VISTAAR

कृषि एवं किसान कल्याण मंत्रालय
MINISTRY OF
AGRICULTURE AND
FARMERS WELFARE

Virtually Integrated System to Access Agricultural Resources (VISTAAR)

Enabling smart climate-resilient agriculture at scale through innovation, inclusivity and knowledge driven ecosystem

INTRODUCING

VISTAAR

OPEN AND FEDERATED DIGITAL NETWORK, POWERED BY AI

In February 2023, Hon'ble Finance Minister proposed "*Digital public infrastructure for agriculture to be built as an open source, open standard & interoperable public good. This will enable inclusive, farmer-centric solutions through relevant information services for crop planning, farm inputs, market intelligence & support for growth of agri-tech industry*"

Foreword

As we stand at the threshold of a new era in Indian agriculture, marked by unprecedented technological advancement and visionary policymaking, it is my privilege to introduce a groundbreaking initiative that holds the promise of transforming the landscape of farming in our country.

The proposed Digital Public Infrastructure (DPI) for agriculture, built on the principles of openness, inclusivity, and innovation, represents a watershed moment in our journey towards harnessing the power of technology for the greater good of our farmers.

At the heart of this transformative effort lies the VISTAAR initiative ("Virtually Integrated System to Access Agricultural Resources"), a pan-India DPI, powered by exponential technologies, poised to revolutionise the way we interact with and support our farming community. Through VISTAAR, we aim to create a dynamic digital network that amplifies the voices of farmers, facilitates knowledge-sharing, and fosters innovation across the agricultural value chain.

Central to the success of VISTAAR is its farmer-centric approach, which places the needs and aspirations of our farmers at the forefront of our endeavours. By providing customised, localised advisory services through AI-enabled platforms and multimodal channels, we seek to empower farmers with the knowledge and tools they need to make informed decisions and improve productivity.

Moreover, VISTAAR embodies the spirit of collaboration and partnership, bringing together stakeholders from across the agricultural ecosystem to co-create solutions that address the diverse needs of our farming community. By embracing open standards, interoperability, and data privacy, we aim to build a digital infrastructure that is robust, secure, and scalable, setting the stage for a more inclusive and resilient agricultural sector.

As we embark on this journey of digital transformation, I am confident that VISTAAR will emerge as a beacon of innovation and progress, driving sustainable agricultural practices, enhancing farmer incomes, and unlocking the full potential of India's agricultural sector. I urge all stakeholders – government agencies, technology partners, civil society organisations, and farmers themselves – to join hands in realising this vision of a digitally empowered and prosperous farming community.

Together, let us build a future where every farmer has the tools, knowledge, and support they need to thrive in an ever-changing world.

Arjun Munda
Hon'ble Minister of Agriculture and Farmers' Welfare

Foreword

It is with great optimism and enthusiasm that I introduce VISTAAR (Virtually Integrated System to Access Agricultural Resources), an integral part of India's visionary journey towards a digitally empowered agricultural landscape. As we embark on this endeavour, we stand poised at the intersection of tradition and innovation, recognizing the profound impact technology can have on the lives of our farmers and the resilience of our agricultural sector.

The genesis of VISTAAR follows the pursuit of Digital Public Infrastructure for Agriculture, a vision articulated by the Hon'ble Finance Minister, Smt. Nirmala Sitharaman, in her budget speech of February 2023. Her call for an Agriculture DPI (Digital Public Infrastructure) has heralded a new era of possibilities, one where technology serves as an enabler for inclusive growth and sustainable development.

Agriculture stands as the cornerstone of India's economy, providing livelihoods for a significant portion of our population and contributing substantially to our GDP. However, the sector is not without its challenges. VISTAAR as a DPI, with its emphasis on openness, interoperability, and decentralisation, seeks to address these challenges head-on, empowering farmers with the tools and knowledge necessary to thrive in an increasingly dynamic environment.

At its core, VISTAAR embodies the ethos of inclusivity, ensuring that every farmer, regardless of location or circumstance, has access to relevant, customised, contextual information and extension services. Through the seamless integration of cutting-edge technologies, we aim to revolutionise the way agriculture is practised in India, fostering a culture of innovation and resilience.

As we embark on this transformative journey, it is imperative that we remain steadfast in our commitment to the principles of transparency, equity, and sustainability. VISTAAR represents not just a network grid, but a testament to our collective resolve to build a future where every farmer can prosper and thrive.

I extend my heartfelt gratitude to all stakeholders involved in bringing VISTAAR to fruition, and I am confident that together, we will usher in a new era of prosperity for Indian agriculture.

Manoj Ahuja
Secretary, DA&FW

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1. Executive Summary

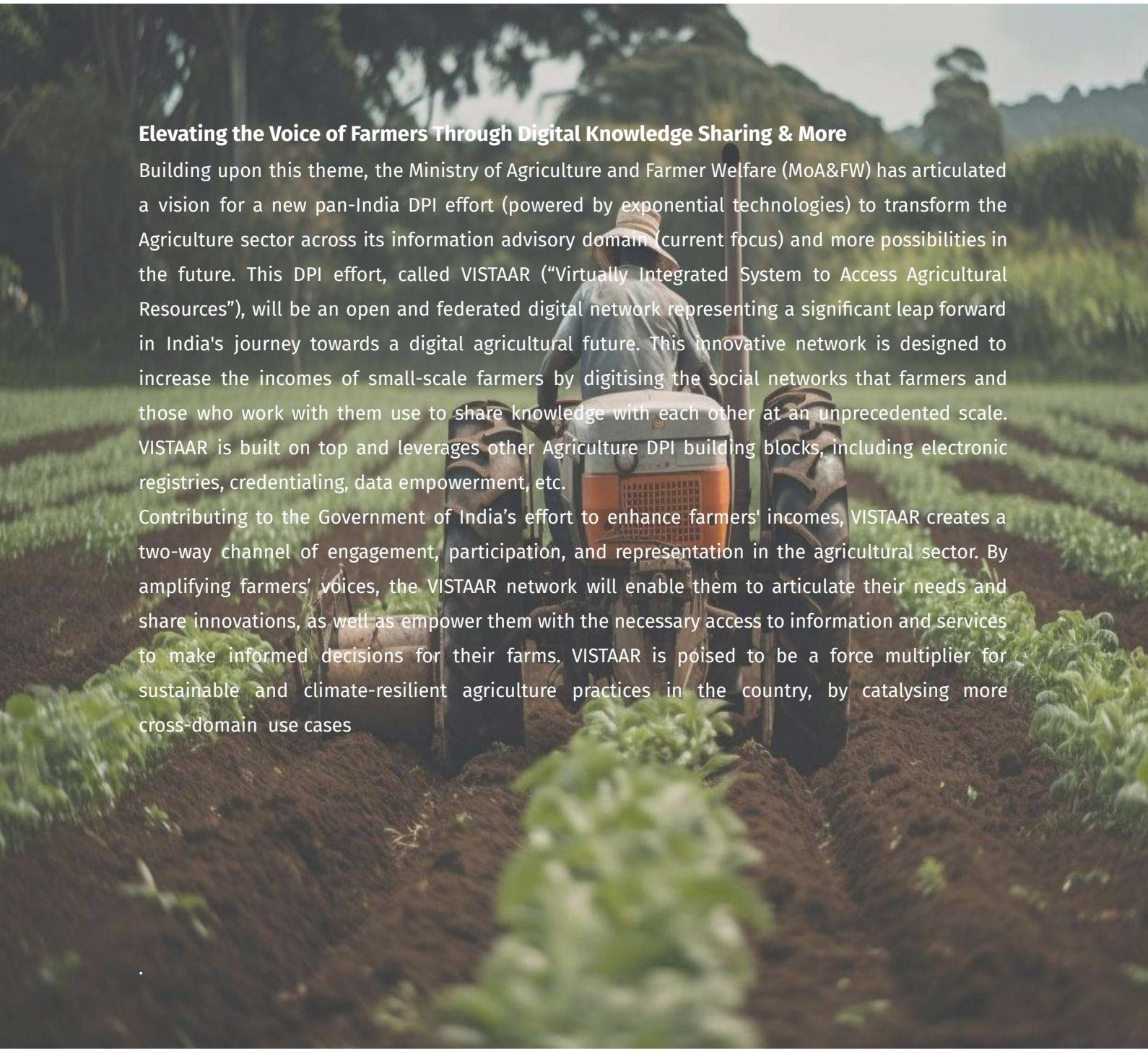
Enabling an Open Digital Agriculture Network in India – Powered by AI

The Hon'ble Finance Minister Smt. Nirmala Sitharaman, in her budget speech in February 2023, announced India's vision for an Agriculture DPI (Digital Public Infrastructure). The announcement set forth the building of an open, interoperable and decentralised network of partners and resources to maximise farmer livelihood resilience and returns. The Hon'ble Finance Minister proposed that "*Digital public infrastructure for agriculture be built as an open source, open standard and interoperable public good. This will enable inclusive, farmer-centric solutions through relevant information services for crop planning and health, improved access to farm inputs, credit, and insurance, help for crop estimation, market intelligence, and support for the growth of agri-tech industry and start-ups*".[1]

Digital Public Infrastructure (DPI) has emerged as a transformative force in India, fostering technological inclusivity and driving socio-economic development at scale. DPIs offer many benefits - efficient service delivery, inclusive development, cost savings, digital sovereignty, interoperability, data security & privacy, ecosystem innovation, and market competition, as demonstrated by Aadhaar and UPI that have empowered millions and brought them to the formal economy. Efforts like PM e-Vidya and DIKSHA in education, ABDM in the health sector, ONDC network in multi-sector commerce, and BHASHINI in Indic language AI are offering additional DPI building blocks beyond the foundational ones to drive inclusive and innovative economic development agenda.

Agriculture is critical to India's economy and is the primary source of livelihood for ~55%[2] of India's population, contributing about 18 per cent [3] to India's GDP. While the ecosystem is a vital pillar of the Indian economy, it continues to be beset with structural drawbacks. To leverage the advancements made by technology and to create an inclusive and innovative digital knowledge economy towards Climate Resilient Agriculture, it is imperative to empower farmers with the necessary tools and knowledge. Extension workers today bridge the gap between the Agricultural Research, technology adoption and Policy ecosystem, and smallholder farmers. However, their information needs are multifaceted, necessitating up-to-date, relevant, and accurate data that can be accessed anytime, anywhere. Furthermore, extension workers require skill-building opportunities in light of evolving agricultural practices. They further require easy access to communication tools and climate-resilient and gender-sensitive training aligning with sustainable agricultural practices to support their work with farmers.

[1] *https://pib.gov.in/PressReleseDetailm.aspx?PRID=1895290*
[2] *https://www.ibef.org/industry/agriculture-india*
[3] *https://www.pib.gov.in/PressReleasePage.aspx?PRID=1909213*



Elevating the Voice of Farmers Through Digital Knowledge Sharing & More

Building upon this theme, the Ministry of Agriculture and Farmer Welfare (MoA&FW) has articulated a vision for a new pan-India DPI effort (powered by exponential technologies) to transform the Agriculture sector across its information advisory domain (current focus) and more possibilities in the future. This DPI effort, called VISTAAR ("Virtually Integrated System to Access Agricultural Resources"), will be an open and federated digital network representing a significant leap forward in India's journey towards a digital agricultural future. This innovative network is designed to increase the incomes of small-scale farmers by digitising the social networks that farmers and those who work with them use to share knowledge with each other at an unprecedented scale. VISTAAR is built on top and leverages other Agriculture DPI building blocks, including electronic registries, credentialing, data empowerment, etc.

Contributing to the Government of India's effort to enhance farmers' incomes, VISTAAR creates a two-way channel of engagement, participation, and representation in the agricultural sector. By amplifying farmers' voices, the VISTAAR network will enable them to articulate their needs and share innovations, as well as empower them with the necessary access to information and services to make informed decisions for their farms. VISTAAR is poised to be a force multiplier for sustainable and climate-resilient agriculture practices in the country, by catalysing more cross-domain use cases

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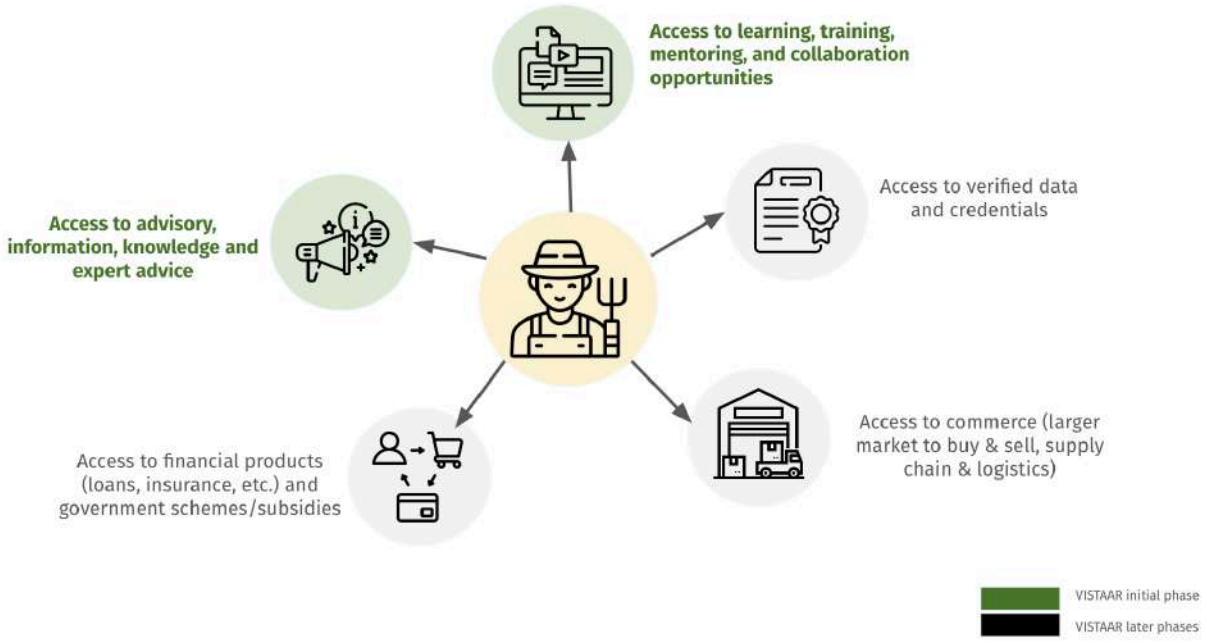
The first phase of VISTAAR is focused on enabling farmers & Frontline Extension Workers (FLEWs) with accurate and timely advisories via easy access to information and knowledge resources, verified data, and learning opportunities. The subsequent phases can unlock innovation across



more use cases to unbundle Agri-commerce, Agri-finance (credit, insurance, etc), Agri-supply chain and logistics while also enabling access to green-energy sources, amongst others, for making Indian Agriculture sustainable and climate-resilient.

Customised and contextual, Local Advisory Powered by Exponential technologies

The core value of VISTAAR is to provide conversational, customised and contextual agricultural advisories to extension workers and farmers through multimodal inclusive channels - such as AI-powered BOTs, mobile Apps, interactive voice response (IVR), web portals and more - thereby improving the relevance and speed of advisory delivery to farmers and equipping extension agents to triage farm-level needs. For instance, with AI language model BOTs powered through VISTAAR, extension workers and farmers can ask questions and receive immediate answers in local languages using voice and text across Indic languages (supported by Bashini) – and the responses to them can include videos and feature farmer innovations relevant to their location and season. Another example of an application of AI is start-ups offering large language Indic voice models leveraging VISTAAR to serve farmers, and extension workers using voice as a primary interface to serve advisories and fulfil network interactions. Further, VISTAAR will enable these multimodal interaction channels to continually improve with each interaction, along with feedback provided by extension workers and farmers, ensuring future network interactions are better tailored to local

farming conditions. Thus, with more locally-customised advisory, farmers will have the ability to adopt climate-smart farming practices that lead to real productivity and income increases.

Beyond just extension workers and individual farmers, VISTAAR will empower collectives such as farmer groups, women-led self-help groups, cooperatives and farmer producer organisations (FPOs). These groups and their member farmers can tap into the network to access and benefit from government programs that can help them invest in FPO[4] and PACS[5] infrastructure, crop insurance, and climate-smart practices, strengthening the value FPOs and PACS offer to their communities.

Building the core components of a pan-India Agricultural Open Digital Network

A key value of this DPI approach is that it creates a federated and open network of contributors and collaborators that drives quality and innovation to serve farmers. At a *Marketplace level*, anyone in the agricultural sector can publish content or use content to benefit their own farmer-facing services.

This initiative will be built on a base of robust *network governance* policies that will ensure that VISTAAR integrates seamlessly with other large open networks, including the Open Network for Digital Commerce (ONDC) and Unified Payments Interface (UPI), reinforcing the support structure for farmers and extension agents. VISTAAR's governance model, driven by MoAFW and state governments, secures the interests of farmers.

Finally, the pieces of this VISTAAR network come together with *Open Technology Building Blocks* that protect data, align content quality, and maintain the network, remaining at the forefront of technological innovation, integrity, and accessibility.

Central Role of Partners for the Future of Digital Indian Agriculture

VISTAAR uses a federated architecture built with a multi-layered approach. On the supply side, it incorporates Data Services, Advisory and Content Services, and trusted registries, made powerful by an AI layer for optimisation. On the demand side, it enables access to services through state applications, agri startups, and community applications through a conversational, natural language interface. These entities facilitate seamless information exchange with extension workers and farmers, employing a suite of AI bots and tools

[4] *FPO - Farmer Producer Organizations*
[5] *PACS - Primary Agricultural Credit Societies*

enhanced by Bhashini to provide information in diverse regional languages and integrate with initiatives like Kisan Call Centre, WINDS[6], Krishi DSS[7] and AgriStack etc. The cohesive network is underpinned by a common protocol, specifications, APIs, and governance frameworks, ensuring privacy by design and fostering interoperability for an efficient, secure and scalable digital ecosystem.

The strength and efficacy of VISTAAR lies in its catalytic architecture. With farmers as the central node, the VISTAAR digital network, acknowledging that no single organisation can meet the range of needs and aspirations of India's vast scale and diversity of farmers, makes available the services and offerings of the Indian agricultural ecosystem to foster a system more responsive to farmer demand. The architecture is simple, easy to adopt and built to accelerate market innovation which is critical to developing user-centric experiences keeping farmers in the center, thus enabling scale. By contributing content and building their own chatbots and applications, organisations can leverage VISTAAR's capabilities to achieve a wider impact across India's broad and diverse agricultural ecosystem. Moreover, by collaboratively building this robust network, VISTAAR can serve as a model for other countries seeking to digitise their agrarian extension services, with India as a leading partner.

While the first phase of VISTAAR will focus on enabling the farmers & FLEWs with accurate and timely advisory, data and learning opportunities, the subsequent phases can unlock innovation across more use cases to unbundle Agri-commerce, Agri-credit and insurance services, Agri-supply chain and logistics, access to green-energy sources, among others. In essence, VISTAAR is not just a catalyst for innovation; it is a transformative force that will redefine the future of agriculture in our nation. By elevating farmers, embracing technological advancements, and fostering collaborative growth, VISTAAR will benefit all stakeholders in the Agro-Ecosystem in India in the times to come.

[6] *WINDS- Weather Information Network and Data System*
[7] *Krishi DSS - Krishi Decision Support System*

2. Landscape of Agriculture in India: Challenges and Opportunities

Agriculture is key to India's economy, contributing to ~55%[8] of India's population contributing about 18 per cent [9] of India's GDP. Unsustainable land use, rising global food demand, increasing urbanisation, a shrinking rural workforce, and increased emissions linked to traditional agricultural practices are just a few of the issues facing the global agri-food sector. Furthermore, in the face of escalating global challenges such as climate change, and resource constraints, the agriculture sector stands at a critical juncture. The need for sustainable and climate-resilient agricultural practices has never been more pressing. In this context, leveraging technology is not just an option but a necessity for the future of agriculture. While Agriculture is a key pillar of the Indian economy, it continues to be burdened with a responsibility to feed the growing global and national population while being beset with structural drawbacks. The challenges facing the agriculture ecosystem in India today are as follows;

1. **Access to the collective wisdom of the network**: Farming as a practice has been prevalent for thousands of years in the country, yet there is no single source of truth regarding tools, techniques and practices that can help every farmer to suit his/her context. There is no pathway to access the diverse and rich knowledge hidden within the network of farmers, agriculturists, experts and other actors in the agriculture ecosystem.
2. **Access to knowledge on successful practices**: Farmers today predominantly rely on traditional practices and may not be fully aware of the evolving modern agricultural practices. Adopting them as well could be a challenge due to cultural norms or the perceived risks associated with change. This reluctance can impede the adoption of new and more efficient farming methods.
3. **Timely and relevant weather information**: Agriculture in India is highly dependent on weather conditions. Farmers often struggle to receive accurate real-time weather forecasts and climate-related information, which is crucial for making informed decisions regarding planting, irrigation, and harvesting.
4. **Access to Market**: Farmers in remote areas may face difficulties accessing markets, resulting in limited opportunities for sales and growth. They also often lack

[8] *https://www.ibef.org/industry/agriculture-india*
[9] *https://www.pib.gov.in/PressReleasePage.aspx?PRID=1909213*

access to information about market conditions, demand trends, and pricing. This information gap prevents them from making informed decisions about what to grow and when to sell, leading to overproduction or undersupply. Due to multiple middlepersons & intermediaries acting as gatekeepers, and geographical isolation, farmers are often limited in their reach to a more extensive consumer base or markets.

5. **Exclusion and Language Barriers**: A significant portion of the farming community in India today is not digitally literate. Despite that fact, the solutions that are designed for them are not fully inclusive in nature, which automatically excludes this majority. Additionally, farmers who can access some of these digital solutions often cannot consume the information available online as they are presented in languages that may not be comprehensible to them.
6. **Supply Chain Fragmentation**: The agricultural supply chain often involves multiple intermediaries, leading to fragmentation and inefficiencies in distribution and coordination.
7. **Storage Losses and Processing Wastage:** Limited discoverability of adequate storage facilities and processors can lead to leakage, spoilage, mould growth, pest infestations, and inefficient handling, causing substantial losses of stored grains, fruits, and vegetables.
8. **Limited Access to Direct Consumers:** Due to multiple middlepersons & intermediaries acting as gatekeepers, and geographical isolation, farmers are often limited in their reach to a larger consumer base or markets.
9. **Limited Awareness of Government Schemes:** Despite various government initiatives and schemes aimed at supporting farmers, there is often limited awareness at the grassroots level. Farmers may not have access to information about subsidies, financial aid, or new farming techniques provided by the government.

Agriculture Ecosystem and Opportunities: At the centre of the agriculture ecosystem is the farmer. Farmers being the treasure trove of knowledge themselves, make it very vital to be at the forefront of this network to be the creator as well as the consumer of the hidden collective wisdom of the network. Then comes the enabling ecosystem. With the growth of the technology ecosystem in India, there is a rise in numerous agritech startups leveraging tech to help farmers increase productivity and reap better yields. Solutions such as precision farming that employ data analytics, IoT, and sensors to provide farmers with real-time insights into soil health, weather patterns, and crop conditions, Agri-Tech platforms that connect farmers directly with markets, providing access to information, financial services, and agri-inputs and farm management tools that assist farmers in planning, monitoring, and optimising their agricultural operations, are just a few of the solutions that are enhancing efficiency, sustainability, and overall prosperity in the agricultural sector. However, these solutions remain primarily limited to farmers with significant holdings. In a concerted effort to also uplift smallholding farmers who form a substantial segment of the agricultural community, there is a growing emphasis on equipping them with knowledge

encompassing best practices, precision farming, and sustainable agricultural methods. The aim is to provide farmer-centric solutions, offering pertinent information services for crop planning and health. Additionally, initiatives are underway to enhance their access to crucial resources, including farm inputs, credit, and insurance. Moreover, support is extended for crop estimation and market intelligence, ensuring a holistic approach to empower smallholding farmers for improved productivity and sustainability.

Extension workers today bridge the gap between the Agricultural Research and Policy ecosystem and smallholder farmers. Their information needs are multifaceted, necessitating up-to-date, relevant, and accurate data that can be accessed anytime, anywhere. Furthermore, extension workers require skill-building opportunities in light of evolving agricultural practices. They further require easy access to communication tools and climate-resilient and gender-sensitive training aligning with sustainable agricultural practices to enable seamless communication with farmers.

There lies an opportunity to create an inclusive, innovative, and climate-resilient agricultural ecosystem that can empower diverse actors to come together and solve problems. The first strategic step in this direction is to create an enabling digital public infrastructure that can amplify the collective wisdom of this network at scale. VISTAAR, being that DPI is envisioned as a ground zero level infrastructure, designed as basic and inclusive as possible, rooted in trusted emergent knowledge, that can cater to the needs of any player in the ecosystem.

3. A multidimensional approach to transforming Agriculture via a Digital Public Infrastructure (DPI) focus

To address the existing fragmentation and skill-gap challenges in the Agriculture ecosystem noted in the previous section, a multi-dimensional approach is needed that can enable seamless collaboration between:

- Information seekers - farmers, agriculture extension workers, etc.
- Information providers - Agricultural Research Institutes, Agricultural Experts, Agri-Tech Companies, Meteorological Agencies, etc.
- Information facilitators - Ministry of Agriculture or Agricultural Departments, Agricultural Research Institutes, Agricultural Training Institutes & Universities, etc.
- Technology providers - AgriTech Companies, Startups, etc.

Addressing a problem on a massive scale, such as those facing the Agriculture ecosystem in India, necessitates a paradigm shift from relying solely on centralised platforms for storing and exchanging value to embracing a decentralised network comprising interconnected ecosystem actors that facilitate the flow of value. Rather than following an operator-driven and monolithic platform-centric approach, there is a growing need to adopt a facilitator-driven and interoperable decentralised network model that enables collaborations.

Throughout history, societies and governments have constructed physical infrastructure such as roads, railways, parks, and libraries in the public interest to promote economic growth and inclusive development, all with the principle of open access. These have allowed private enterprises, civil society organisations, and governments to drive widespread innovation. To illustrate, a physical public infrastructure like a village road opens up numerous commercial and value-creating opportunities, including the establishment of gas stations, hotels, shops, and the proliferation of automobiles. This, in turn, triggers a cascade of benefits stemming from the initial infrastructure investment, benefiting all stakeholders and facilitating regional development. Yet, in an increasingly digital world wherein interactions between individuals and service providers (businesses, Governments) increasingly shift toward the digital, a few pressing questions emerge: *Can we expedite local economic engagement in a fair and inclusive manner by encouraging greater market participation and fostering innovation? Should we not contemplate the creation of such an*

open infrastructure in the digital realm and create digital highways in sectors such as agriculture that have primarily relied on traditional manual practices?

The answer lies in setting up a "Digital Public Infrastructure(DPI)" model designed to establish an equitable and competitive environment facilitated by transparent and supportive policies that can leapfrog innovation and inclusion. DPI has emerged as a transformative force in India, fostering technological inclusivity and driving socio-economic development at scale. DPIs offer many benefits - efficient service delivery, inclusive development, cost savings, digital sovereignty, interoperability, data security & privacy and innovation, as demonstrated by Aadhaar and UPI that have empowered millions and brought them to the formal economy. A DPI model such as "Open Networks" is driving a new wave of change in supercharging economic transactions and democratising access (to services, goods and human capital) at scale across several sectors. The "Open Network for Digital Commerce (ONDC)" and "ONEST (Open Network for Education and Skilling Transactions)" are working demonstrations of this idea for critical sectors in India today.

3. Introducing "VISTAAR": Elevating the voice of farmers through accurate, timely and effective digital knowledge advisory practices

Building upon the Hon'ble Finance Minister's budget speech, the Ministry of Agriculture and Farmer Welfare (MoA&FW) has articulated the vision for a new pan-India DPI effort (powered by AI technologies) for transforming the Agriculture sector across its information advisory domain (current focus) and more possibilities in the future.

This DPI effort - **VISTAAR** ("Virtually Integrated System to Access Agricultural Resources") - will be an open, interoperable and federated digital network representing a significant leap forward in India's journey towards transforming the Agricultural services and product sector. This innovative network is designed to increase the incomes of small-scale farmers by digitising the social networks that farmers and those who work with them use to share knowledge with each other at an unprecedented scale. Contributing to the Government of India's effort to double the income of farmers, VISTAAR aims to create a two-way channel of engagement, participation, and representation in the agricultural sector. By amplifying farmers' voices, the network enables them to articulate needs and share innovations, empowering them with the necessary information to make informed decisions for their farms, all powered by exponential technologies like AI.

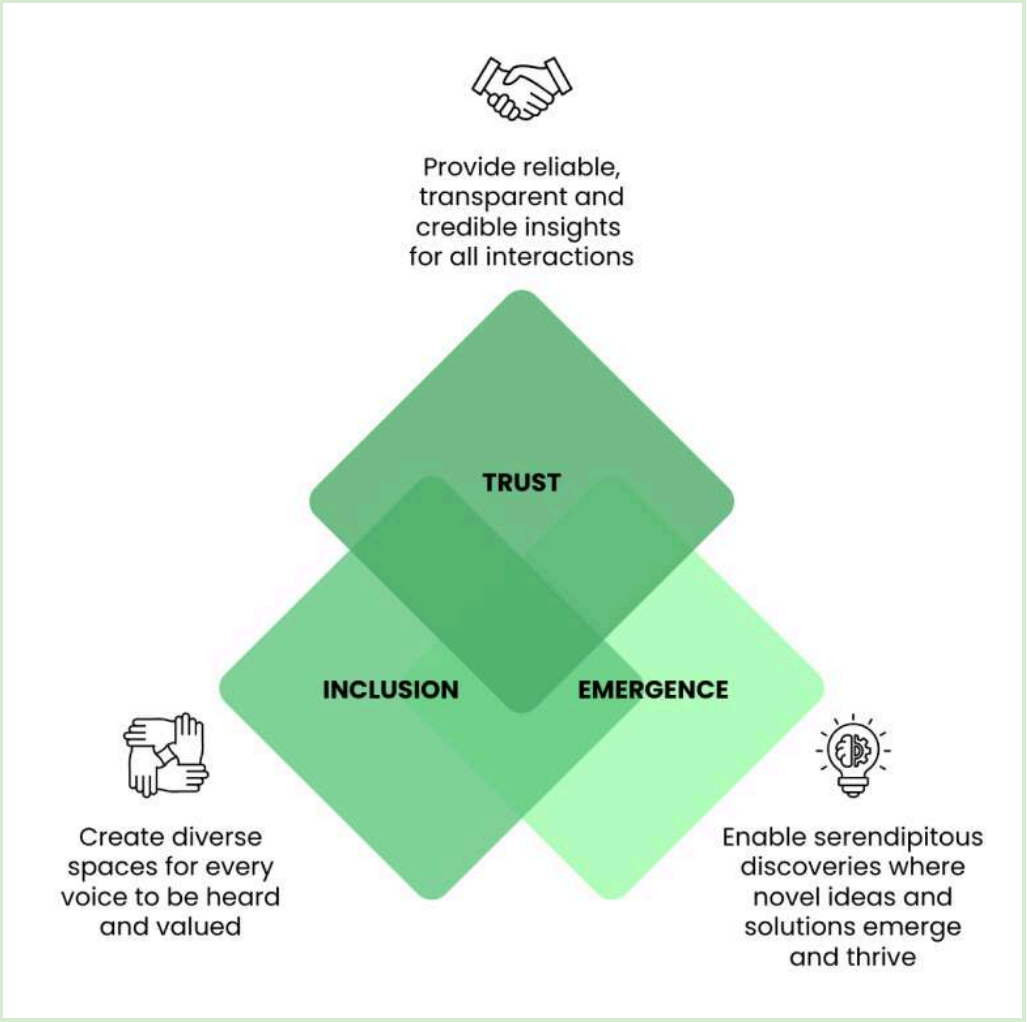
A key value proposition of the VISTAAR network model is that it will enable a federated open specification-driven network of ecosystem contributors and collaborators (across information advisory, goods and services marketplace and credit services domains) that will ultimately drive quality and bring innovative practices to the fingertips of Farmers and Agriculture extension workers. Also, VISTAAR's network governance framework - driven collectively by MoAFW and State governments - will ensure there is seamless integration with India's other population-scale DPI efforts (such as UPI) and secure the interests of farmers. VISTAAR's core architecture will also

protect the data of the beneficiaries involved, support efforts to standardise content quality across the board and solve for future-proof innovation, integrity, and accessibility practices.

4. Core Values of the VISTAAR network

Any network becomes strong and sustainable if it is fundamentally rooted in a few core values that resonate with all the network participants. These core values are essential for providing culture, guiding decision-making, promoting consistency and helping define and foster a shared vision and purpose for the network. VISTAAR shall be designed with a strong underlying value system that promotes trust, inclusion and emergence. VISTAAR shall attempt to answer these critical design questions.

- How do we design to ensure participation from various stakeholders, embrace diverse perspectives and simultaneously provide the traceability and transparency that promotes trust in the network?
- As a digital infrastructure that strives to include the last person of the community?
- To harness the collective wisdom of all the stakeholders in a continuous emergent fashion that learns and course corrects with every feedback loop?



5. Farmer Innovation and Practices

VISTAAR shall be the digital public infrastructure that represents the experiences, expertise, and collective wisdom of farmers. It shall empower farmers by granting them access to knowledge, insights and recommendations on innovative practices provided by their fellow farmers that are trusted, traceable and bias-free. This will foster a virtuous cycle of knowledge sharing and learning at the grassroots level. The curated knowledge of innovations and practices is not limited to farmers only. Government departments, service providers, and other actors in the agriculture ecosystem can also access this knowledge to understand, improve and propagate it according to their contexts and requirements. This will enable democratising access to knowledge on a large scale. By making the platform multilingual and multi-channel (accessible through the web, WhatsApp, etc.), the creation and consumption of innovations becomes more straightforward from anywhere, by anyone, and in any language. This can pave the way for the widespread adoption of farmer innovations and best practices across the agriculture ecosystem. VISTAAR shall thus empower the entire agriculture ecosystem, especially the farmers, to have seamless access to innovations and best practices from across the length and breadth of the nation and without any barrier of language. This becomes a strong use case for demand creation that can inform the

policies, research and Govt. initiatives that can prove to be more effective, relevant and useful for the entire ecosystem. It is a classic example of how *samaaj, bazaar and sarkaar* can come together and solve societal problems at scale, with communities at the centre, and with the power of collective wisdom.

6. Guiding Principles of the VISTAAR Network

- Anchor on Farmer Community & Voices
- Amplify with Knowledge from within the Network
- Ensure complete Transparency & Explainability
- Create Diversity
- Foster Innovation
- Leverage the power of collective wisdom
- Evolve and measure changes continuously

Anchor in the Voices of Farmer community

While the supply side has been a more vital pillar in the past, when it comes to the Agriculture Ecosystem, VISTAAR shall amplify and accelerate the demand side by keeping the farmer community at the centre of it all. Farmers will now be able to record in their own voices from anywhere, in any language they are comfortable with and share their knowledge, innovation, point of view, and feedback, as the case may be. Farmers' voices will now be heard, literally! This can go a long way, from demand assessment that can inform policies, research, and supply-side amenities

to impact assessment where the feedback loops can be quicker and more frequent, all of this at a fraction of the current cost.

Amplify the knowledge from within the network

The Agriculture ecosystem is made stronger by the people with diverse backgrounds and expertise all of whom are contributing to the bigger and better cause. There is so much tacit knowledge hidden within this network of individuals and institutions and with every interaction they have with one another. With VISTAAR being the enabler, this tacit knowledge can be transformed into explicit knowledge, shared and amplified across the ecosystem.

Design for complete transparency & explainability

Imagine access to knowledge and insights from one's own network of trusted people, available in a way that is easily traced back to the source of knowledge. On top of it, imagine transparency with which the stakeholders can understand how data is collected, processed, and used, establishing accountability. In addition, imagine the explainable models helping the stakeholders understand how and why certain decisions have been made in the process of harnessing the knowledge. VISTAAR is envisioned as a trusted partner to the entire agriculture ecosystem.

Create diversity

Any DPI is only as successful as the length and breadth of its diverse stakeholders in the ecosystem who realise value in their own contexts. VISTAAR is designed to create such open environments where every ecosystem actor can leverage this infrastructure to build on top of and accelerate problem-solving in their own contexts and capacities. VISTAAR attempts to answer this question of how to continuously create opportunities for a diverse set of actors to join hands.

Foster Innovation

VISTAAR is aimed at creating an environment that fosters innovation across the board. It creates a continuously growing bank of knowledge across the ecosystem. The diverse set of stakeholders in the ecosystem are both the creators and consumers of this knowledge. Imagine sharing x knowledge and getting 100x knowledge back that is very useful and relevant to one's context. With access to such emergent collective wisdom where best practices are shared, the path to innovation and disrupting evolution is accelerated.

Leverage the power of collective wisdom

The whole is always greater than the sum of its parts. VISTAAR shall enable every actor in the Agriculture ecosystem to harness and amplify the collective wisdom hidden in the network. It will shift the equilibrium of the entire ecosystem that is now empowered with emergent and trusted knowledge.

Evolve and measure changes continuously

VISTAAR will lend itself to sense, make sense and evolve on the go with quicker and more effective feedback loops. It will thrive to listen effectively from the entire network on a regular basis and make course corrections as required very quickly, thus improving and evolving continuously in a

fast track. This also helps measure the micro changes on a regular basis while working towards the macro change.

7. Architecture and Design Principles of VISTAAR

Shifting the paradigm: From "Siloed" platforms to an Open, Federated & Interoperable VISTAAR Network

Today, there are a few digital platforms that exist in the Country that enable Farmers and extension workers to access resources, data, courses and content, but these platforms operate as closed-loop systems. These systems create platform silos which result in a citizen switching through multiple applications to find the right course, expert advice, weather patterns, etc - thus sometimes creating a broken or less-contextual user experience. Furthermore, agriculture information providers must enlist themselves on multiple platforms to enable their offerings to a large pool of farmers while dealing with developing end-to-end farmer-centric solutions and costs to enable adoption.

What if there was a more straightforward unifying mechanism that can enable interoperability between several Government and private-sector Agri-technology systems, to deliver the correct value to the Farmers?

It would open up significantly larger market access for Agri-information providers and increase choice for Agri-information seekers. The creation of VISTAAR as a "network of many platforms" will significantly increase market access to platforms and enable more interconnected choices for the Farmer & FLEWs across a multitude of contextual use-cases around Agri-information advisory and beyond (e.g. discovering organic farming courses, discovering the suitable advisory materials on specific pesticides, search and avail farm-credit or insurance products, discover and order farming equipment machinery on lease for etc.). This network layer will foster innovation, provide access to all, and ensure trusted interactions between various platforms on VISTAAR.

By implementing a unified network protocol, VISTAAR architecture will allow for seamless interoperability, thereby facilitating the smooth exchange of data between the various network participant platforms. This will be designed keeping core principles around diversity and inclusivity in mind in order to ensure that services enabled via VISTAAR, are designed for all and not for limited few.

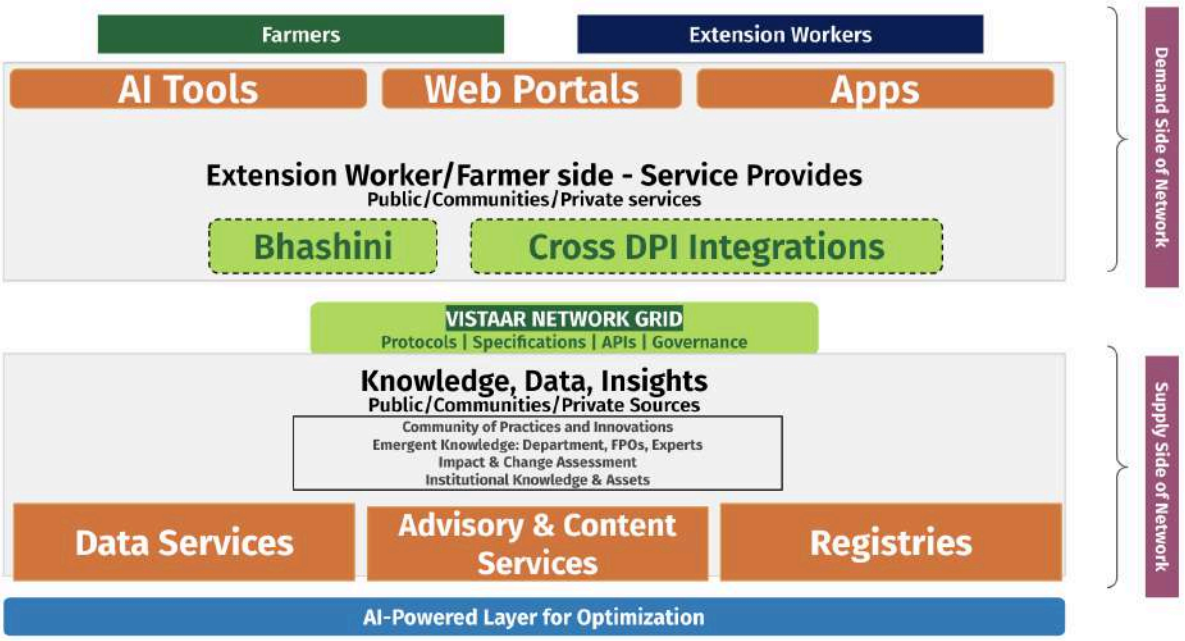


Figure 1. - VISTAAR Architecture

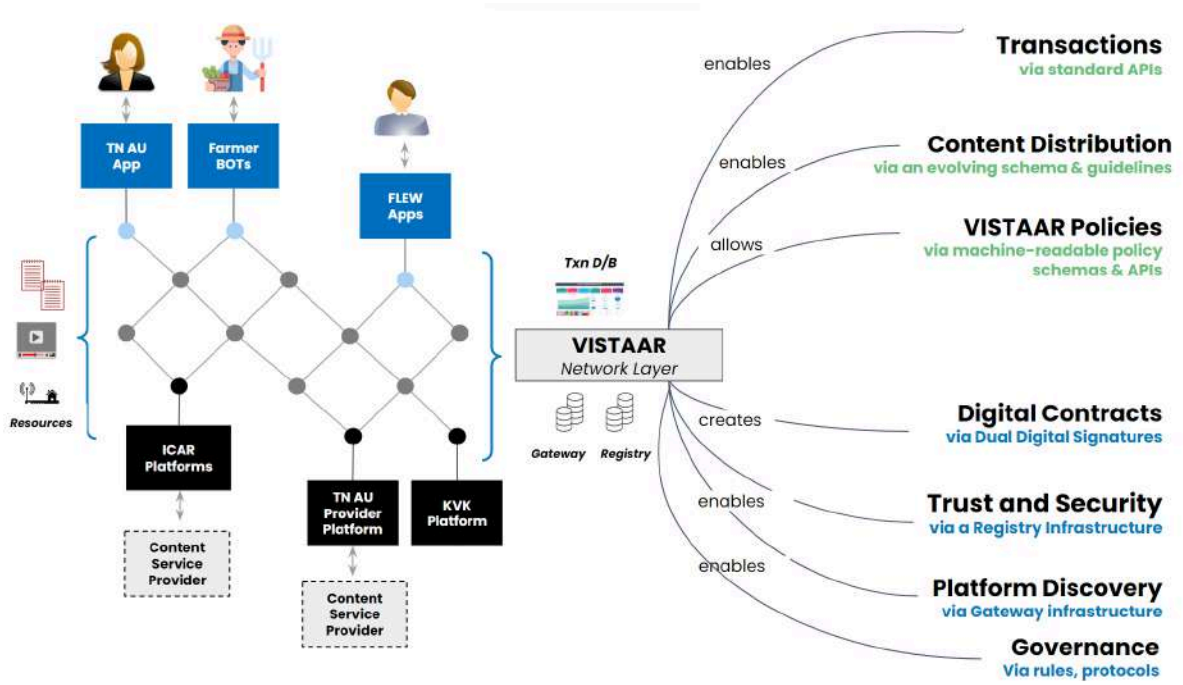
The VISTAAR network will be implemented as a federated model to ensure the following;

- data resides at the source itself,
- there are adequate measures in place to ensure security and privacy by design,
- there are open standards, specifications and APIs, digital trust technologies to allow for trusted-information portability
- and above all, a minimalistic approach through the development of minimal, reusable building blocks.

This architecture will leverage the power of exponential technologies (like AI) to augment the experience of information advisories served to the farmers, both contextual and trusted. This architecture will be designed to not only meet the current needs of the Agriculture sector but will also be ready to evolve and scale in response to changing requirements from the field and the changing landscape of emerging technologies. On the supply side, VISTAAR will incorporate data services, information advisory and content service provider platforms, and trusted registries made powerful by exponential technologies (such as AI-layers for optimisation). On the demand side, it will enable any and all public and private sector platforms, spanning across State applications, Agri-startups, and Community applications. The knowledge exchange enabled on this network will be traceable, transparent, trusted and can work at scale. Over the VISTAAR network backbone, multi-channel & multi-party information exchanges for a multitude of use cases (e.g. a suite of AI bots and tools enhanced by Bhashini that provides advisory services in diverse regional languages) will be executed and, thus, significantly ***amplify the voice of the farmers themselves who are at the centre of this ecosystem***.

The unified network protocol for VISTAAR will encompass specifications, APIs, and governance frameworks, ensuring privacy by design and fostering interoperability for an efficient, secure and scalable digital ecosystem. Via this protocol, VISTAAR will provide a seamless discovery and

access/fulfilment experience for farmers and agriculture field-level extension workers. This will be provisioned by onboarding and integrating several Agri-tech platforms (Apps, Web Portals, AI BOTs) - both on the seeker & provider sides - on the VISTAAR network and thereby facilitate “multi-party” network interactions all via this single unified-protocol layer. When multiple platforms - all conforming to the same unified protocol - come together on VISTAAR, it will unlock massive flow and value exchange across many connected platforms. It will allow for combinatorial bundling of experiences across categories, e.g. searching for a pesticide using voice-enabled search (in any language) and getting expert videos from Kisan Vigyan Kendra (KVK) or connecting to an AI bot answering queries about weather patterns and further setting up a video call with a farmer associate to even discovering government schemes or accessing credit or loans for buying farming equipment. It will also redistribute the cost and risk across the value chain, improving the efficiency and throughput of the overall network. A great example of scenarios that VISTAAR could augment in the future: Over the last year, an AI-led proof of concept had been piloted by the Ministry of Agriculture in a specific State, got Farmers to record in their own voices and in their own language, their success stories, knowledge and innovations that worked for them. Now imagine, if this knowledge base is now made accessible to the entire agriculture ecosystem (via the VISTAAR network), especially to the other farmers who now can trust what they are hearing or reading as they are directly from their peer farmers. They can learn from this collective wisdom and recalibrate their agricultural practices that can improve their yield and profitability. Likewise, State Government departments can now harness and share the collective wisdom of their own information networks (holding crucial sectoral insights from localised implementations & engagements with a network of field partners), all on VISTAAR; thereby making this information-set easily discoverable by other seeking-network participants. All this is possible with VISTAAR, being an open, interoperable digital network.



8. Possibilities that VISTAAR will unveil!

One of the core propositions of VISTAAR is that it will allow for network participants to provide conversational, customised agricultural advisories to extension workers through new-age AI multilingual interfaces (along with traditional tech channels like mobile Apps & web portals), thereby improving the relevance and speed of advisory delivery to farmers and equipping extension agents to triage farm-level needs. With such an interface, extension workers and farmers can ask questions and receive immediate answers in local languages using voice and text across Indic languages (supported by Bashini) – responses include relevant videos and feature farmer innovations. Further, the assistant continually improves with each interaction and from feedback provided by extension workers and farmers, ensuring future conversations are better tailored to local farming conditions. With more locally-customised advisory, farmers will have the ability to adopt climate-smart farming practices that lead to real productivity and income increases. An inclusive approach ensures that farmers, regardless of gender, can access the content through various channels such as Telegram, a standalone app, interactive voice response (IVR), and more. Beyond just extension workers and individual farmers, VISTAAR empowers diverse farmer groups, such as women-led self-help groups and FPOs. These groups and their member farmers can tap into the network to access and benefit from government programs that can help them invest in FPO infrastructure, crop insurance, and climate-smart practices, strengthening the value FPOs offer to their communities.

VISTAAR is envisioned to be rolled out in phases this year and beyond, with the following initiatives in mind;

1. In Phase 1,
    a. Agri-Advisory: Access to content and data services (Supply Side)
    b. Farmer Innovation and Practices (Demand Side)
2. In Future,
    a. Agri-Learning (access to skilling courses and vocational training)
    b. Agri-Commerce (access to marketplace needs)
    c. Agri-Services (equipment and human resource-power)
    d. Agri-Finance (access to credit services)

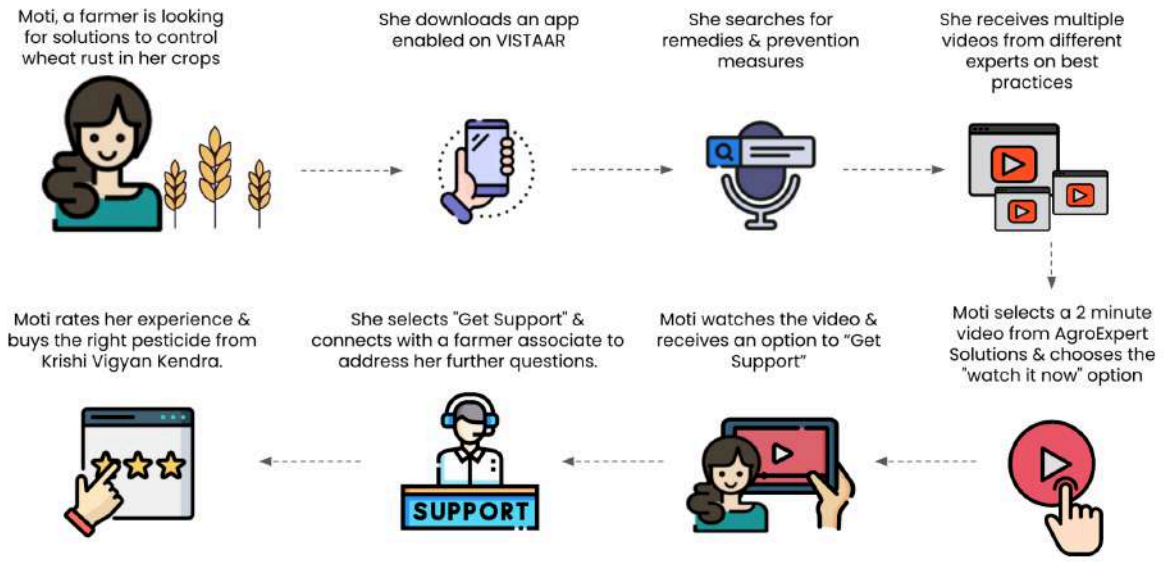
A quick view of the Phase 1 use cases are detailed below :

a. Agri Learning - Content and Advisory

Farmers or Farm-Level Extension Workers (FLEWs) can utilise the VISTAAR Network to access easily digestible "byte-sized content," such as videos, to obtain pertinent agricultural advisory

information. The interactions or user behaviour enabled via the VISTAAR network to enable this use case, could be as follows;

- Who are the consumers?: Farmers are the primary consumers of agricultural advisory information on the VISTAAR Network, while Farm-Level Extension Workers (FLEWs), comprising agricultural extension officers, field agents, and community workers, can also utilise the platform for accessing relevant content.
- Who will be the facilitators?: Ministry of Agriculture or Agricultural Departments, Agricultural Research Institutes specialising in agricultural research and development can contribute by providing expert guidance, validating content, and ensuring the accuracy and relevance of information available on VISTAAR.
- Who will be the providers of advisory content resources?:
    - Agricultural Experts and Consultants who can create and contribute educational content related to various aspects of agriculture, including crop management, pest control, soil health, and sustainable farming practices.
    - Agricultural Organizations and NGOs focusing on agricultural development can produce and share content on the VISTAAR network to educate farmers and extension workers about innovative techniques, government schemes, and best practices.
    - Agri-tech companies specialising in agricultural technology and solutions can provide content related to the use of technology in farming, such as precision agriculture, farm management software, and IoT devices.
- Who could be the providers of Platforms/Apps/BOTs?: Startups specialising in Ed-tech can collaborate with agricultural organisations to create user-friendly platforms, mobile apps, or chatbots that facilitate easy access to byte-sized agricultural advisory content.

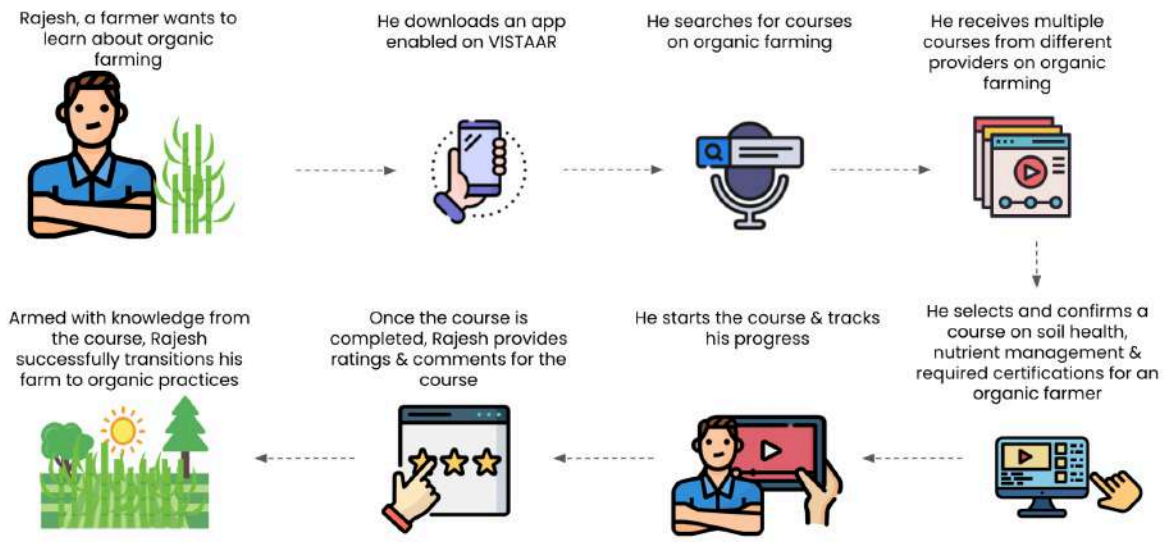
A Sample Illustration
Scenario Summary: Moti is a Tehri farmer in the Garhwal region of Uttarakhand. She is a wheat farmer and is struggling with yellow wheat rust, a common wheat disease in low temperatures. She struggles to control it and seeks practical solutions to address the disease and increase her crop yield. She is introduced to Vistaar through Krishi Vigyan Kendra and downloads a Vistaar-enabled bot to plug into the Vistaar network. After downloading the bot, she uses the bot interface to search for remedies and prevention measures for yellow rust through a voice-enabled search. She receives multiple videos from different experts on best practices and fertilisers to address her concerns. Moti selects a 2-minute video from AgroExpert Solutions and chooses the "watch it now" option. She watches the video and understands the suitable fertilisers she needs. After watching the video, Moti selects "Get Support" and connects with a farmer associate to address her further questions. After the conversation, Moti gives a rating and buys the right pesticide from Krishi Vigyan Kendra.


b. Agri Learning - Skilling through curated courses

Extension workers and Farmers can utilise the courses available on the VISTAAR Network to enhance their understanding of various agricultural practices, technologies, and methodologies. This content includes videos, tutorials, and other interactive resources tailored to their specific training needs. The interactions or user behaviour enabled via the VISTAAR network to enable this use case could be as follows;

- Who are the consumers?: Farm-Level Extension Workers (FLEWs), comprising agricultural extension officers, field agents, and community workers, would be the primary consumers of agricultural skilling courses on the VISTAAR Network, while farmers can also utilise the platform for accessing relevant content. Additionally, students pursuing agricultural studies and educators teaching agriculture-related subjects can also benefit from the educational resources available on the VISTAAR Network for both academic and professional development.

- Who will be the facilitators? : The Ministry of Agriculture or Agricultural Departments, Agricultural Training Institutes & Universities specialising in agricultural education contribute expertise and curriculum development support to ensure the relevance and efficacy of skilling courses offered on VISTAAR.
- Who will be the providers of skilling content resources?
    - Agricultural Experts and Consultants who can create and contribute educational content related to various aspects of agriculture, including crop management, pest control, soil health, and sustainable farming practices.
    - Agricultural Organizations and NGOs focusing on agricultural development can produce and share content on the VISTAAR Network to educate farmers and extension workers about innovative techniques, government schemes, and best practices.
    - Agri-tech companies specialising in agricultural technology and solutions can provide content related to the use of technology in farming, such as precision agriculture, farm management software, and IoT devices.
- Who could be the providers of Platforms/Apps/BOTss? : Startups specialising in Ed-Tech can collaborate with Agricultural organisations to create user-friendly web platforms, mobile apps, or AI BOTs that facilitate easy access to byte-sized agricultural advisory content.

A Sample Illustration
Scenario Summary: *Rajesh is a Field Level Extension Worker in Firozabad, Uttar Pradesh. He wants to learn about good organic farming practices to apply this knowledge in his interactions with the farming community. He is informed about the VISTAAR network and proceeds to search for relevant content on organic farming. He received a comprehensive course & Videos on "Organic Farming" on getting started, soil health, nutrient management, and required certifications and marketing for an organic farmer. He selects and confirms the content. Rajesh now starts the video and tracks his progress. Once completed, Rajesh provides ratings and his feedback. He also received a Verifiable Credential (VC) & published it to his DigiLocker account.*


c. Agri Learning - Data services

Farmers, agricultural extension workers, and other stakeholders in the Agricultural sector leverage the VISTAAR Network to access comprehensive data series providing detailed insights into soil quality, weather patterns, and related information sourced from various channels, including satellite data. The interactions or user behaviour enabled via the VISTAAR network to enable this use case could be as follows;

- Who are the consumers?: Farmers can discover & leverage soil and weather data advisories from several provider-side platforms (enlisted on VISTAAR) for making more informed crop-related decisions. Agricultural Extension Workers can now offer personalised advice based on these data advisories. Researchers and Educators can also employ this data advisory for studies and teaching on soil-weather dynamics.
- Who will be the providers of advisory data services?:
    - Satellite Imagery Providers: Companies and organisations offering satellite imagery services contribute to the VISTAAR Network by providing data series on soil characteristics, vegetation indices, and weather patterns derived from satellite observations

    - Meteorological Agencies: National and regional meteorological agencies supply real-time weather data series, including temperature, precipitation, humidity, and wind patterns, to support agricultural decision-making on the VISTAAR Network.
    - Agricultural Data Providers: Organisations specialising in agricultural data collection and analysis contribute valuable insights into soil health, nutrient levels, moisture content, and other agronomic factors through comprehensive data series accessible via the VISTAAR network.
- Who could be the providers of Platforms/Apps/BOTs?: Startups specialising in Satellite Imaging and Weather Intelligence can collaborate with agricultural organisations to create user-friendly platforms, mobile apps, or chatbots that facilitate easy access to informational services.

9. Considerations for VISTAAR Governance and Sustenance

As the VISTAAR Network model is decentralised, many of the operational functions involved will be thus unbundled; and encompass several multi-party legal relationships between Governments, Seeker-side & Provider-side participant platforms, and other core institutions (e.g. Academic Agri-Research institutions). Thus, it is essential that a sound, robust network governance model is institutionalised within VISTAAR to manage these relationships without friction & deliver value to the core users.

VISTAAR's governance will clearly articulate processes for content creation, credentialing, traceability and discovery that enable content suppliers, consumers, and network orchestrators to work together to achieve shared goals. A governance codesign process will be envisioned in the early months of VISTAAR, with States playing an active role with opportunities for input from the private and social sectors. A Steering committee of critical partners will ensure a participatory but organised process. State Departments of Agriculture will be invited to join the network as stewards of their respective state instances of VISTAAR. In this role, they can customise key aspects of their network related to the critical decision points around content management, traceability and use. There will also be specific parameters set at the National level, which will remain constant to enable a quality, secure user experience for all.

Government stewards can determine which organisations can participate in the VISTAAR network and support digital processes for the submission of content. This not only means participation in content contribution but also decisions relating to which organisations can plug into the network with their own apps and Bots. For example: credentialing guidelines could halt the contribution of undesirable content (e.g. promote banned chemicals or exploit farmers) and encourage content that promotes specific climate-smart practices that are the priority of the State. In addition, stewards will need to enable and improve cross-partner content discovery by implementing tagging

systems to identify syndicated content and its permissions. This will facilitate a feature for FLWs to discover and access content from other partners, clearly marked with syndication status.

It is recommended that each state develop a guiding constituency constituent group to generate and review guidelines in alignment with critical standards. In addition, representative and expert bodies will engage in the review of content flowing from state-supported advisories via the network to ensure quality and accuracy.

10. Harvesting Progress - Future Possibilities with VISTAAR

VISTAAR is poised to be a force multiplier for sustainable and climate-resilient agriculture practices in the country by catalysing more cross-domain use cases. While the first phase of this initiative is focussed on arming farmers & FLEWs with accurate and timely information, data and learning opportunities, the subsequent phases can unlock innovation across more use cases to unbundle Agri-commerce, Agri-financing services, Agri-supply chain and logistics, Access to green-energy sources, Circular economy, among others.

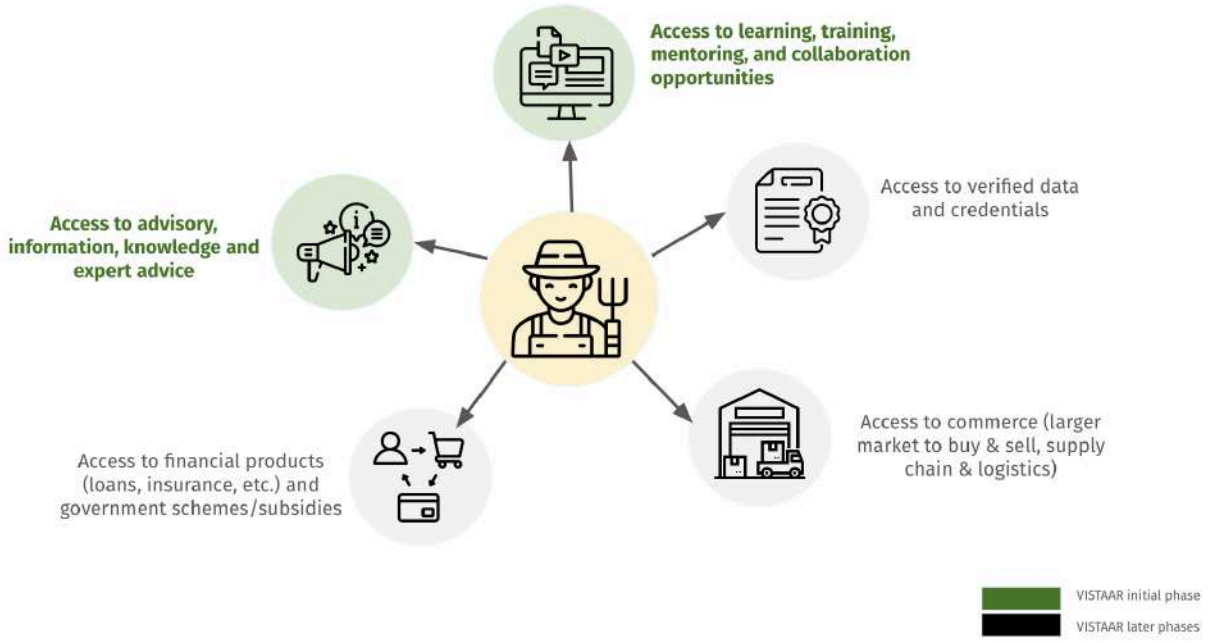


Figure 2 : Unlocking future possibilities

11. Conclusion

VISTAAR will not just be a catalyst for innovation in the country; instead, it will be a transformative force that will redefine the future of agriculture in our nation. By elevating farmers, embracing technological advancements of the current age and future, and fostering collaborative growth with the power of an 'ecosystem-driven' approach, VISTAAR will benefit all stakeholders in the Agri-value chain in India.

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