded within women's self-help institutions.

This system operates under the Farm Livelihoods and Mahila Kisan Sashaktikaran Pariyojana (MKSP) components of NRLM. Its core features are as follows.

1. Three-Tier Extension Architecture

- **Village Level:** More than 50,000 local Community Resource Persons (CRPs) act as frontline extension workers. They provide training, demonstrations, and technical guidance on crop, livestock, and forest-based livelihoods. Specialised CRPs include:
  - Krishi Sakhis – Agriculture extension workers
  - Pashu Sakhis – Livestock health and management facilitators
  - Van Mitras – Forest and NTFP-based livelihood supporters.
- **Block and Cluster Level:** Producer Groups (PGs) and Producer Collectives organise farmers for aggregation, collective planning, and value chain development, supported by Cluster-level Resource Persons (CLRP).
- **State and National Level:** The National Mission Management Unit (NMMU) and State Rural Livelihoods Missions (SRLMs) deploy thematic experts, known as State Resource Persons (SRPs) and National Resource Persons (NRPs), for technical backstopping, design of capacity-building materials, and continuous training cycles

2. Participatory and Peer-to-Peer Learning Approach

NRLM's extension model relies on social mobilisation and peer learning rather than top-down knowledge dissemination.

Key features include:

- **Farmer Field Schools and Learning Routes:** Villages function as living classrooms where farmers learn holistic crop, soil, and livestock management through demonstrations led by CRPs.
- **Video-Based Extension:** In collaboration with Digital Green, NRLM uses locally produced short videos and handheld projectors to blend audiovisual learning with discussion-led mass outreach.
- **Women-Led Decision-Making:** Each Self-Help Group (SHG) and its Village Organisation collectively plan cropping calendars, resource allocation, and collective procurement, ensuring bottom-up extension planning.

3. Programmatic Components Supporting Extension

- **Mahila Kisan Sashaktikaran Pariyojana (MKSP):** Anchors women farmers as change agents in natural farming, biodiversity enhancement, and soil health management.
- **Sustainable Livelihoods and Adaptation to Climate Change (SLACC):** Extends the extension model to climate resilience, introducing participatory weather planning, risk mapping, and soil carbon restoration.
- **Integrated Farming Clusters (IFCs):** Focus on integrated production systems (crop–livestock–horticulture–fishery) managed collectively by SHG and farmer clusters for livelihood diversification.

4. Integration of Extension with Enterprise

Many SRLMs, such as those in Odisha (OLM), Maharashtra (UMED/TNRLM), and Jharkhand (JSLPS), have mainstreamed fee-based service models in which CRPs evolve into agri-service entrepreneurs.

They now facilitate:

- Input distribution,
- soil testing,
- custom hiring of implements, and
- collective marketing via Farmer-Producer Organisations (FPOs) and Producer Groups.

5. Use of Convergence and Partnerships

The model promotes multi-institutional convergence, aligning local SHG federations and CRP networks with:

- Krishi Vigyan Kendras (KVKs) for scientific validation,
- Agriculture & Animal Husbandry Departments for technical inputs,
- MGNREGA for soil and water conservation works, and
- Corporate CSR or NGOs for value chain and market development support.

Institutional Philosophy

Four cardinal principles guide NRLM's and SRLMs' extension design:

1. **Social Mobilisation Before Technology Transfer** – Strengthening solidarity among women farmers through SHGs before introducing innovations.
2. **Community Resource Persons as Extension Agents** – Peer farmers as extension intermediaries build credibility and sustainability.
3. **Digital and Participatory Learning Blend** – Combining visual learning, data-driven feedback, and local content creation.
4. **Women's Collective Governance** – Village Organisations, not outside institutions, supervise extension quality and CRP accountability.

The model operates at three levels as presented below.

Level	Key Institutions	Extension Agents	Extension Tools	Focus
Village	SHGs, Village Organisations	Krishi Sakhi, Pashu Sakhi, Van Mitra	Demonstrations, videos, farmer field schools	Productivity & sustainability
Cluster/ Block	Producer Groups, FPOs	Cluster Resource Persons	Group planning, input-output systems	Market access & aggregation
State/ National	SRLM, NMMU, NRP Network	Technical Partners & Experts	Digital training, policy convergence	Standardization & scale-up

In essence, NRLM's extension system blends community-led governance, gendered leadership, and digital peer learning to create a nationwide bottom-up extension infrastructure.

It transforms every Self-Help Group federation into an institutional platform for agroecological learning, enterprise incubation, and climate-resilient rural development.

Scale and Outcomes

- Coverage: Over 100 million households mobilised across 9 million SHGs. Farm-Livelihood Outreach: By 2025, more than 6.3 million small farmers, a majority of them women, had received agricultural and livestock extension support.
- Sustainability: Most states are transitioning to member-paid or enterprise-linked extension systems for long-term self-reliance

3.2 Key Features that distinguish Alternative Extension Models

One of the most distinguishing aspects of these models is the way they treat extension as a social process of empowerment and mutual learning rather than a technical activity of persuasion. Their distinguishing features—co-creation, inclusivity, decentralised authority, and collective accountability—create learning ecosystems that are not only productive but also resilient and self-sustaining.

By embedding participation as both method and ethos, these models make agricultural development more adaptive, democratic, and ecologically conscious qualities that conventional, top-down systems often fail to achieve.

Across the wide range of alternative extension models—community-driven, digital, enterprise-based, and agroecological—a consistent lesson emerges: farmer involvement is the foundation of effective, equitable, and sustainable agricultural change. Studies of participatory and pluralistic extension systems emphasise that when farmers move from being recipients to co-designers, decision-makers, and evaluators, extension becomes both more adaptive and enduring.

A few specific distinguishing features are as follows:

Farmer Empowerment and Co-Creation of Knowledge: These models recognise farmers as active partners in the innovation process. Through designing, testing, and adapting new knowledge with experts, farmers engage in co-innovation, ensuring that technologies fit local agro-ecologies and resource conditions. This replaces the predominant top-down "technology transfer paradigm with the more appropriate co-innovation paradigm.

Experiential and Social Learning: Unlike traditional classroom training, these models rely on learning-by-doing and peer-to-peer engagement. Methods such as Farmer Field Schools (FFS), Community Resource Persons (CRPs), and Pashu Sakhi networks foster collective experimentation and reflection—farmers observe, discuss, and refine practices together. Such group learning enhances confidence, knowledge retention, and adoption rates.

Decentralised and Community-Led Governance

Alternative systems embed extension institutional control at the village or cluster level through SHGs, sanghams, or FPOs. Decision-making on crops, inputs, and advisory content lies with these local bodies, reinforcing ownership, trust, and accountability. This structure contrasts sharply with the centralised departmental extension hierarchies.

Integration of Indigenous and Scientific Knowledge

These models combine farmer wisdom on soil fertility, seed selection, or weather patterns with formal science. This integration creates practices that are culturally appropriate, cost-effective, and ecologically sound, forming the core of agroecological and climate-smart transitions.

Inclusivity and Equity Orientation

A defining ethos is the inclusion of women, smallholders, and marginalised communities. Gender-sensitive facilitation (as in NRLM's Krishi and Pashu Sakhis, or DDS's women sanghams) ensures that previously excluded voices shape agricultural priorities. This brings social legitimacy and redistributes decision-making power in rural spaces.

Collective Action and Institution Building

Rather than serving individual farmers, these models cultivate collective structures—producer groups, seed networks, livestock cooperatives—that act as permanent vehicles for extension and market negotiation. They strengthen social capital, enhance bargaining power, and sustain technical support even after project phases end.

Participatory Planning, Monitoring, and Feedback

Tools such as Participatory Rural Appraisal (PRA) and community scorecards allow farmers to set priorities, assess outcomes, and hold facilitators accountable. Participatory monitoring ensures relevance and continuous refinement of extension activities.

Use of Digital Media for Co-Learning

These models increasingly combine ICTs—videos, community radio, WhatsApp groups—with face-to-face learning. Platforms like Digital Green and Access Agriculture translate local farmer success stories into visual narratives, reinforcing horizontal extension while keeping the process community-driven.

3.3 Outcomes through farmer participation in alternative extension models

Farmer participation in networks for adapting new knowledge has resulted in several positive outcomes.

These are discussed below:

Co-creation Drives Relevance and Adoption: Farmers' direct participation in generating and testing innovations—such as in participatory technology development or seed selection—leads to locally adapted solutions that fit their farming realities. Projects like NRLM's Krishi Sakhis or CSA's community service centres show that farmers trust and adopt technologies they co-develop rather than those imposed externally.

Farmer-Led Learning Networks Amplify Impact: Peer-to-peer knowledge exchange, whether through Farmer Field Schools, Digital Green videos, or Access Agriculture ERAs, enhances diffusion far beyond what conventional agents can achieve. Social learning builds confidence and accountability, creating self-reinforcing cycles of innovation within communities.

Collective Institutions Strengthen Extension Sustainability: Community organisations—SHGs, sanghams, producer groups, or FPOs—turn learning into governance. When extension is managed through federated structures, knowledge transfer becomes institutionalised, ensuring continuity after projects end.

Blending Indigenous and Scientific Knowledge Enriches Solutions: Farmers contribute experiential understanding of soil, water, and climate variability; scientists add analytical validation. Such integration leads to more robust and resilient practices in soil health, ecological pest management, and biodiversity conservation.

Trust and Two-Way Communication Are Central: Farmers value consistent dialogue over prescriptions. Frequent visits, local facilitation, and open exchanges—as seen in DDS or The Goat Trust—build credibility and enable fine-tuning of interventions. Extension is most effective where trust replaces hierarchy and farmers see themselves as partners rather than clients.

Gendered and Inclusive Engagement Multiplies Returns: Women's involvement—as service providers (Pashu Sakhis), community trainers, or media producers—has proven to increase adoption and diversify household benefits. Inclusive participation ensures that extension addresses broader livelihood and nutrition outcomes, not just yield gains.

Continuous Feedback and Reflexive Learning Ensure Adaptability: Participatory systems incorporate farmer feedback into monitoring and redesign cycles. This iterative learning—trial, observation, reflection, adaptation—keeps extension responsive to climate change, market shifts, and farmer priorities.

Farmers as Intermediaries Multiply Reach: Trained farmers serving as animators, CRPs, or digital connectors (as in NRLM, Digital Green, or DeHaat) create last-mile trust and make large-scale outreach cost-effective. Empowering these intermediaries transforms extension from a vertical chain into a horizontal web of knowledge brokers.

Synthesis: What Farmer Involvement Teaches Us

Participation is efficiency, not charity—farmer involvement accelerates learning, reduces failures, and ensures ownership.

Diversity of engagement matters—combining collective organisation, technology platforms, and local facilitators caters to India's varied agro-ecologies.

Sustainability follows empowerment—when farmers manage extension processes, external dependence decreases, and adaptation becomes habitual.

Knowledge pluralism strengthens resilience—bridging formal science with farmers' experiential insight creates systems able to navigate uncertainty.

3.4: Comparing Costs and Recovery Structures of Alternative Extension Models

Across India's major public, NGO, and enterprise-based agricultural extension systems, costs per farmer and cost-recovery mechanisms vary widely depending on levels of digitalisation, cadre structure, and institutional ownership. Available data and evaluations show that innovative NGO-led and digital models have substantially reduced costs by 8–15 times compared to conventional government systems, while recovering part of these costs through entrepreneurial, market-linked, and membership-based models.

Table 1: Comparative Cost and Recovery Structures of Alternative Extension Models

Organisation / Model	Estimated Cost per Farmer (USD / INR)	Cost Recovery Mechanisms	Notes
Digital Green	3–6 USD(~₹250–₹500) per farmer adopting a demonstrated practice	Cost sharing with government (NRLM, State Agriculture Depts.); donor grants for platform; partial recovery through public partnerships	10× cheaper than traditional field extension; digital infrastructure is permanently hosted under state systems.
NRLM / SRLMs (Krishi & Pashu Sakhis)	₹1,200–₹1,800 per household per year (cluster-based cost)	Community cadres are paid from project or federations' funds; progressive movement to fee-for-service (farmers pay ₹50–₹100 annually); federations earn margins via collective marketing	Self-sustaining federated extension.
PRADAN Agricultural Production Cluster	₹1,000–₹1,500 per farmer, per season	Community Service Providers (CSPs) recover fees (₹100–₹200) from SHGs/PGs and share commission on inputs and output marketing; funded partly by BRLF & NRLM projects.	Cost shared by community institutions at 40–50% by the 3rd season.

Syngenta Foundation/ AEGF Agri Entrepreneur Model	₹900 – ₹1,200 per farmer served annually (≈ 10 USD)	AEs earn from sales commissions, equipment rental, and training fees; the Foundation provides initial capital and a digital back end; after year 3, AEs are self financing	Recovery through entrepreneurial profits (3–8 % margin).
The Goat Trust (Pashu Sakhi Network)	₹700– ₹1,000 per animal owner per year	Fee for service: each Pashu Sakhi earns ₹25 – ₹40 per visit + commissions on inputs / insurance; no free services after initial support	Most sustainable livestock extension cadre; fully community paid after 3 years.
Centre for Sustainable Agriculture (Farmer Service Centre /CSA)	₹1,000–₹1,500 per farmer (per season)	Input margin (5–10 %), soil testing & advisory fees, plus project based technical support through FPO revenues	Model shifts to cost recovery through FPO membership (₹500 annual subscription).
Paani Foundation (Farmer Cup)	₹1,000 per villager mobilized (community investment ≈ 25 days labor value per participant)	Crowd contributed and voluntary labour (shramdaan)rather than a monetary fee; grants cover training/media	Behavioural extension with non financial recovery through social capital.
Deccan Development Society (Women's Sangham System)	< ₹500 per farmer per year (collective learning)	Cooperative grain/ seed banks generate revolving funds; sanghams share harvest or seed contributions as in kind recovery.	Fully owned by women farmers; operates on in kind reciprocity.
Access Agriculture (ERA Model)	≈ ₹300 per farmer exposed through videos	Cost recovery by rural entrepreneurs (ERA youth) from training fees and equipment rentals; initial toolkits donated by partners	Entrepreneurial micro extension network.

Cross-Model Insights

- **Digital and Peer-Learning Systems (< ₹500 per farmer):** Platforms like Digital Green and Access Agriculture achieve the lowest unit costs through shared digital infrastructure and peer-led dissemination. Primary recovery is through partnerships or social enterprises rather than user fees.
- **Community Cadre Systems (₹700–₹1,800 per household):** NRLM, PRADAN, CSA, and The Goat Trust rely on extensive para-professional networks (Sakhis,

CSPs, CRPs). Recovery transitions from full project support to user-paid service or commission-based income within 2–3 years.

- **Enterprise-Driven Models (Syngenta, PRADAN, CSA):** Financial sustainability rests on margin recovery—commissions on inputs, collective marketing, and rental of agri-equipment contribute 15–30% annual turnover coverage by year three.
- **Collective and Rights-Based Models (DDS, Paani Foundation):** Here, economic cost recovery is non-monetary—through voluntary contributions, seed exchange, and collective grain funds—anchored in social capital and autonomy rather than financial return.

Table 2: Synthesis on Cost Structure and Recovery

Category	Typical Annual Cost / Farmer	Recovery Pathway	Sustainability Horizon
Digital ICT Extension	₹250–₹500	Gov–NGO co-financing, digital platform services	Immediate –2 yrs
Community Cadre Extension	₹700–₹1,500	Fee for service, input/ trading margin	2–3 yrs
Enterprise/Market-linked Extension	₹1,000–₹1,500	Business revenues of AEs/ FPOs	3 yrs +
Collective /Volunteer Systems	₹0–₹500	In-kind or social recovery	Socially sustained

In conclusion, modern agricultural extension economics in India shows that:

- Digital social-learning models (e.g., Digital Green, Access Agriculture) are the most cost-efficient (₹ 250– 500 per farmer).
- Community cadre and enterprise models (NRLM, PRADAN, Syngenta Foundation, CSA) converge at ₹ 1,000– 1,500 per farmer annually, achieving partial to full self-financing within three years.
- Collective agroecology networks (DDS, Paani Foundation) rely on non-monetary cost recovery through social labour and resource pooling rather than cash, reflecting sustainability through community ownership and solidarity.

4. EXTENSION APPROACHES USED BY STARTUPS

Most Indian agritech startups now act as "private extension systems", combining digital tools, data science, and local entrepreneurship to deliver advice, inputs, financing, and market access as integrated services. Their models differ from NGO or public extension systems in that they are transaction-linked, tech-enabled, and financially self-sustaining rather than project-based. These are presented in Table 3.

Table 3: Major Extension Models Used by Agri-Startups

Startup	Extension Model	Core Mechanism	Revenue & Sustainability
DeHaat	Full-Stack Rural Enterprise Model	Establishes DeHaat Centres (franchise-like outlets) run by micro-entrepreneurs serving 500–700 farmers each. Offers crop advisory, input supply, finance, and market linkage under one platform.	Advisory is free; the company earns from input margins and crop sales commissions—farmers' success = company's revenue.
AgroStar	Digital Marketplace + Advisory Helpline	Uses AI-based mobile app in regional languages and call centres to offer personalised crop advice and enable one-click purchase of quality inputs.	Revenue from input sales (B2F model). Advisory is bundled to retain loyal customers.
Gramophone	Data-Driven Precision Advisory Platform	Combines farm profiling, weather integration, and soil diagnostics to deliver precision agro-advisory plus e-commerce for inputs.	Commissions from sales and embedded credit service fees; the app attracts farmers via savings and reliable guidance.
NinjaCart / WayCool	Market-First Extension Model (Output-Led)	Extends advisory focused on improving yield quality and logistics efficiency for buyers. Advice links directly to procurement standards.	Margin on produce aggregation and logistics; advisory cost embedded in supply chain efficiency.
Fasal / Cropin / SatSure	Data and Sensor-Driven Advisory	Use IoT, satellite imagery, and AI analytics to create "Decision Support Systems" that offer irrigation, nutrient, and pest timing recommendations.	SaaS licensing to agribusinesses, FPOs, and insurers; indirect benefits to farmers through partners.

BigHaat	E-Commerce + Tele-Advisory Hybrid	Offers localised crop services through call centres, WhatsApp bots, and mobile storefronts; provides climate advisories and online order fulfilment.	Transaction margins from 10–20% on agri-inputs.
Krishi Network / KisanGPT	Social Knowledge Platform Model	Works like a "social media extension" where farmers share content, get expert advice, and engage brands through vernacular videos.	Brand sponsorships, input partnerships, and data monetisation—advisory acts as an engagement funnel.
Samhitha Crop Care Clinics	Precision Agri-Clinic Model	Local franchise clinics provide soil testing, drone spraying, and customised pest management solutions.	Fee-for-service from farmers and contracts from large buyers seeking quality traceability.

Common Features of Startup-Led Extension

- **Data and Technology Backbone** – Artificial intelligence, IoT, cloud analytics, and satellite data drive predictive and personalised advisory services.
- **Full-Value-Chain Orientation** – Startups link advisory with input/output transactions so that extension creates measurable economic value.
- **Micro-Entrepreneur Networks** – Local agents (DeHaat partners, "Krishi Dosts," or "Agripreneurs") extend digital platforms to offline farmers, mirroring service-centre models.
- **Freemium or Cross-Subsidy Model** – Advice is offered free to build loyalty; revenue comes from sales, logistics, insurance, or data subscriptions.
- **High Scalability** – Digital platforms allow exponential outreach at ₹200–₹400 per farmer per season, compared to ₹1,000–₹1,500 in NGO models.

Advantages of Startup Extension Models

- **Efficiency & Scale:** Operate at one-third to one-tenth the cost of traditional extension, reaching millions digitally.
- **Personalisation:** Farm-specific, data-backed advice instead of generic crop packages.
- **24×7 Access:** Mobile access overcomes field staff shortages.
- **Market Orientation:** Help farmers make profitable decisions, not just productive ones.
- **Private Sustainability:** Self-financing via trading, logistics, and analytics services—requiring no donor cycles.
- **Integration of Youth & Innovation:** Employs local youth as franchisees or digital promoters, creating rural employment.

Disadvantages and Systemic Gaps

- **Equity Risks:** Small and poorer farmers without smartphones or credit access can be excluded.
- **Profit Bias:** Advisory often designed to drive product sales, potentially over-promoting inputs.
- **Data Privacy & Trust:** Farmers may distrust sharing location and crop data with private firms.
- **Low Local Institutional Anchoring:** Unlike NRLM or DDS models, startups lack a gender or community institution focus.
- **Dependency on Connectivity & Literacy:** Weak digital infrastructure limits rural inclusion.

- **Fragmented Accountability:** When multiple franchise layers exist, quality control of advice can vary.

A comparative analysis between startup-led extension models and NGO/Community Extension models is presented in Table 4.

Table 4: Startups vs Development Models

Dimension	Startup-Led Extension	NGO / Community Extension
Cost per Farmer	₹200–₹500 (recovered via sales margins)	₹700–₹1,500 (dependent on donor funds or membership)
Scalability	Very high (digital networks)	Moderate (personnel-intensive)
Inclusivity	Moderate (depends on access to smartphones & pay capacity)	High (women, poor farmers, central)
Knowledge Intensity	Medium – relies on algorithmic insights	High – field-based experiential learning
Revenue Source	Commercial transactions (inputs, outputs, data)	Grants, service fees, and collective trading
Accountability	Customer-based (performance tied to sales)	Community-based (peer and institutional accountability)

Indian startup-driven extension has evolved into a "value-chain extension model" in which technology, micro-enterprise, and agribusiness converge. It excels in efficiency, speed, and market integration, but lags in equity, deep capacity building, and ecological stewardship. The most promising direction observed is blended partnership models—for example, NRLM + DeHaat or AgroStar-CSR alliances—that combine public trust with private technology and create a hybrid ecosystem of inclusive, data-driven agricultural extension for smallholders.

5. HOW TO ADOPT AND GRADUATE BETWEEN MODELS

One of the key challenges faced by extension managers is making informed decisions about selecting the most appropriate models. A summary of the key features, strengths, and Limitations of these models is presented in Table 5 below.

Table 5. Key features of different models

Sl. No	Type	Features	Strengths	Limitations
1.	**Community-Based & Participatory Models** (Examples: NRLM/SRLM, DDS, Goat Trust, RySS/ APCNF, PRADAN, CSA)	Strong trust, integration of local knowledge, empowerment of women/youth, cadre-based extension (CRPs, Sakhis, Sanghams), collective actions (SHGs, FPOs).	Deep social mobilisation, long-term behavioural change, inclusivity, and sustainability in ecologically sensitive and resource-poor settings.	Scaling is gradual, requires intensive capacity building and may initially depend on donor/public investments.
2.	**Enterprise & Service Centre-Based Models** (Examples: Syngenta Foundation/AEGF, CSA Farmer Service Centres, FPO Service Hubs)	Entrepreneur-led, fee/revenue-based sustainability, bundled services (input, advisory, markets), focus on economic viability.	Quick diffusion with business incentives and robust in zones of commercial activity builds local entrepreneurial capacity.	May exclude poor farmers if fee-based; some ecological goals can be compromised for market efficiency.
3.	**Digital and Tech-Driven Models** (Examples: Digital Green, Access Agriculture, DeHaat, AgroStar, Gramophone)	ICT platforms, data analytics, video- and media-based learning, mass reach at low cost, youth-friendly interfaces.	Scalable, fast outreach, personalised advice, efficient for progressing regions and high-connectivity.	Digital divide (excludes non-smartphone/low literacy farmers), limited capacity for deep, trust-based adoption

4.	**Agroecological & Rights-Based Collectives** (Examples: Deccan Development Society, Paani Foundation)	Farmer sovereignty (seed/grain banks, media collectives), voluntary labour, in-kind cost recovery, social capital-centric	Ideal for marginalised groups, dryland/ tribal/low-resource contexts, fosters local innovation and resilience.	Harder to scale commercially, slow to transition into formal markets.
5.	**Government-Led & Hybrid Models** (Examples: State ATMA/SAMETI, *Rythu Vedika* (Telangana), Agristack (UP), Krushi Odisha)	Decentralised planning, public–private–NGO convergence, strategic district-level customisation, digital and mass campaigns.	Universal coverage, resource pooling, institutional legitimacy, and the ability to mainstream successful pilots.	Risk of bureaucracy, varying technical depth, and slower adaptation to local nuances unless participatory features are embraced.

Some of the principles for selecting appropriate extension models are discussed below.

Assess local context:

- **Social capital:** Where strong women's groups/SHGs/FPOs exist, leverage or strengthen participatory models.
- **Market orientation:** Where farmers are commercially active, they lean towards enterprise models and service centres.
- **Ecological sensitivities:** In zones needing agroecology (rainfed, tribal), begin with rights-based, community-led systems.
- **Connectivity & scale:** Where digital literacy and phone penetration are high, integrate tech-driven solutions.
- **Government partnership:** In regions with proactive departments, blend state channels with local participatory/tech options.

Adopt Phased Graduation Pathways

- **Initiation (Mobilisation):** Start with participatory mobilisation—build collectives, form SHGs/Sanghams, introduce basic farmer field schools and CRPs. Use peer learning and group demonstrations to anchor behaviour and trust.
- **Deepening (Capacity and Enterprise):** Over 1–3 years, introduce enterprise features—train local youth/women as service providers, set up FPO or service hubs. Gradually add input supply, market linkages, and fee-for-service options.
- **Scaling and Integration (Tech & Markets):** As trust and capacity grow, incorporate digital advisory platforms, precision data tools, and broader market networks. Use government partnerships and private investment to mainstream successful innovations (mass campaigns, e-extension, cluster-level convergence).
- **Sustaining the Change (Ownership & Adaptation):** Transition institutional ownership from project-led to community- or enterprise-led management. Anchor cost recovery through collective marketing fees, local entrepreneurship, or federated

memberships. Reinvest in participatory monitoring, feedback, and inclusion—ensuring adaptability to climate, market, and socio-cultural shifts.

Learn from Policy & Practice Synthesis

- **Combine strengths:** Hybridise models to balance social inclusion, technical efficiency, market orientation, and resilience.
- **Foster learning loops:** Build systems for continuous farmer engagement—feedback, innovation, and adaptation beyond initial project cycles.
- **Graduate carefully:** Avoid abrupt shifts; let community maturity, local market evolution, and digital access dictate when and how to move from one model to another.
- **Institutionalise transition:** Use government schemes (ATMA, NRLM, etc.) and local federations as scaffolding to help communities move towards self-reliant extension and learning systems.

6. CONCLUSION

Agricultural extension plays a crucial role in enabling the transformation of agrifood systems. Considering the huge diversity in farms and farmers, India needs a well-coordinated, pluralistic extension that values the contributions of the public, private, and community extension actors. The alternative extension models emerging in the country provide a wide range of services that Indian farmers need and offer several lessons on how to organise extension in the country. The key lessons from these initiatives are discussed below.

6.1 Key Lessons from Alternative Extension Models

Extension works better when farmers are treated as co-creators rather than recipients.

Across models—CSA, RySS/APCNF, PRADAN, DDS, NRLM cadres, Access Agriculture, and Digital Green—the consistent differentiator is co-creation and farmer agency.

- Farmers test, adapt, validate, and refine practices rather than passively receive recommendations.
- Extension functions as a social learning system, not a top-down delivery mechanism.
- Trust deepens, and adoption becomes durable and scalable because knowledge is locally owned.

Lesson: Relevance is not delivered; it is coproduced

Inclusion is not a moral goal alone—it is the main pathway to impact

Alternative models that intentionally engage women farmers (NRLM, DDS, Goat Trust), small and marginal farmers (most NGO/community models), and socially excluded communities (DDS, NRLM, PRADAN) achieve greater change because they reach those who manage much of farming and household food systems. These models build extension around women-led institutions (SHGs, sanghams), village-level cadres (Krishi Sakhis, Pashu Sakhis, CRPs), and collective governance.

Lesson: Equity-first design improves adoption, resilience, and legitimacy.

Digital tools scale only when rooted in human relationships.

Digital Green, Access Agriculture, and startup models demonstrate that digital tools enhance reach and speed of delivery and can also help generate locally relevant advice. But they succeed when these tools and models are embedded in a trusted community facilitation mechanism, provide offline options and mechanisms for feedback, and offer ways to follow up and provide coaching support.

Lesson: Digital extension is an amplifier; the foundation is human trust and local institutions.

The best extension models integrate ecology, livelihoods and markets.

The strongest alternatives do not treat agriculture as only "crop practices." They integrate soil and water processes, pest ecology, cropping system diversity, livestock and nutrition, market access and value chains. This is visible in CSA's Farmer Service Centres, RySS's natural farming ecosystem, PRADAN's cluster strategy, DDS's seed sovereignty and food systems, and enterprise models linking advisory to services and markets.

Lesson: Extension must shift from agronomy-only advice to whole-farm and food-system advisory.

Institutional anchoring matters more than project duration

Many conventional extension efforts collapse after the project ends because they lack local ownership, financial pathways, and governance. By contrast, alternative models embed extension within community structures such as SHGs, federations, sanghams, FPOs, service centres, rural entrepreneurs, and village cadres. This creates continuity beyond funding cycles.

Lesson: Sustainability comes from local institutions, not external staffing.

Pluralism is inevitable, but the governance determines whether pluralism becomes a strength or chaos.

The report's typology (community-led, enterprise-based, digital/startup-led, rights-based agroecological, government hybrid) shows that India is already operating in a pluralistic extension environment.

But pluralism becomes fragile when:

- messages conflict,
- private incentives bias advice,
- accountability is unclear.

Lesson: The future is not "one model," but a governed ecosystem of models.

Accountability mechanisms work best when they are local, social, and outcome-focused

Participatory models introduce accountability through:

- SHG and federation oversight,
- community scorecards,
- peer monitoring,
- institutional feedback loops.

Digital systems (e.g., Digital Green's tracking) add measurable adoption and follow-up data.

Lesson: Accountability should track outcomes (risk reduction, soil health, net income) rather than outputs (trainings, demos, targets).

Cost-efficiency improves when extension is decentralised and blended

The report's comparative cost discussion suggests:

- digital peer-learning models can reduce costs dramatically,
- community cadre systems are moderately costly but of high depth,
- enterprise models recover costs via service margins,
- collective rights-based systems use in-kind recovery and social capital.

Lesson: The cheapest extension is not necessarily the best—the best extension is cost-efficient and outcome-effective, optimised for context.

6.2 Ways Forward: Building a Next-Generation Extension Ecosystem for India

Alternative extension models demonstrate that the future of extension in India is neither purely public nor purely private, neither purely digital nor purely community-based. It is a governed ecosystem built on farmer agency, inclusion, ecological intelligence, and locally embedded accountability. The strongest models transform extension from a one-way technology pipeline into a learning infrastructure—where women farmers, smallholders, and socially excluded communities are not last-mile recipients but first-mile designers. Digital tools and enterprise mechanisms can dramatically scale and sustain extension, but only when anchored in trust-based local institutions and outcome-based accountability systems. The solution is not simply "more staff" or "more training".

The extension system failed in India, not because farmers are difficult to reach, but because institutions often tried to reach them without understanding them. It failed not only because it did not reach farmers, but because it did not respect farmers as knowledge producers. In the climate era, a one-way system is not just outdated—it is "dangerous." It failed to internalise that:

- farmers behave rationally under constraints, not under textbook assumptions;
- ecological processes are not side issues—they define long-term viability;
- technology has social and economic consequences, not just yield effects;
- pluralism without governance produces noise, not knowledge;
- and without accountability, systems drift toward activity rather than impact.

When extension became an administrative pipeline rather than a learning service, farmers were left to navigate climate risk, debt, markets, and ecological decline largely on their own. Crisis was not an accident; it was an institutional outcome.

The way forward lies in deliberately combining models, enabling graduation pathways, and redefining extension success as resilience, income stability, and ecological regeneration. This would require integrating social science research on farmer behaviour and analysing gender and social norms into extension design. In other words, disseminating good agronomic practices alone cannot solve the agrarian distress we are witnessing around.

What follows is a practical roadmap for designing the next-generation extension ecosystem for India, aligned with the challenges outlined earlier in this report.

Reframing the Mandate

Extension should broaden its mandate beyond technology transfer to embrace strengthening resilience & Livelihoods, and this means it should focus on:

1. Risk advisory and climate adaptation planning
2. Soil–water–pest ecology management
3. Reducing the cost of cultivation
4. Enterprise and market intelligence
5. Post-harvest and value chain intelligence
6. Inclusion and empowerment (women, smallholders, excluded groups)
7. Farmer innovation and knowledge integration

These have been the philosophical shift underpinning all successful alternative models.

Design extension as a hybrid architecture, not a single system

A national extension strategy should be multi-layered to compensate for weaknesses in every other layer. These layers include:

1. Community Cadre Layer (deep inclusion & trust)
    - SHG-based Krishi Sakhis, Pashu Sakhis and Community Resource Persons (CRPs) that support farmer field schools, participatory trials
2. Service Centre / Enterprise Layer (bundled services + sustainability)
    - Farmer Service Centres and FPO hubs that support diagnosis, access to quality inputs, credit facilitation and product aggregation
3. Digital Layer that enhances scale, supports personalised advisory, facilitates feedback and tracks adoption
    - Participatory video, helplines, AI-assisted advisory, online learning modules
4. Rights-Based Agroecology Layer that supports enhanced agrobiodiversity, seed sovereignty and climate justice
    - Seed/grain banks, community media and local food systems

Make inclusion a non-negotiable design standard

Every extension plan should be assessed against inclusion indicators, not merely reach, and it should assess the involvement of:

- women farmers as primary participants and service providers;
- small/marginal farmers and tenant cultivators as priority groups and
- (c)socially excluded hamlets included through targeted cadres and governance.

This would necessitate the promotion of women-led cadres and village institutions; the redesign of time, venue, and language used for extension interventions; the inclusion of plots and fields not tied to land titles; and the use of scorecards to assess these, especially at the block level and below.

As not everyone needs the same advice or service, farmer segmentation is critical. This requires systematic farmer profiling at the block level and the use of digital tools. Advisory packages should be designed based on:

- farm size and resource base,
- irrigation access,
- agroecological zone,
- market connectivity,
- gender and labour constraints,
- risk appetite and debt exposure.

Institutionalise "Farmer Knowledge Systems" as part of extension

To strengthen two-way knowledge transfer and support the adaptation of knowledge to local contexts, extension should recognise, integrate, and promote farmer knowledge systems. This would necessitate:

- creation of farmer innovation registries at the block/district level
- organising "farmer innovation fairs" and rapid technology trials every year, which could also be linked with KVK validation trials
- promoting participatory technology development and participatory plant breeding platforms, and
- providing support to community media initiatives for documenting farmers' knowledge systems

Every KVK and agricultural university should have Farmers' Advisory Panels, seasonal problem- and priority-workshop sessions, and farmer-led monitoring of trial relevance. This ensures that science works on what farmers actually need—not what is administratively convenient.

Evidence and practice increasingly support lead farmer networks, community resource persons, FPO-linked advisory teams and participatory technology development. Peer learning is often more trusted and context-sensitive. Public extension should enable and quality-assure it, not ignore it.

Though ATMAs and KVKs were intended to promote decentralisation and responsiveness, at the district level, they have often become procedural in nature. They should ideally serve as platforms for inter-departmental convergence and for coordinating pluralistic extension systems, and whatever administrative and procedural support these institutions need to play these roles should be provided. If adequately capacitated, they could serve as learning platforms that support the co-production of new knowledge.

Create measurable accountability through outcome-based governance.

Beyond tracking inputs and activities, extension need to track the outcomes of interventions, which would require an outcome dashboard at the district level. These outcome indicators should include:

- net income stability (variance reduction, not just average income)
- cost of cultivation trends
- changes in soil health (organic carbon, micronutrients and other biological indicators where possible)
- water footprint indicators in water-stressed blocks
- pesticide load and resistance signals
- inclusion outcomes (who benefited)

To enhance accountability, these outcome indicators must be tracked through community monitoring, federation oversight, and third-party audits to assess the quality of service. In other words, extension teams should be evaluated not based on the number of training sessions or demonstrations they organised, but on the number of innovations documented, farmer-led trials facilitated, inclusion outcomes (women, smallholders, excluded groups), and measurable resilience impacts. There should also be a mechanism to redress grievances arising from harmful advisory and public reporting to build trust and improve performance.

Build "graduation pathways" across extension models (phased transitions)

One of the challenges in extension is the frequent switching of models, which erodes community trust. Addressing this challenge requires developing a phased approach as follows:

Phase 1: Mobilise & build trust (Year 0–1), where the focus should be on participatory planning, formation of SHGs and collectives, identifying CRPs and through them enhancing capacities of farmers in basic agroecology and risk management.
Phase 2: Build local services and enterprises (Year 1–3), with a focus on strengthening FPOs and service centres, facilitating input-output marketing, and initiating fee-for-service pilots.
Phase 3: Scale with tech + markets (Year 2–5), where the focus should be on the use of digital platforms, precision advisory and facilitating procurement of quality products
Phase 4: Sustain through local ownership (Year 3+), where the focus should be on strengthening the capacities of federations to design and manage their own extension systems, design local financing of extension through membership and service margins and put in place learning loops and inclusion audits to assess performance and inclusion.

Strengthen the capacities of pluralistic extension actors

To address contemporary challenges, extension services should embrace a professionalisation agenda in which extension workers in the public, private, and NGO sectors, as well as new agripreneurs engaged in extension delivery, gain new capacities and have their skills and expertise certified. Capacities have to be enhanced in the following areas:

- facilitation and participatory methods
- social inclusion and gender analysis
- climate risk assessment and contingency planning
- ecological literacy (soil biology, pest ecology, water systems)
- enterprise and value chain analysis
- ethical advisory and conflict-of-interest norms and
- data literacy and digital tools use

Extension workers should increasingly act as facilitators of farmer learning, connectors to markets/services, and risk-advisory agents.

If India gets this right, extension becomes not a "message delivery system," but a **public resilience infrastructure**—as essential as roads, irrigation, and credit. And unlike many infrastructures, it has a special feature: it can make farmers smarter each season, rather than more dependent.

About CSA

The Centre for Sustainable Agriculture (CSA) is a Hyderabad-based civil society organisation that has been working since 2004 to support the transition to an agriculture that is ecologically sound, economically viable, and socially just. CSA works with smallholders, Farmer-Producer Organisations, state governments, and research institutions across Andhra Pradesh, Telangana, Odisha, Maharashtra, and Sikkim.

Its work spans farmer institution-building, agroecological practice, PGS and organic certification, policy advocacy, and rural enterprise incubation — anchored by three flagship initiatives:

- **Grameen Academy** — CSA's learning and incubation platform, offering structured training in agroecology, natural farming, seed conservation, FPO management, and rural enterprise design for farmers, rural youth, and extension practitioners.
- **Sahaja Aharam** — a farmer-producer company promoted by CSA, providing PGS-certified organic markets for smallholders and connecting ecological farming with urban and institutional consumers.
- **eKrishi** — CSA's digital platform, supporting farmer advisories, pest and disease surveillance, participatory traceability for organic produce, and FPO management.

CSA today directly supports around 50,000 farmers and reaches over 200,000 more through its extension and advisory networks, aiming to support half a million farmers in their agroecological transition by 2030.

About AESA

Agricultural Extension in South Asia (AESA) is a network of all those who are interested and involved in Extension and Advisory Services (EAS) in South Asia.

Our vision is to improve food and nutrition security through efficient and effective EAS in South Asia. Our mission is to promote sharing, learning, and networking for building effective and efficient EAS.

AESA is part of the Global Forum for Rural Advisory Services (GFRAS).

The Centre for Research on Innovation and Science Policy (CRISP) hosts the Secretariat of AESA. CRISP conducts policy-relevant research on agricultural extension and rural innovation.