

# BRIDGING THE GAP

## Revolutionizing **Extension** for **Agri-Tech** Adoption

ecociate

Despite being the backbone of India's economy, employing over half the workforce and contributing significantly to GDP, the agricultural sector faces significant challenges. A large portion consists of small and marginal farmers cultivating less than two hectares. These farmers struggle with limited access to credit, water resources, and essential inputs. Traditional practices, while ingrained, may not be optimized for the changing climate or market demands. The Indian farmer's life is a constant battle against information gaps, uncertainty, and unforeseen risks. They lack crucial knowledge on crops, weather patterns, and best practices. Traditional methods may lead to inefficient water use and fertilizer application. Market access remains uncertain, with a disconnect between farmers and buyers. Additionally, unforeseen pests and unpredictable weather add another layer of stress. This marginalization hinders productivity, limits income potential, and perpetuates a cycle of poverty in rural communities

### THE CHALLENGE: A Complex Demographic Landscape

India's agricultural sector, though vast and diverse, faces significant demographic challenges. Firstly, a low literacy rate hinders progress. Studies show an average literacy rate below 50% for all farmers, with even lower rates for women (around 30%). This limits their ability to understand complex technical information and navigate the digital world essential for adopting modern AgTech solutions.

Secondly, the sector grapples with a decline in youth participation. Estimates suggest youth involvement is below 30%, likely due to a lack of perceived career opportunities compared to urban jobs. Finally, fragmented landholdings present another hurdle. Many farmers, particularly in some regions, are smallholders with limited land parcels. This fragmented structure, with an average landholding size of less than 2 hectares, can hinder productivity and investment in modern technologies like AgTech solutions. These demographic challenges create a complex landscape that requires innovative solutions for successful AgTech integration in Indian agriculture.

Technology-based solutions offer a ray of hope, with the potential to revolutionize agricultural practices, improve yields, and empower these marginalized farmers. From soil management tools that utilize satellite imagery and data analytics to optimize fertilizer and water use, to precision agriculture techniques that provide targeted interventions based on real-time field conditions, a plethora of innovative technologies are emerging. Additionally, post-harvest solutions that minimize spoilage and waste through improved storage facilities and transportation networks can significantly enhance the income earned by farmers. However, bridging the gap between what tech companies can offer and how these solutions are perceived and utilized by rural communities remains a critical challenge.

Ecociate, a knowledge agency with a deep understanding of the agricultural sector, has been working with more than 30 technology companies to support them map and refine their business models. This collaboration has yielded valuable insights, highlighting a significant mismatch between the technology being offered and the needs and realities of the farming community. Tech companies, often operating with an urban-centric approach, may develop solutions that are too complex, lack local language support, or fail to address the specific challenges faced by small and marginal farmers. This highlights the need for a more human-centered approach to technology development and its extension amongst Indian small and marginal farmers.

## India's AgTech Revolution

The Indian agritech sector is brimming with innovation, boasting over 3,000 startups according to industry estimates. This vibrant ecosystem is fuelled by more than 1,300 startups that leverage cutting-edge technologies like artificial intelligence and machine learning to address challenges across the agricultural value chain. As of April 2023, the Department for Promotion of Industry and Internal Trade (DPIIT) specifically recognized around 2207 startups in the Agri-Tech industry, highlighting the government's focus on fostering this dynamic sector.

The agritech sector has seen a surge in investment in recent years. Between January 2020 and June 2022, nearly \$1.33 billion was raised across 139 deals. There was a 300% jump in funding from 2020 to 2021.

## From Soil to Supermarket - Navigating the AgTech Revolution

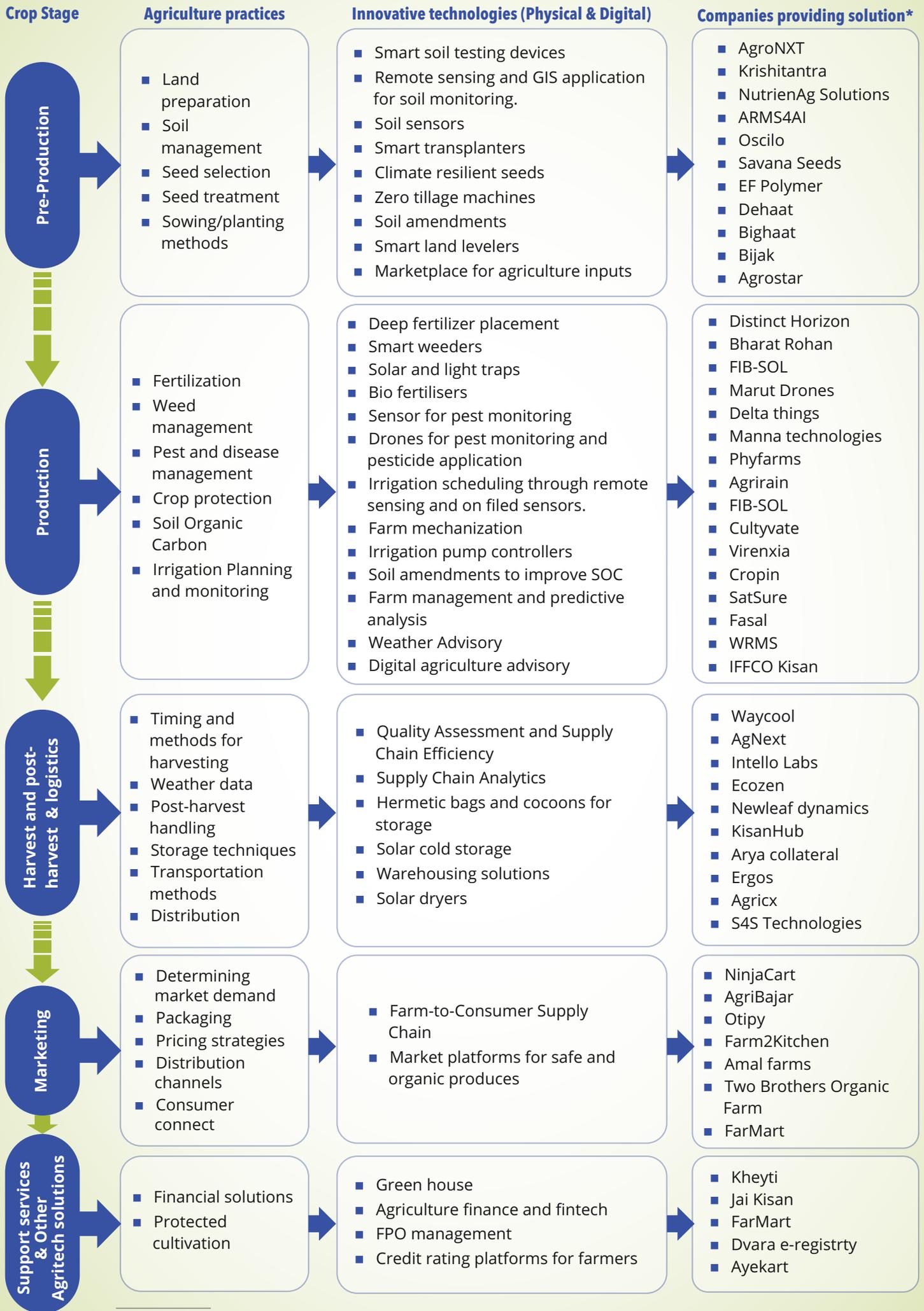
AgTech solutions are rapidly taking root, offering a helping hand to farmers at every stage of their journey. AgTech is weaving a powerful web of support. This technological transformation empowers farmers to optimize every step, from planting to profit, fostering a more efficient, sustainable, and prosperous agricultural ecosystem. The table '*Agriculture value chain technology map*' below captures this with greater details.

In India's fertile ground of innovation, AgTech is transforming the agricultural landscape from seed to sale. Precision agriculture takes root with data-driven technologies guiding every step. Soil sensors meticulously analyze conditions, informing the selection of the most productive seeds. Satellite imagery and advanced drones equipped with high-resolution cameras and spectral imaging capabilities scan vast fields, meticulously monitoring crop health. This digital eye in the sky empowers farmers to detect pests and diseases at the earliest

stages, enabling them to take targeted interventions and minimize crop losses.

But the impact of AgTech extends far beyond the farm. Once the harvest arrives, farmers can leverage online platforms to connect with a wider range of buyers and distributors, facilitating a more efficient marketing process and potentially fairer prices. Real-time market analysis empowers them to make informed decisions about when and where to sell their produce, maximizing their return on investment. Imagine a farmer in a remote village using a mobile app to connect directly with consumers in urban centers, eliminating middlemen and getting a better price for their high-quality goods. AgTech empowers farmers to become not just cultivators of crops, but strategic business managers, ultimately building a more secure and prosperous future for themselves, their families, and the agricultural sector as a whole.

# Agriculture Value Chain Technology Map



\*Some companies are offering services in multiple stages of the value chain.

By integrating agri-tech solutions across each stage of the agricultural value chain, farmers can improve efficiency, resource management, and overall productivity. This not only benefits farmers' livelihoods but also contributes to a more sustainable and secure food system.

## From Traditional extension to Tech-Driven delivery: the **TRANSFORMATION** of Indian Agricultural Extension

While mobile phone adoption has revolutionized rural communication, replicating this success with AgTech isn't straightforward. Unlike a one-size-fits-all mobile phone, AgTech solutions need to be tailored to address the complex and diverse needs of different farmer segments. Scaling these solutions requires a nuanced understanding of factors like farm size, crop types, the agroecology zone farmers reside, access to resources, and technological literacy.

Traditional extension services, delivered by a network of local representatives who share a common language and cultural background with the farmers they serve, is the norm. These representatives include Krishi Vigyan Kendras (KVKs) - science centers focused on agricultural research and extension; staff from the Department of Agriculture, who provide technical advice and support; local lead farmers - respected individuals within the community who can share their knowledge and experiences; Community Resource Persons (CRPs) - who act as a bridge between farmers and government programs or schemes; and most importantly, retailers who play a crucial role in disseminating information, providing access to inputs, and sometimes even offering basic agronomic advice to farmers.

Tech companies, on the other hand, often lack this local touch. They tend to develop and market their solutions with an urban perspective, assuming a

level of digital literacy and access to technology that may not be present in rural communities. Their communication materials might be in English, a language unfamiliar to many farmers. Additionally, the user interfaces of their tech solutions may be complex and difficult for farmers with limited technological experience to navigate. This lack of cultural sensitivity and understanding of the ground realities faced by small and marginal farmers creates a significant barrier to trust and hinders the adoption of potentially life-changing technologies.

## The Need for a Responsive Extension System by Adopting a **HOLISTIC APPROACH**

To unlock the transformative potential of technology in Indian agriculture, a more responsive extension system is essential. The current system, while well-intentioned, often falls short in effectively delivering tech-based services to marginalized farmers. Hence, a regular and periodic conversation amongst the tech providers (AgTech companies), the disseminators (existing extension agencies and personnel) & the tech users (farmers) is warranted to move forward on the transformation agenda. This conversation, to create greater awareness and appreciation around what these three actors bring to table to develop mutual synergies, through workshops, writeshops, targeted trainings and joint field trips to farmers,' is desired. The actors therefore feed each other and fine tune, upskill themselves so that the tech companies get sensitized on the extension challenges and work towards them, the extension delivery agencies and personnel become an effective conduit, while the farmers are not just users but co-creators of a product / service / advisory that really addresses their challenges. Few action areas are:

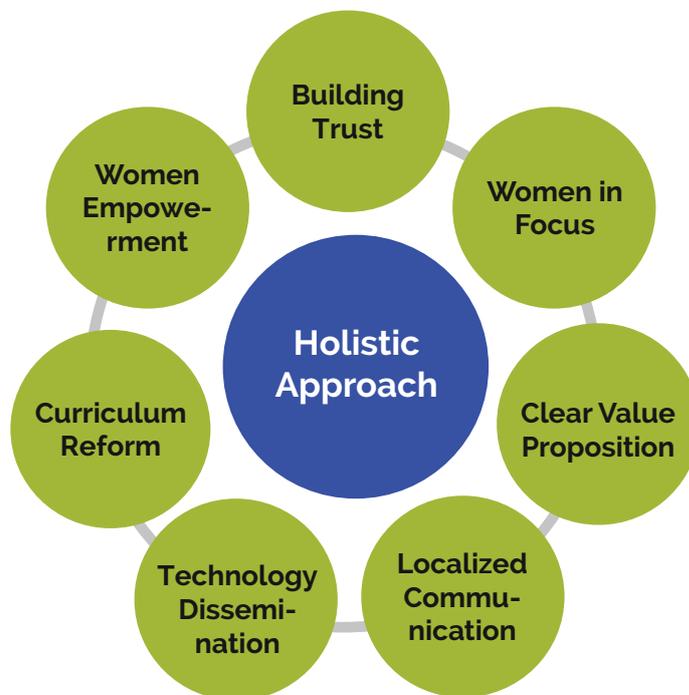
- **Improving Digital Literacy:** Many farmers lack the digital literacy skills required to operate tech-based solutions effectively.

Traditional extension services need to be equipped to bridge this digital divide by making use of relevant technologies.

- **Bottom Up Approach:** The traditional model often follows a top-down approach, where pre-determined solutions are disseminated to farmers without considering their specific needs and contexts. Greater sensitization to integrate customization can lead to higher adoption rates, wherein use of IT, IoT etc. has demonstrated great potential to regularly engage and seek feedback, without being resource intensive.
- **Embracing Language and Cultural Aspects:** Extension workers may not be fluent in the local languages spoken by farmers, creating communication gaps and hindering effective knowledge transfer. Additionally, cultural sensitivities might not be adequately addressed. Effective use of technology can neutralize and their offering inclusive.
- **Increasing Reach and Awareness:** Traditional extension services may not have the capacity or resources to reach all farmers, particularly those in remote areas while they need to be reached out in the best interest of agricultural growth. By utilizing digital measures, not only farmers outreach can be improved, but also greater awareness about latest technologies and their benefits can be expected.

India's agricultural sector stands to gain immensely from technological advancements. However, to truly unlock this transformative potential, a one-size-fits-all approach won't suffice. It would need a holistic strategy that builds trust, empowers women, and clearly communicates the value proposition to farmers in their local language and preferred channels.

- **Building Trust:** Farmers need to be convinced of the technology's effectiveness and potential impact on their livelihoods. Demonstration plots, field trials, and success stories from similar contexts can foster trust and encourage



wider adoption. Early adopter engagement for technology refinement is crucial to address initial challenges and ensure the technology aligns with farmers' specific needs and practices.

- **Women in Focus:** Women play a pivotal role in Indian agriculture. Therefore, technology solutions must be designed with their specific needs in mind. User interfaces should be intuitive, and operations simple to ensure seamless adoption. By making technology accessible and user-friendly for women farmers, we can maximize its impact on agricultural productivity and household incomes.
- **Clear Value Proposition:** The benefits of the technology need to be clearly articulated and demonstrably showcased. Farmers need to understand how the technology will improve their yields, incomes, or overall agricultural practices. Clear communication on investment and returns, coupled with accessible financing options, will encourage technology adoption.
- **Localized Communication:** Effective knowledge dissemination necessitates a deep understanding of the target audience. Information, Education, and Communication (IEC) materials must be meticulously adapted

to resonate with local contexts, languages, and cultural nuances. This requires a localized approach, ensuring that messages are not only understood but also relevant and impactful.

- **Technology Disseminators:** To effectively bridge the digital divide in agriculture, a dedicated cadre of locally embedded technology champions is essential. These individuals, equipped with both technical expertise and strong communication skills, can serve as a critical link between tech companies and rural farming communities.
- **Curriculum Reform:** To bridge the digital divide and foster effective technology adoption among farmers, ITIs (Industrial Training Institutes) and ITCs (Industrial Training Centers) should integrate courses that focus on the behavioral aspects of technology. By equipping individuals with a strong understanding of human-technology interaction, these institutions can cultivate a skilled workforce capable of effectively disseminating and supporting technological solutions in rural areas.
- **Women Empowerment:** The NRLM's extensive grassroots network, particularly its focus on women's empowerment, positions it strategically to champion the adoption of tech-led solutions in rural India. By training and equipping Self Help Groups (SHGs) and their federations with digital literacy and skills, NRLM can cultivate a cadre of women leaders capable of not only adopting technology but also guiding their communities in its effective use. This approach will be instrumental in bridging the digital divide and ensuring that the benefits of technology reach the most marginalized farmers.

## Social Behaviour Change as the Solution

**India's agricultural sector faces challenges due to low literacy rates among farmers, declining youth participation, and fragmented landholdings. These factors limit the adoption of AgTech solutions.**

**Simply introducing AgTech solutions without considering the social and cultural context will result in limited adoption. This is where a Social Behaviour Change (SBC) model can bridge the gap. An SBC approach can tailor communication and training methods to different literacy levels and preferred learning styles, utilizing visuals, local languages, and storytelling alongside digital tools. Building trust is crucial, so the SBC model can address concerns about cost, complexity, and potential risks through peer-to-peer learning, testimonials, and demonstrations. Leveraging existing social networks of farmers through groups, local leaders, and influencers can also promote AgTech adoption. Empowering young people as champions and facilitators can bridge the digital divide and encourage their peers to see agriculture as a viable career option with the help of AgTech. By employing an SBC model, AgTech can reach a wider user base, improve user experience through tailored communication, and ultimately contribute to a more sustainable agricultural sector by promoting practices that optimize resource use and improve overall farm**

## A Quantum Leap: Collaboration at the Heart of Extension

To truly revolutionize technology adoption in the agricultural sector, a collective effort transcending traditional boundaries is crucial. This requires a symphony of collaboration: government agencies setting the vision and providing extension infrastructure, NGOs serving as knowledge bridges and social safety nets, tech companies developing user-centric solutions, and most importantly, farmer organizations actively participating in design, testing, and dissemination.

By prioritizing factors like trust-building through transparent communication and capacity-building programs, empowering women farmers through accessible technology and training, and fostering effective communication through localized outreach in preferred languages and channels, we can pave the way for a quantum leap in India's agricultural landscape. This shift will not just enhance productivity and overall prosperity, but also unlock the immense potential of technology to empower farmers and create a more sustainable future for generations to come.



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