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REVIEW ARTICLE

Agricultural Extension: Emergence, Present Context, and Future Scenario

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ABSTRACT

WHEN FARMERS HAVE QUESTIONS, WHO WILL HAVE THE ANSWERS? A farmer may have access to a smartphone, weather forecast, market information, and hundreds of agricultural videos, yet still be unsure what to do in the field tomorrow morning. This paradox captures the changing meaning of agricultural extension. Extension began as an organized effort to take knowledge beyond institutions and gradually became a major instrument for agricultural development and technology transfer. In India, its journey has passed through community development, the Green Revolution, Krishi Vigyan Kendras, ATMA, and a growing pluralistic ecosystem of public, private, and farmer-led advisory services. Today, climate variability, market uncertainty, natural resource constraints, and information overload are redefining the extension challenge. The next generation of extension must move beyond simply delivering information. It must provide trusted, timely, localized, and actionable intelligence. Artificial intelligence, digital platforms, remote sensing, big data, and mobile communication can dramatically expand the reach of extension, but technology cannot replace trust, field experience, and farmer participation. The future belongs to a hybrid extension system, in which human expertise and digital intelligence work together.

Key words: Agricultural extension, artificial intelligence, climate resilience, digital extension, farmer advisory, farmer participation, technology transfer

INTRODUCTION: THE QUESTION HAS CHANGED

Imagine a farmer looking at a crop early in the morning. The leaves appear different from yesterday. Rain is expected, but how much? Should irrigation be given? Is the symptom a nutrient deficiency or an emerging pest? The farmer takes out a mobile phone and searches for an answer. Within seconds, dozens of suggestions appear.

This is the new reality of agricultural extension. The farmer is no longer waiting for information to arrive. Information is already everywhere. The real challenge is deciding which information is correct, which is relevant to the local situation and which action makes economic and ecological sense. Agricultural extension, therefore, is entering a new era. Its fundamental purpose remains the same – helping farmers make better decisions – but the way that purpose is achieved is changing rapidly.

AN IDEA OLDER THAN THE SMARTPHONE

Agricultural extension may sound like a modern institutional concept, but the underlying idea is ancient. Farmers have always exchanged knowledge about seeds, seasons, soils, water, and pests. Organized agricultural advice has a long history, while modern extension developed largely during the nineteenth and twentieth centuries. The term "extension" became associated with taking

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educational opportunities beyond universities and institutions and into communities. As agriculture modernized, extension acquired a more formal role. Research institutions generated new knowledge, extension organizations communicated it and farmers were encouraged to adopt improved practices. This technology-transfer model became particularly important in developing countries where increasing food production was a national priority. Over time, extension evolved toward approaches that respond more directly to farmers' needs and changing conditions.

INDIA: FROM DEVELOPMENT MESSAGE TO KNOWLEDGE NETWORK

In India, agricultural extension became closely connected with nation-building after Independence. Community development and extension programs attempted to improve agriculture alongside rural infrastructure, education, and livelihoods. During the Green Revolution, extension played a crucial role in communicating improved varieties, fertilizer practices, irrigation management, and crop protection measures. The emphasis was understandably on increasing production. However, agriculture soon demonstrated that a single message could not work everywhere. Farmers differed in resources, soils, water availability, markets, risk-taking ability, and local knowledge. Extension consequently began moving toward demonstrations, farmer training, group approaches, adaptive research, and stronger links between research and farmers.

The establishment of Krishi Vigyan Kendras (KVK), beginning with the first KVK at Puducherry in 1974, represented an important step. KVKs were designed as Farm Science Centres where technologies could be assessed under local conditions, demonstrated, and taken to farmers through training and other extension activities. Over the decades, the KVK network has become a major pillar of India's frontline extension system.

THE PRESENT EXTENSION LANDSCAPE: TOO LITTLE INFORMATION OR TOO MUCH?

The extension problem of the 21st century is very different from that of the Green Revolution era. The issue is increasingly not lack of information but the quality, relevance, and timing of information. A farmer today may receive advice from a KVK scientist, agricultural officer, input dealer, fellow farmer, farmer-producer organization, private company, YouTube creator, WhatsApp group, or mobile application. This pluralistic system has enormous potential. It allows knowledge to travel quickly and gives farmers more choices. However, it also creates a new risk: misinformation can travel as quickly as good science. This changes the role of the extension professional. The extension worker of the future cannot remain only a transmitter of recommendations. The role is expanding toward that of a knowledge broker, facilitator, problem solver, communicator, and validator of information.

FROM EXTENSION WORKER TO KNOWLEDGE BROKER

A successful extension professional will increasingly need to answer four questions: What is happening? Why is it happening? What can the farmer do? And which option is most suitable under the farmer's own conditions? This requires combining scientific evidence with local knowledge. A satellite image may indicate vegetation stress, a weather model may indicate rainfall risk and a soil test may identify a nutrient problem. But the farmer may know that a particular patch has poor drainage or that a local pest appears after a specific weather pattern. The strongest advisory emerges when these different forms of knowledge meet. This is why farmer participation is not an outdated concept in the digital age. It is becoming even more important. Farmers should not be treated merely as receivers of technology but as observers, experimenters, and co-creators of knowledge.

THE DIGITAL REVOLUTION HAS ARRIVED

Digital technology is changing extension from periodic communication to continuous communication. Mobile applications, videos, interactive voice systems, social media, remote sensing, drones, and online advisory platforms can

connect farmers with knowledge without requiring a physical visit every time. India's extension landscape is moving in this direction through ICT-based information dissemination, digital advisory platforms, data applications, and partnerships among public and private stakeholders. These developments signal a shift from static information delivery toward more integrated, data-driven advisory services. Artificial intelligence can help search large information resources, interpret data, identify patterns, translate languages, and generate personalized recommendations. When combined with weather, soil, crop, and market information, it may help extension systems deliver more contextualized advice. But these systems must be reliable, transparent, and available in languages farmers understand.

BUT CAN ARTIFICIAL INTELLIGENCE REPLACE THE EXTENSION WORKER?

The short answer is no. And perhaps it should not. Artificial intelligence can help an extension system respond to thousands of farmers simultaneously. But an algorithm may not understand why a farmer does not trust a recommendation, why a particular practice is unacceptable locally or why an apparently ideal technology is unaffordable for a household.

Extension is not only about information. It is also about behavior, confidence, relationships, negotiation, and learning. A farmer may adopt a new technology after seeing it work on a neighboring farm long before being convinced by a technical leaflet. Human interaction therefore remains central. The future is not "AI versus extension worker;" it is "AI plus extension worker."

WHAT WILL EXTENSION LOOK LIKE IN THE NEAR FUTURE?

The extension system of the future is likely to become more personalized, predictive, and participatory. Personalized extension will use information about location, crop, soil, weather, farm resources, and production objectives to generate recommendations that are more relevant than generic advisories. Predictive extension will use forecasts, pest surveillance, and other data to warn farmers before a problem becomes severe. Participatory extension will allow farmers to contribute observations and local knowledge directly into advisory systems.

Climate change will make this transformation especially important. Farmers will need advice not only on increasing yields but also on managing uncertainty – choosing resilient varieties, conserving water, adjusting planting dates, diversifying enterprises, protecting soil, and responding to extreme weather. Extension will increasingly become a form of farm-level risk management. The future system must also connect production with markets and livelihoods. A technically excellent crop recommendation may have little value if the farmer cannot obtain quality inputs, access finance, find a market, or manage post-harvest losses. Extension will therefore become more integrated with entrepreneurship, value chains, natural resource management, and local institutions.

THE HUMAN TOUCH WILL BECOME MORE VALUABLE

Paradoxically, as agricultural extension becomes more digital, the value of human interaction may increase rather than decline. When information is abundant, trusted interpretation becomes scarce. Farmers will need professionals who can distinguish evidence from misinformation, translate complex science into practical decisions and help communities evaluate technologies rather than simply promote them. The extension worker will need a new combination of skills: digital literacy, data interpretation, communication, facilitation, behavioral understanding, climate knowledge, and the ability to work across disciplines.

Training institutions will therefore have to prepare extension professionals for a different world. Tomorrow's extension worker may conduct a field demonstration in the morning, analyze satellite-derived information in the afternoon, and participate in an online farmer advisory session in the evening.

FROM TECHNOLOGY TRANSFER TO TRUST TRANSFER

Perhaps, the most important shift in agricultural

extension is a shift from technology transfer to trust transfer. Farmers are more likely to use knowledge when they trust its source, understand its relevance and see evidence that it works. Demonstrations, farmer-to-farmer learning, local institutions, and repeated interaction will therefore remain important even in a highly digital agricultural system. The extension organization of the future should not try to compete with the internet. It should help farmers navigate it. It should identify reliable knowledge, localize it, validate it, and connect it with practical action.

CONCLUSION

Agricultural extension has travelled from traditional knowledge sharing to organized educational services, from technology transfer to participatory approaches, and now toward digital and intelligent advisory systems. Its history shows that extension survives not because its tools remain unchanged but because it continuously adapts to the changing needs of farmers. The future will bring artificial intelligence, big data, drones, remote sensing, multilingual digital platforms, and increasingly sophisticated decision-support systems. These technologies can make extension faster, wider, and more precise. But they will succeed only when they remain connected to the realities of farms and the people who cultivate them. The extension worker of the future will therefore not disappear. The role will evolve from messenger to mentor, from technology demonstrator to knowledge broker and from information provider to trusted partner in decision-making. In an uncertain agricultural world, the ultimate purpose of extension will remain remarkably simple: helping farmers know what to do, when to do it and why it matters.

REFERENCES

1. Food and Agriculture Organization of the United Nations. The history, development, and future of agricultural extension. In: Swanson BE, Bentz RP, Sofranko AJ, editors. Improving Agricultural Extension: A Reference Manual. FAO; 1997. Available from: https://www.fao.org/4/w5830e/w5830e03.htm [Last accessed on 2026 Sep 29].
2. Food and Agriculture Organization of the United Nations. Improving Agricultural Extension: A Reference Manual; 1997. Available from: https://www.fao.org/4/w5830e/w5830e00.htm [Last accessed on 2026 Sep 29].
3. Indian Council of Agricultural Research. Krishi Vigyan Kendras (KVKs); (n.d.). Available from: https://www.icar.gov.in/en/krishi-vigyan-kendras-kvks [Last accessed on 2026 Sep 23].
4. Indian Council of Agricultural Research. Curtain Raiser: Golden Jubilee Celebration of KVKs; 2024. Available from: https://icar.gov.in/en/curtain-raiser-golden-jubilee-celebration-kvks [Last accessed on 2026 Sep 29].
5. Qamar MK. Modernizing National Agricultural Extension Systems: A Practical Guide for Policy-Makers of Developing Countries. Food and Agriculture Organization of the United Nations; 2005. Available from: https://www.fao.org/4/a0219e/a0219e00.htm [Last accessed on 2026 Sep 30].
6. Rajalahti R, Swanson BE. Strengthening Agricultural Extension and Advisory Systems: Procedures for Assessing, Transforming, and Evaluating Extension Systems (Agriculture and Rural Development Discussion Paper No. 45). United States: World Bank; 2010.
7. Indian Council of Agricultural Research. Indian Agriculture after Independence; 2022. Available from: https://icar.gov.in/sites/default/files/2022-12/indian-agriculture-after-independence.pdf [Last accessed on 2026 Oct 03].
8. Indian Council of Agricultural Research. ICAR Achievements 2021-22. Available from: https://icar.gov.in/sites/default/files/2022-12/icar-achievements-2021-22_02-11-22d.pdf [Last accessed on 2026 Oct 03].