

India Digital Ecosystem of Agriculture and Agristack: An Initial Assessment

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Abstract

Creation of an Agristack has now, for some time, been identified as a necessary step for the realisation of the potential offered by Digital technologies and ICTs in Indian Agriculture. In order to create Agristack, the Indian Agriculture Ministry is in the process of finalising the “India Digital Ecosystem of Agriculture (IDEA)” which lays down a framework for building Agristack. The IDEA Ecosystem shall help the Government in effective planning towards increasing the income of farmers in particular and improving the overall efficiency of the Agriculture sector. In the process towards building the Agristack, the Ministry is undertaking pilot projects in collaboration with leading technology companies and ‘Agtechs’.

We summarise both the IDEA initiative and the pilots in this paper. We find that the IDEA ecosystem and the pilot projects are welcome initiatives. However, owing to some concerns around data and individual privacy that have been raised as well as the efficacy of solutions and the significant involvement of the private sector, continued transparency in all matters would serve the best interest of all concerned. It is hoped that the government adopts a consultative process with all stakeholders to resolve the genuine concerns. It should also seek continuous feedback of these initiatives through third party evaluations and independent studies so that a robust digital ecosystem in Indian Agriculture can be established that benefits the Indian farmer.

1.0 Introduction:

The rapid development and deployment of digital and information and communication technologies in almost spheres of the contemporary economy is evident. These technologies are also being developed and deployed in the Agriculture sector. In India, there has been a deeply articulated need for an Agristack (a dynamic, public (with individual privacy protected) and open database of farm, farmer and crop grown, to spur innovation in Indian Agriculture on the lines of the Indiastack (Round Table on Leveraging ICT to Accelerate Indian Agriculture, CSD, 2020). The Government of India is deliberating on an India Digital Ecosystem of Agriculture (IDEA) framework. IDEA lays down the architecture for the federated farmers' database (Agristack) that is being built by taking the publicly available data as already existing in various schemes and linking them with the digitized land records (PIB, 2022). The vision of IDEA is, "To build a National Digital Agriculture Ecosystem, to elevate Indian Agriculture Sector to higher levels of efficiency and productivity, and to improve the welfare and income of farmers" (Consultation Paper on IDEA, 2021). The IDEA framework would be the foundation to build innovative agri-focused solutions leveraging emerging technologies to contribute effectively in creating a better Ecosystem for Agriculture in India. This Ecosystem shall help the Government in effective planning towards increasing the income of farmers in particular and improving the efficiency of the Agriculture sector as a whole. (PIB, 2021)

This paper is for a project that is a Columbia University (New York) - TERI (The Energy and Resources Institute, New Delhi) collaboration. The focus of the project is to study the application of Information and Communication Technologies (ICTs) in various Sustainable Development Goals. The project title is 'Towards a New Indian Model of ICT led Growth and Development'. We first briefly list the salient features of the IDEA as spelt out in a consultation paper circulated by the Ministry of Agriculture, Government of India (MoA) in June 2021. Next, we summarise the 10 memorandum of understandings (MoUs) that the MoA has entered into with leading private players to build the Agristack and to pilot different solutions based on the Agristack. We then list some concerns expressed by different entities around the initiative before concluding.

2.0 The IDEA framework:

The IDEA framework promotes a long-term view of aspects like interoperability, data governance, data quality, data standards, security and privacy, besides promoting open innovation as prerequisites for digital ecosystem building in the context of Indian Agriculture. The IDEA initiative aspires to place the farmer at the centre of the agriculture ecosystem leveraging open digital technologies.

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Some of the aspirations/objectives/salient principles/features articulated in the National Digital Agriculture Ecosystem/IDEA include:

- To provide location-specific and personalized extension services across agriculture lifecycle, with simultaneous protection of privacy of personal data so that the farmer can take an informed decision on what and how much to grow and when, where and at what price to sell
- To build capacities across the gamut of digital agriculture and precision agriculture
- To promote adoption of standards for interoperability and seamless exchange of information across ecosystem, while ensuring that the digital rights are properly managed
- To give a fillip to R&D and Innovations in agriculture through access to high-quality data
- To formulate and leverage PPP frameworks for realizing the ‘power of the digital’
- Cloud first approach wherein the framework stresses on adoption of the principle of Cloud First or Cloud-by-default and leverage the full range of benefits offered by the cloud technologies
- Mobile First Approach wherein the delivery of all digital services is designed through mobile by default
- There should be little lag between the significant amount of cutting-edge knowledge on new crop varieties and crop management methods generated by the well-established network of Agriculture Universities, Research Stations, and the specialized research institutions of ICMR, and its widespread use by the farmers. IDEA suggests to use a ‘Lab-to-Field’ modular building block in the framework to achieve this
- To facilitate large number of innovative solutions useful to the farmers and market players around real time data on prices of agricultural commodities across the country and abroad

The IDEA approach lists the following 6 major areas as Value-added & Innovative services. They are:

- Crop Planning (Macro and Micro Crop Planning)
- Cultivation (Smart Farming As a Service)
- Supply Chain (Logistics)
- Market (Market connect)
- Quality (Quality Testing, Traceability)
- Data (Data exchange)

As far as the implementation of the IDEA framework is concerned, the major guidelines suggested are:

- IDEA is proposed to be implemented on a mission-mode, by establishing a National Mission on Digital Agriculture (NMDA) with a dedicated team of experts. An

autonomous and professional wing within the just-established National Farmers Welfare Society.

- An effective PPP Framework will be formulated after co-designing it with the private sector. The framework should allocate responsibilities, risks and rewards between the public and private sector
 - i. A three-year action plan may be developed for implementing IDEA across the country. The plan may specify the milestones, deliverables, and timelines. The action plan may include the following:
 - i. Establishment of National Mission on Digital Agriculture (NMDA)
 - ii. Design and development of Federated Architecture of IDEA
 - iii. Design, development, and implementation of IDEA Core
 - iv. Assessment of legacy systems of Centre & States for conformance to IDEA Principles and Architecture and enhancing the same to conform.
 - v. Design and notification of Policies on Security, Privacy and Consent Management and Data Sharing, in consultation with States and Industry.
 - vi. Establishing UHID system and publication of relevant APIs
 - vii. Design, development / enhancement of IDEA Common Applications
 - viii. Formulate appropriate Central Sector Scheme for IDEA
 - ix. Establishing a dedicated institution for setting IDEA Standards
 - x. Notification of PPP Framework for implementation of various components of IDEA.
- An impact assessment framework may be designed to assess the outcomes and impact on the targeted beneficiary groups

Further, MoA identified and invited certain companies from the private sector (well-known Technology companies/Agritech Startups) as well as publicly invited proposals for pro-bono collaboration to develop Proof of Concepts (PoC) based on the federated Farmers' database. These 1 year pilot projects, to be implemented through memorandum of understandings (MoUs) between the respective company and the MoA will help in understanding solutions that can be built using available data. Out of these pilots, the ones which are found to be relevant and beneficial to the farmers will be scaled up at National level (PIB, 2021). In fact, the reference to the launch of a scheme in PPP mode for delivery of digital and hi-tech services to farmers with involvement of public sector research and extension institutions along with private agri-tech players and stakeholders of agri-value chain, in the Union Budget for 2022-23 appears to be a reference to IDEA or the digital mission to implement IDEA (India Budget, 2022-23).

Since the launch of the consultation paper in June 2021, till date, 10 MoUs were signed by the MoA with different entities to run the pilot projects in selected districts in different states.

1. Microsoft Corporation (India) Private Limited
2. Amazon Internet Services Private Limited (Amazon Web Services (AWS))

3. Esri India Technologies Private Limited (erstwhile Esri India Technologies Limited),
4. Patanjali Organic Research Institute Private Limited
5. Star Agribazaar Technology Private limited
6. Cisco Commerce India Private Limited
7. Ninjacart (63Ideas Infolabs Private Limited)
8. ITC Limited
9. Jio Platforms Limited
10. NCDEX e Markets Limited (NeML)

3.0 Summary of the MoUs signed:

Microsoft India Pvt. Ltd.: Microsoft is implementing digital agriculture platform with solutions in farm management and farmer services that can directly help farmers. The focus of their engagement with MoA is to build AgriStack, evolve National Farmers' database, create a unified platform for farmers to provide them end to end services across the agriculture food value chain and enable bringing together the larger ecosystem of stakeholders including MSME's to build solutions for farmers on the common data platform owned by States and Central ministries.

The Agri Platform for Farmers is hosted on Microsoft Azure based Data & Analytics services. It will consolidate agri ecosystem across the value chain (farm to fork) to empower the farmer using Data Analytics. In this regard, 100 villages have been selected and a pilot is being carried out by Microsoft.

Amazon Web Services: Amazon Web Services, has, in the MoU, proposed 'agri solution stack' that aims at offering unified farmer service interface for digital services across agri value chain and creating an innovation ecosystem around digital agriculture. In this regards, AWS intends to offer its cloud services to various solution providers/partners (these would primarily be 'agtechs', startups that apply technological solutions to agricultural aspects) to (mutually decided between the DAC&FW and AWS) to help build and/or pilot solutions across the agri value-chain. The objective of the initiative is to make best efforts at building an effective digital solution stack that can help enhance livelihood of farmers and promote inclusive development of agriculture sector in India.

AWS proposes the following tangibles to create a National Agri Data Stack and Enabling Startups Ecosystem:

- Assist in design of an open and scalable platform approach by leveraging emerging technologies, data science techniques

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- Offer its cloud services platform which includes services related to AI, ML, Blockchain, IoT, Analytics or as may be required for supporting the pilot
- Extend AWS Startups program to the ministry or to an incubator identified by the ministry
- Provide technical training and guidance to the identified startups

Cisco: Cisco is a globally renowned company across Networking, Security, Collaboration, and the Cloud – building the platform for a Digital World. Cisco’s technology forms the backbone of internet infrastructure.

Cisco, along with industry partner Quantela, has developed Agriculture Digital Infrastructure (ADI) solution, which includes hardware and software components for better farming and knowledge sharing. A common software platform – Smart Agriculture Platform integrates the sensors and information available from the MoA and Satellite Data processing solution into one single dashboard providing real time status. Proofs of Concept (POC) have already been implemented in select districts in target states. Key information pertaining to insights on crop forecasting, weather patterns, plant disease patterns, soil quality, moisture content, etc. are being gathered through the POC which are either completed or underway. The insights gathered under these POCs by consolidating information from farms and farmers will be shared by Cisco with MoA and they will play a critical role in the data pool to be created under the National Agri Stack. The POCs will also support creation of an innovative model of gathering insights from Cisco’s ADI and Smart Platform from other states.

Under this MoU, Cisco will conceptualize a Proof of Concept in effective knowledge sharing between farmers, administration, academia and industry in two districts in India, viz. Kaithal (Haryana) and Morena (Madhya Pradesh), as per the MoU. Cisco will support the Ministry of Agriculture by providing the software, i.e. Smart Agriculture Platform, which is part of the Agriculture Digital Infrastructure (ADI), at zero cost. This software is critical for the implementation of the POC

Jio: Jio, which is a large Indian telecom service provider, is also into the business of providing IT and digital services. In the MoU with the MoA, Jio proposes to build/enhance features of ‘JioKrishi’ (Jio Agri) platform. This platform aims to cater to the following agricultural functions and services:

- Enable creation of a data-driven ecosystem for the farmer and farm activities;
- Soil testing and analytics of the soil parameters of farmers’ lands as well as irrigation needs of farmers
- Provision agro advisory to farmers using multimedia like videos etc. and
- Facilitate farmers’ access to agricultural specialists to answer their queries directly

Jio Agri Platform is built with the purpose of digitizing agri ecosystem across the value chain to empower the farmers. It is designed to bring major participants of the Agri value chain on a common integrated platform and drive efficiencies in all agricultural activities and transactions, be it ‘in the farm’, ‘around the farm’, or ‘beyond the farm’. The platform features have been divided into 2 categories i.e. basic and advanced. While basic features use

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stand-alone data on apps to provide advisory, the advanced features uses data from different sources, powers AI/ML algorithms, and gives accurate personalized advisory.

The primary intervention module, i.e., advisory (basic as well as advanced) service will be taken up in first phase and the following key modules will be deployed in 2 districts of Maharashtra, viz. Jalna and Nashik are as follows:

- Farm management Module to digitize farm activities and transactions through the value chain
- Precision farm advisory module for weather, irrigation, pest, disease forewarning alerts and advisory
- IoT advisory platform for Agri and Livestock, to be installed on croplands and cattle to provide personalized advisory using data
- Knowledge management services to ensure integration with various knowledge resources
- Query Management service: Creation of a discussion forum and a panel of experts
- Information and applications for Govt. schemes, to facilitate checking eligibility and applying for government schemes for farmers

ESRI: ESRI India proposes to support MoA in establishing a ‘Nation Agriculture Geo Hub’. This will establish a framework to collect and integrate available geo-spatial information with other associated information, perform spatial analytics, share results & data and deploy dynamic Apps to support policy planning and monitoring requirements.

Under this engagement, it is proposed to execute following activities:

- Establishment & Launch of "Nation Agriculture Geo Hub"
- Creation & collation of farmer and other agriculture data/ services on GIS platform
- GIS based Locust crises monitoring & response system
- Configuring Data and services to create a GIS based web enabled application for information sharing and Spatial Analytics
- Share outcomes of Spatial Analytics in the form of Open Services & Apps - Web Apps, Mobile Apps integrated with Dynamic Dashboards for Planning, Monitoring, and Decision making and advisory

Ninjacart: 63 Ideas Infolabs Private Limited, operating under the brand name Ninjacart, is a technology based fresh produce supply chain company. Its mission is to improve the efficiency of post-harvest logistics of agriculture produce through using technology and thereby create value to all the stakeholders. Today Ninjacart operates in and around 11 Indian cities including Bengaluru, Chennai, Hyderabad, Delhi, Gurugram, Mumbai, and Pune.

Ninjacart will develop and host the Agri Marketplace Platform (AMP), which will enable bringing together of all the participants in the post-harvest market linkage. Design, develop and deploy the AMP in phases, with each phases decided based on technical and market requirements. Ninjacart will develop and host the Agrimarket place platform (AMP) to bring together all participants in the post-harvest market linkage. AMP will try to digitally enable coordination between various players which is essential to successfully operate the market

linkages. AMP seeks to provide for 360° engagement with all the ecosystem players to achieve fork-to-farm flow of information as envisaged in the report of committee to double farmers' income.

Specifically, Ninjacart will,

- Provide technical inputs to different entities that enable the linkages like FPOs, Mandis etc.
- Program Management/ project management towards successful building and execution of AMP
- Implement algorithm driven process to enable the market marking
- Bring forth efficiency through using the latest technology tool like image recognition, ML etc.
- Digital on boarding of different players in the ecosystem like farmers, truck operators, traders, Mandis, retailers etc.
- Take marketing and operations initiatives to successfully run the platform

The locations where Proof of Concept (POC) will be conducted are Chhindwara (Madhya Pradesh), Anand (Gujarat) and Indore (Madhya Pradesh).

Patanjali: The Farmer Registry for Farmers Data & Analytics services will be in built with the purpose of consolidating farmer information across the value chain (farm to fork) to empower the farmer. The Farmer Registry will have provision for partners to build solutions for increasing the income of farmers and a data pool (owned by Agri Ministry & other related ministries) will be created with end-to-end scope of farmer welfare, farm management, and farmer advisory services along with this. GAP analysis for existing Government schemes will be done considering farmers' eligibility for various government schemes & actual beneficiaries. All these will be pooled to build unified farmer service interface. Among first, PoC on farm management and farmer services in 3 Districts Haridwar (Uttarakhand), Hamirpur (Uttar Pradesh) & Morena (Madhya Pradesh) will be conducted.

An app will be developed for farmer advisory for the following:

- Nutrient Profiling of Soil;
- Demographic Details of Farmer's through Digital Support Mechanism with Advanced features of Geo-tagging and Geo- fencing
- Automated Weather Based Alert Services to farmers on Soil reports and fertilizers
- Accurate quantification of the farmer crop and yield
- Organic, Non-organic and mixed Fertilizer Recommendations and its Optimization as per Crop Types (Organic/Non-Organic/Mixed)
- E-Commerce Linkage Opportunity for Farmer's Produce and Consumer Purchase
- Farmers will be trained for using the app.

The following outcomes are envisaged for the MoA:

- Single Dashboard for the summarized information;

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- Accurate quantification of the farmer crop and yield;
- Measuring the crop changing patterns of the farms over a period;
- Suggestive measures to promote specified crops of the farmers;
- Accurate estimates of farmer's income and suggestive measures to double the farmer's income.
- Precise Digital Information of Socio-Economic Landscape of Farmers across India.
- A Single Concise Data Warehouse with Easy Access as per Needs of Governmental Departments,
- Subsidy Schemes, and their Executions;
- Farm ERP and warehouse linkage;
- Apart from this with historical data studies change in cropping patterns will be identified.

ITC: ITC Limited is also engaged in agri business through one of its business divisions called Agri Business Division. ITC proposes to implement 2 proposals as part of their MoU with MoA.

- Customized Site-specific crop advisory for wheat
- Empowering Dairy Farmers with Digitization of Dairy Value Chain

ITC has proposed to build a Customized 'Site Specific Crop Advisory' service with an objective to transform the conventional crop-level generic-advisory to a more customized site-specific crop advisory to the farmers using a digital crop monitoring platform, hosted on ITC's e-Choupal 4.0 digital platform, supported by an on-ground handholding ecosystem. The proposal will be implemented in identified villages of Sehore and Vidisha districts of Madhya Pradesh and support Wheat crop operations through their e-Choupal 4.0 initiative.

The proposal will be implemented in identified villages of Sehore and Vidisha districts of Madhya Pradesh and support Wheat crop operations. The e-Choupal 4.0 platform will have a crop monitoring module for capturing identified agronomy practices, integrate with Govt. platforms like farmers' database, electronic land record database, soil health records database etc. The details of the proposed proof-of-concept to deliver site specific customized crop advisory are as below:

Customized crop advisory will be a combination of— Site/Farm level; Village level and agro climatic zone level practices. The different customized advisory elements that can be provided are:

Customized varietal recommendation: Based on soil type, irrigation facilities and time of sowing, customized varietal recommendations will be provided for wheat varieties.

Customized crop calendar: Based on sowing date and variety, the crop calendar and advisory of key farm operations (inter cultivation, irrigation, nutrient management etc.) can be customized with specific dates for each operation

Pest/Disease Management: Identify biotic and abiotic stress on the site using remote sensing, Pest & Disease forecast, Crop image-based pest/disease identification. Rust, bunt etc. pose major threat in wheat crop.

Advisory on management of terminal heat stress: The proximity to the equator and the popular cropping systems, which involve late sowing of wheat, expose wheat to high temperatures (exceeding 35-degree Celsius) during grain filling.

Nutrients management: Soil tests, along with data about preceding season (captured on mobile app) can help provide site-specific nutrient management.

Irrigation Management advisory: Location specific irrigation advisory based on the critical stages of crop and weather patterns.

Rainfall forecast based advisory: Untimely, unseasonal rains during harvesting are detrimental to wheat crop. Depending on the rainfall forecast in the village, each farmer can be advised to take up or avoid specific practices in line with their customized crop calendar.

Customized Harvesting: Harvesting advisory based on variety, sowing time and weather condition, to help farmer saving post-harvest losses. Harvesting time is very crucial in wheat. If harvesting is done early than percentage of mud balls increases and affects crop quality. If harvesting is delayed than overripe wheat crop will lead to losses as grains see 'shattering'; they fall on the ground the moment an overripe plant comes in contact with the cutter bar of the harvester. Also broken grains percentage increases.

Market Linkage: Variety wise prices of mandis in proximity to wheat farmers and procurement prices of ITC for nearest purchase center will be provided through digital platform.

They would implement the above based on relevant datasets from the government, weather data, remote sensing (satellite feed) and soil health data. The site-specific advisory can be disseminated to the farmer on multiple channels depending on the criticality and nature of information. The various dissemination channels can be Mobile App, through SMS, Call centre and also On-ground, smartphone-enabled agri extension team.

Agribazaar: As part of its MoU with MoA, Agribazaar will implement its platform for farmers to integrate the entire agri ecosystem across the entire district. Various stakeholders at State & local authority levels shall be given conditional access to the platform, thus integrating the entire Agri ecosystem across the 3 pilot districts – Kota (Rajasthan), Guna (Madhya Pradesh) and Mathura (Uttar Pradesh).

For post-harvest scope, the platform is already integrated with eNAM and will further have provision to provide access to other digital marketplaces to reach out to farmers. The specific activities will include:

1. Farmer data sanitization for Agristack for selected districts:
 - a. List of farmers from three schemes namely: Pradhan Mantri Kisan Samman Nidhi (PMKISAN), Soil Health Card (SHC) and Pradhan Mantri Fasal Bima Yojna (PMFBY) & others, shall be compiled and compared with the land records data.
 - b. The compiled data will be standardized as per the LGD nomenclature
 - c. The records having mismatch with the LR data will be shared with DAC&FW and/or local authorities for validation and field survey
 - d. Field data received from the local authorities will be updated with the compiled data to create clean, unique, standardized, verified data for Agristack.

2. Agri land profiling & crop estimation using Soil Data and Remote sensing technology
 - a. Land cover mapping:
 - b. Soil degradation mapping:
 - c. Crop Identification & acreage estimation
 - d. Crop yield & modelling and production estimation – to help with crop cutting experiments (CCEs) for yield estimation and insurance purposes also
 - e. Past and current weather data analysis

3. Generalised advisory platform for farmers, including mobile app for Farmers with following advisory services to farmers
 - a. Pre-harvest advisory: Weather advisory, soil preparation, crop management, monitoring of crop health
 - b. Post-harvest advisory
 - i. List of APMC yards and distance from farm gate for farmers
 - ii. Current and past arrival & price trends of the commodities
 - iii. Rates on commodity exchanges and list & location of delivery centers
 - iv. List & locations of warehouses with capacity & storage charges
 - v. List of eNAM or any other e-market delivery centers, arrival & rates Information
- c. Marketplaces
 - i. Integrating all digital marketplaces for Agri commodities & agri inputs
 - ii. Providing single log-in access to all farmers to the integrated marketplaces
 - iii. Enabling farmers to list trade on the marketplace or participate in any listed trade
 - iv. On-boarding functional FPOs functional for buying Agri Inputs or sale of farm produce
- d. Access to financial assistance
 - i. Develop a platform to connect farmers directly to the financial institutions.
 - ii. Facilitate e-KYC, land use details of the farmer's land for past 1-2 years, crop health assessment report, current crop risk assessment for overall credit assessment
 - iii. Access to farmers to the list of financial products offered by the financial Institutions and allowing farmers to raise request for any particular product from any of the financial institutions.

NeML: NCDEX e Markets Limited (NeML) is the leading National Spot Exchange in India. It works with domain experts and offers trading platforms for trading in a host of commodities, both agricultural and non-agricultural to various market participants, primary producers including farmers, traders, processors etc. These trading platforms combine technological efficiency and market friendly trading features in a transparent atmosphere to make trading a rich and rewarding experience. With a national presence, the company has pioneered breakthrough initiatives like Mandi Modernization Program (MMP), e-Pledge, and e-marketing. (PIB, 2021)

NeML's four services namely Market Linkages, Aggregation of demand, Financial Linkages and Data Sanitization will serve as a foundation to build innovative agri-focused solutions by leveraging technologies to contribute effectively towards increasing the income of farmers and improve farm efficiency/efficiency of the Agriculture sector in the. The project will be rolled out in three Districts / States, viz. Guntur (Andhra Pradesh), Devanagere (Karnataka)

and Nasik (Maharashtra).

NeML will deploy their online platform for FPOs to run their (FPO) operations. NeML trading platform with physical infrastructure offers FPOs to setup their own markets to enhance the income of farmers. They will provide assistance in the following tangibles:

- Current and past arrival & price trends of the commodities
- List & locations of warehouses with capacity and storage charges
- Rate information on commodity exchanges and list & location of delivery centres.
- Facilitation of bulk purchase of inputs directly from companies and/or distributors and further distribution to member farmers at reasonable
- Sale/ disposal of commodities Enabling farmers/ FPOs to list trade on the online marketplace or participate in any listed trade.
- Procurement of Commodities offers online and transparent e- procurement platform that provides an end-to-end solution for procurement from farm-gate until its storage in a warehouse and its selling.
- NeML has a financial linkage module called 'ePledge' that links the client, warehouse and bank together to enable an electronic pledge against the deposited commodity. ePledge assists in funding support leading to FPO system strengthening motion through market linkages.
- List of farmers from Government schemes (run on NeML platform eKisanMandi, eSamriddhi) and other procurement schemes shall be compiled and compared with the land records data, wherever available. This will help farmers in getting historical crop records reducing the risk management.
- Data will be updated to create unique, standardized and verified data for the National Agri stack.

3.1 Common elements in the MoUs:

Certain common points appear in multiple MoUs among the 10. They are listed below:

On its part, the MoA would provide required data sets to the respective companies by engaging with concerned authorities for the initiative; however, data security and ownership of data will reside with the MoA.

All MoUs are on the basis that each Party will bear its own costs and expenses incurred in connection with the performance of its obligations under this MOU and any other matter relating to this MOU.

Other common points:

- The company will provide required tools technologies to build Farmer Platform with infrastructure, Devops, Collaboration Suite, Blockchain, IoT, Analytics, AI, ML and as required and mutually agreed between the respective company and the MoA.
- Subject Matter Expertise (SME.) to evolve the proposed initiative.
- Provide technical expertise as required towards enablement and capacity building of stakeholders and officials of various groups involved during the journey of evolution.

- Program Management/ Overall coordination towards successful building and execution of the proposed initiative and running project governance.
- Presentation of solution capability to be made to Ministry and concerned stakeholders
- Thought leadership Paper on different cutting edge technologies in Agriculture with Ministry
- Conceptualize PPP model with ministry, states, and other stakeholders for national launch and farmer communication strategy to make the entire initiative self sustained and growth- oriented.

4.0 Concerns around IDEA and Agristack:

There have been some concerns also raised regarding IDEA and the Agristack. ‘The introduction of AgriStack compromises farmers’ privacy as without a stringent data protection law, it will be challenging to establish liability for a data breach of the collected, used, and stored data’(Bhardwaj and Pande, OHRH, 2021). Some other prominent concerns identified are around ‘Data Sovereignty and Farmers’ Consent and a stronger consent framework to protect economic interests being necessary by giving farmers better control over their data. Any system that uses a person’s data must have that person as a stakeholder in the decision-making and governance process of that system. With no data protection law in place, this exercise is taking place in a legal vacuum, with no protection for the interests of the farmers whose data is being used’ (kisanswaraj.in/2021).

5.0 Conclusion:

It is hoped that farmers will receive various kind of support from the pilots to be conducted as part of the MoUs which we have described above. Some solutions which may emerge with help of these pilot projects could be: Farmers will be able to make informed decisions about which crop to grow, what type of inputs and seed varieties to use, time of sowing and best practices that can be adopted to maximize yield. Farmers can decide whether they should sell right after harvest or store their produce. Precision will increase in agriculture and farming will move towards being smart farming leading to resource use efficiencies for farmers.

At the same time, it appears that there is no absolute clarity on the modalities of both IDEA and the Agristack. Given the context, however, the references to thought leadership in multiple different MoUs reflect a step towards understanding technological solutions and learning by doing. It is indeed a progressive step towards engaging the government machinery with cutting edge initiatives in the rapidly developing technological arena. Hence both IDEA and the pilots being undertaken are welcome. The important thing is that given the huge importance of the Agristack as well as the IDEA framework for Indian Agriculture, once these pilots have completed a year and are over, as planned now, an independent third party evaluation must be commissioned by the MoA to evaluate the performance of these solutions, particularly to the end farmer-user. Also, concerns around the issue of privacy and sharing of data belonging to farmers should be resolved comprehensively in consultation with all stakeholders. It is also hoped that at the end of the these pilots, clarity emerges on the implementation of the IDEA framework, the Agristack and implementation aspects of solutions for Indian Agriculture based on IDEA and Agristack. Finally, given the dynamic nature of digital technologies, a nimble approach is suggested in implementing IDEA.

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