

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 2; February 2026; Page No. 269-272

Received: 01-12-2025
Accepted: 05-01-2026

Indexed Journal
Peer Reviewed Journal

A review on: Structural challenges and equality issues in agricultural extension system

¹Sangeeta Yadav, ²Aishwarya Singh and ²Jaya Verma

¹Research scholar, Extension Education and Communication Management, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

²Teaching Associates, Extension Education and Communication Management, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i2d.3048>

Corresponding Author: Dr. Aishwarya Singh

Abstract

Across various agro-ecological zones, agricultural extension systems are essential for disseminating scientific knowledge, encouraging the use of new technologies, and bolstering decision-making. However, many developing nations, especially India, continue to confront severe structural limitations that restrict the efficacy, reach, and inclusivity of extension services despite decades of investment and change. The quality of advice delivery is weakened by persistent shortages of skilled extension personnel, disjointed institutional frameworks, insufficient funding, poor connections between research, extension, and farmers, and inadequate coordination among various service providers. According to recent data, there are only 0.12 million public extension workers in India, serving millions of farmers at an average ratio of 1:1,162 operational holdings, much less than what is advised internationally.

As a result, frontline employees are overworked and there is an increasing reliance on para-extension workers, input dealers, and private actors whose responsibility and training quality differ greatly.

Extension outcomes are further limited by equity inequalities. Despite increased governmental attention, women farmers still have substantially less access to extension information, and digitalisation runs the danger of exacerbating gaps because of gendered differences in smartphone ownership, digital literacy, and mobility. Due to institutional biases in program design, land-linked eligibility requirements, and social hierarchies, marginalised groups, such as tenants, landless labourers, tribal communities, and lower-income households, are frequently left out of mainstream extension. While digital advancements like AI-enabled advisories and mobile apps provide scalability and timeliness, they also create issues with algorithmic bias, limited contextual relevance, and accessibility.

Therefore, implementing technology alone is not enough to reform extension systems. Investments in human resources, interoperable data systems, unified governance frameworks, mixed digital-human delivery models, and outreach tactics that are socially and gender inclusive are all necessary for sustainable gains. It is also crucial to strengthen para-extension cadres through quality assurance, performance-linked finance, and certification. In general, improving productivity as well as fostering climatic resilience, environmental sustainability, and equitable rural development depend on addressing structural and equity barriers.

Keywords: Agricultural extension, institutional, quality assurance, issues

Introduction

In order to facilitate knowledge transfer, technological adoption, and informed decision-making across a range of agro ecologies, agricultural extension systems are essential in connecting scientific advancements with farming communities (Anderson & Feder, 2022) ^[1]. Extension systems in many developing nations, especially India, still have structural constraints that limit their efficacy and inclusivity despite decades of investment (Sulaiman & Davis, 2023) ^[14]. Workforce shortages, disjointed institutional frameworks, insufficient funding, poor research-extension connections, and uneven service quality across regions are some of these structural problems (Rana *et al.*, 2024) ^[12]. These constraints make it more difficult for extension actors to offer timely, contextualised, and farmer-focused advising services, particularly in regions that are dealing with market instability, rapid climatic variability,

and new pest and disease concerns (Birner *et al.*, 2022) ^[2].

The acute lack of qualified extension agents in comparison to the number of farmers is one of the most talked-about structural deficiencies. According to Raghuvanshi and Tripathi (2023) ^[11], the ratio of extension workers to farmers is still well below national and international norms, which results in heavy workloads and few possibilities for field interaction. Due to operational obstacles caused by these shortages, learning outcomes and the adoption of better practices are weakened as farmer interactions become less frequent and of worse quality (Anderson & Feder, 2022) ^[1]. As a result, many public systems are depending more and more on agripreneurs, private extension agents, and Para-extension workers; nevertheless, these arrangements frequently lack uniform training standards and quality assurance procedures (Hernandez & Kumar, 2023) ^[7].

Due to the lack of coordination between many actors,

including state departments, Krishi Vigyan Kendras (KVKs), agricultural institutions, non-profits, and private businesses, institutional fragmentation exacerbates these problems. Although this diversity of actors may be advantageous for innovation, it frequently leads to redundancy, inefficient use of resources, and inconsistent advice that farmers get (Sulaiman & Hall, 2022) ^[15]. The flow of locally applicable technological solutions and feedback loops, which are crucial for improving research priorities and extension strategies, are further hampered by weak research-extension-farmer links (Reddy *et al.*, 2023) ^[13].

Pervasive equity issues influence who gains from extension and who is left out in addition to structural obstacles. Despite making significant contributions to agricultural work and decision-making, women farmers have significantly less access to extension advice than males, indicating the persistence of gender inequities. Marginalised populations' access to mainstream extension initiatives is further restricted by social injustices related to caste, landlessness, tribal identity, and tenancy arrangements (Gaurav & Mishra, 2022) ^[15]. Although encouraging, the digitalisation of extension runs the potential of widening already existing gaps due to unequal access to cell phones,

mobile data, and digital literacy—especially among rural women and lower-income households (GSMA, 2024) ^[6]. These disparities underscore the necessity of purposefully inclusive extension systems as opposed to technologically deterministic or gender-neutral ones (Doss & Quisumbing, 2022) ^[3].

Extension system reform is more important than ever due to the modern agricultural landscape, which is moulded by market integration, workforce shortages, climate change, and sustainability requirements. In addition to increasing productivity, addressing structural and equitable issues is crucial for boosting resilience, environmental sustainability, and rural livelihoods (Birner *et al.*, 2022) ^[2]. Policymakers, researchers, and practitioners can build extension systems that are more accountable, coordinated, and equitable by following a thorough analysis of these issues (Sulaiman & Davis, 2023) ^[14]. As a result, this introduction lays the groundwork for a more thorough examination in later sections by highlighting the necessity of looking at both structural flaws and equity disparities in agricultural extension.

The Problem of Limited Extension Manpower

Recent Data: Extension Manpower & Coverage in India

S. No.	Description	Value / Estimate
1	Number of extension professionals in India (public extension)	0.12 million
2	Recommended extension-worker to farmer/holding ratio (irrigated)	1: 1,100 farmers/holdings
	Currently reported average ratio (operational holdings per extension officer) nationwide	1: 1,162 holdings/extension officer
4	Total sanctioned public-extension positions (all-India) (earlier estimate)	143,863 posts, of which only 91,288 filled (gap ~ 52,575)
5	Proportion of holdings served (all holdings) — <i>i.e.</i> , actual reach vs potential	Only ~ 6.8% of farmers reportedly reached under current public extension coverage (as per older FAO estimate)

The shortage shows itself as overworked frontline employees who have to cover numerous communities and technical areas, which cuts into their time for on-farm demonstrations and genuine farmer involvement. Systems are depending more and more on digital channels and para-extension actors (input dealers, NGO facilitators, and lead farmers) to close the gap; these replacements can aid in scaling but raise concerns about quality and quality assurance.

Institutional fragmentation and governance gaps

A variety of players, including state and federal departments, agricultural colleges, KVKs, private extension providers, NGOs, and corporate agritech actors, are involved in extension delivery in many different contexts. Although pluralism might spur creativity, it frequently results in disarray, redundancy, and poor coordination. In order to match research priorities, extension curriculum, and on-field delivery, recent strategy papers demand formal institutionalisation and more transparent coordinating mechanisms (NAARM, 2024). Performance measurement is further complicated by fragmentation: training counts and event totals increase, but there is still a dearth of solid data on long-term results (yields, incomes, environmental indicators).

Uncertain financing sources for on-going operating expenses, a lack of standardised job descriptions and

performance reviews for extension employees, and a lack of agency-wide ICT integration are examples of governance weaknesses. Lack of interoperable data platforms hinders shared early-warning systems and real-time surveillance where digital advisories are implemented, making responses to insect outbreaks or climatic shocks less effective.

Financing and incentive structures

Predictable funding is necessary for sustainable extension. Funds are frequently short-term and project-tied, which promotes pilotism over systemic strengthening. Experienced agents are pushed from front-line extension to administrative positions or private sector jobs because of staff workloads and poor incentives. Because many monitoring systems prioritise counts (farmer interactions, trainings) above learning results or behavioural change, incentive misalignment can also promote quantity over quality.

The public financing that is available is frequently distributed through a variety of programs (ATMA, KVKs, state programs), necessitating better budgeting, clear allocation guidelines, and performance-linked funding that rewards observable effects.

Equity issues: who is (and isn't) reached?

Gender, tenancy and landlessness, social groups (caste/tribe), and digital access are the main areas of equity

concern in extension. There are glaring differences, according to recent data:

Gender: Women farmers are under-represented, according to several research and surveys. For instance, only a small percentage of women have regular access to extension services, according to IFPRI and other assessments; one estimate revealed that about 23% of female farmers used extension, compared to substantially greater proportions of men in various surveys. Improved extension targeting could help overcome the production difference between female-managed farms and comparable male-managed farms, as acknowledged by national initiatives (ICAR gender strategy, 2025) ^[20].

Digital gender gap and mobile access: Despite the tremendous growth in rural internet penetration (IAMAI ICUBE 2024) ^[21] reported 488 million rural active internet users), access to smartphones and mobile devices is still uneven. Gender disparities in device ownership and internet usage persist, according to GSMA and national telecom studies (GSMA Mobile Gender Gap Report, 2024; national polls 2024-2025) ^[6, 10]. Women, the elderly, tenants, and low-income households run the risk of being excluded when extension is digitised carelessly.

Tenants and smallholders: Due to their ease of gathering for demonstrations, landowners and larger farmers have historically been the focus of extension. Although they typically make decisions about plot-level management, tenant farmers, sharecroppers, and casual labourers frequently do not have access to tenure-based programs, necessitating customised outreach.

Intersectionality is important: mainstream extension is unlikely to help rural women from marginalised castes who have restricted mobile access. To close these gaps, specific, gender-sensitive strategies are required, such as community digital hubs, voice-based advisories, women-only training groups, and female extension workers.

Digitalization: promise and risk for equity

Scale and timeliness are provided by digital technology (mobile apps, IVR, video, social media groups). There is a sizable rural internet base that could be used for expansion, according to the IAMAI ICUBE (2024) ^[21]. However, there are dangers associated with digital interventions: low digital literacy, limited smartphone ownership among women, UX complexity, and language mismatches all hinder uptake. Research indicates that mixed models, which combine local facilitation with digital information, are most effective. Additionally, algorithmic decision-support needs to be evaluated for generalizability and bias; AI models trained on small datasets may misidentify pest issues in novel agro-ecologies, costing vulnerable farmers.

Para-extension actors and quality assurance

Many systems depend on Para-extension actors, such as input dealers, private consultants, agri-entrepreneurs, and skilled lead farmers, to supplement the limited number of governmental employees. Although their technical proficiency and motivations vary, these actors are frequently

dependable and approachable. According to research, a code of practice, brief certified training, and credentialing are necessary to guarantee that para-extension guidance is in line with public-good goals (sustainability, resilience, and safe pesticide usage). Pilot studies have demonstrated the potential of turning input dealers into skilled para-extension workers, but scaling calls for organised supervision and rewards.

Evidence gaps and research priorities

There are few thorough long-term effect studies that connect structural reforms to outcomes like yield, income, pesticide use, gendered productivity, and resilience, despite the regular reporting of activity metrics (number of trainings, hamlet meetings, etc.). There are few large-scale randomised assessments that evaluate hybrid digital-human models. System diagnostics are hampered by the absence of interoperable administrative data. Priority research areas include: (a) long-term RCTs of blended extension models, (b) scalable methods to credential and quality-assure para-extension actors, (c) analyses of gendered digital access interventions, and (d) cost-effectiveness studies comparing traditional vs digital-assisted extension.

Recommendations

Expand and reorganise human resources: In order to achieve the suggested worker-to-farmer ratios, national and state plans should make investments in hiring and keeping more frontline extension personnel; interim steps must increase the number of accredited para-Extension cadres.

Data interoperability and institutional cooperation: Establish interoperable data platforms and institutional structures (district-level extension coordination cells) that connect KVKs, ATMA, state agencies, and early-warning monitoring systems for pests and climatic shocks.

Make sure to specifically target inclusion: Create extension KPIs that track inclusion (women reached, renter households reached) and provide funding for outreach that is sensitive to gender (female extension staff, demo plots just for women, voice/IVR content).

large-scale blended delivery: Encourage hybrid solutions that integrate human assistance with digital advisory; digital should enhance local agents rather than replace them.

Para-extension quality assurance: Provide brief, recognised training, a credentialing mechanism, and monitoring for input merchants, lead farmers, and private consultants.

Rigorous observation and investigation: To support ongoing learning, fund randomised and quasi-experimental assessments of scaled models and make public datasets available.

Conclusion

Extension systems' capacity to provide inclusive, high-quality advising services is hampered by structural issues like a lack of human resources, disjointed institutions, inadequate funding, and poor coordination. However,

technological solutions by themselves won't equalise gains due to equity challenges including gendered access, tenant exclusion, and digital gaps. To adapt extension systems to modern agricultural concerns, policy changes that include human-resource investments, institutional integration, inclusive design, and accountability for equality are crucial.

References

1. Anderson JR, Feder G. Agricultural extension: Good intentions and hard realities. Washington (DC): World Bank Publications; 2022.
2. Birner R, Davis K, Ponniah A. Innovations in extension and advisory services: Implications for institutional reform. *Journal of Rural Studies*. 2022;93:15-27.
3. Doss C, Quisumbing A. Closing the gender gap in agriculture: A global priority. *Food Policy*. 2022;109:102203-102203.
4. Food and Agriculture Organization of the United Nations. The future of agricultural knowledge and innovation systems. Rome: FAO; 2024.
5. Gaurav S, Mishra S. Social inequality and access to agricultural services in rural India. *Economic and Political Weekly*. 2022;57(12):45-54.
6. GSMA. Mobile gender gap report 2024. London: GSMA; 2024.
7. Hernandez R, Kumar A. The rise of private extension in developing countries: Opportunities and regulatory challenges. *Agricultural Systems*. 2023;210:103672-103672.
8. International Crops Research Institute for the Semi-Arid Tropics. Strengthening agri-extension for a strong farm sector. Hyderabad: ICRISAT; 2025.
9. International Food Policy Research Institute. Gender and agricultural extension: Evidence from South Asia. Washington (DC): IFPRI; 2023.
10. National Academy of Agricultural Research Management. Farmer-centric extension strategy for India. Hyderabad: NAARM; 2024.
11. Raghuvanshi P, Tripathi R. Human resource constraints in public extension: A district-level assessment. *Journal of Community Mobilization and Sustainable Development*. 2023;18(2):285-295.
12. Rana R, Singh K, Verma A. Structural limitations in India's agricultural extension system: A review. *Indian Journal of Extension Education*. 2024;60(1):1-12.
13. Reddy VR, Shiferaw B, Kassie M. Strengthening research-extension linkages for climate-smart agriculture. *Climate and Development*. 2023;15(4):400-410.
14. Sulaiman R, Davis K. Extension reform for inclusive and sustainable agriculture. *Agricultural Extension Review*. 2023;35(1):10-22.
15. Sulaiman R, Hall A. Pluralistic extension systems: Coordination challenges and institutional innovations. *Agricultural Research and Innovation*. 2022;13(2):77-89.
16. International Crops Research Institute for the Semi-Arid Tropics. Strengthening agri-extension for a strong farm sector. ICRISAT pressroom; 2025.
17. Agriculture extension services in India: Meta-analysis. *Research Journal of Agricultural Sciences*. 2025;10(3):1-10.
18. National Institute of Agricultural Extension Management. Indian scenario of extension and advisory services. MANAGE Discussion Paper. 2024.
19. Sulaiman VR, Hall A. On institutional pluralism and its effectiveness in extension—Variation across Indian states. *Indian Farming*. 2022;69(01):55-58.
20. Indian Council of Agricultural Research. ICAR agricultural extension division information and KVKs. New Delhi: ICAR; 2025.
21. Internet and Mobile Association of India, Kantar. ICUBE—Internet in India 2024 report. Mumbai: IAMAI; 2024.
22. Government of India, Press Information Bureau. ATMA training statistics and extension reach (2021-2025). New Delhi: PIB; 2025.
23. Bhattacharyya S. Transforming agricultural input dealers into para-extension workers in rural India: Constraints and strategies. ResearchGate. 2025.
24. International Food Policy Research Institute. Promoting gender-sensitive agricultural extension. AgriArticles summary. 2023.