



Impact of Digitizing Agriculture Farm Operations on transforming Indian Agriculture Production and increasing farmer's Income

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An Indian Perspective: What does emerging technology (5G-AI-IOT) means to us?

- Sustainable telecom & service delivery infrastructure to deliver all kind of services to all citizen and their assets everywhere, always, secure and affordable
- “Digitization” of everything related to our socio-economic life including of our personal assets with full safety of assets and security of credential.
- Only hope of Provisioning of Urban Amenities to Rural Area (PURA)
 - Governments have failed to provide (quality health, education, business avenues) to its Rural citizen mainly due to lack of adequate budget.
 - Emerging technology is coming to our rescue to deliver the quality services remotely through advance network and associated capability
- Ensure early realization and adoption of Digital Economy, Digital Governance, Digital-Identity, Smart-Cities, Smart-Village, Smart-Utilities, Smart-Transport --- Increased rural contribution in GDP !!
- Farmer profit (not just production) to be doubled by 2022 !!
 - Digitization of non-production farming operations.
 - Digitization of Agriculture production farm operations

Solution Objective for Agriculture Transformation

- Digitization & Monitoring of farm operations
- Collaboration among stakeholders for better productivity and profitability
- **Reduce pressure on natural resources and farm revenues**
- **A substantial part of the existing knowledge (specially, ancient natural farm practices with scientifically proven results) and its underpinning information flows has yet to be exploited to its full potential.**
- **The resulting performance gap has strong social, ecological and economic implications.**
- **Address interoperability and lack of openness of different technical systems**
 - An enhanced interoperability would allow for increased data sharing and the resulting knowledge generation.
- **Address lack of information on the effectiveness of new technologies**
 - which slows down their take up.
- **Building platforms integrating different technologies like Internet of Things (IoT) devices, cloud, photonics, networks, geo-localization and robotics combined with applications based on data analytics and knowledge management.**
- **Reference architecture, semantics technologies and standardization framework to demonstrate communication exchange of data across different systems and platforms.**
- Hence, Develop **decision support systems** for farmers and agi-ecosystem

Multi-Actor Stakeholders & System Inputs

- **The Multi-actor stakeholder landscape**
 - The natural resources of the Earth including soil, crops, livestock, water, and air
 - Agricultural Industries (Supplies), Farmers (producers), distributors (logistics providers), consumers & markets; Regional Authorities & Policy makers
 - Agricultural and environmental scientists, Modelers of the systems, knowledge engineers and software developers/integrators
- **System Inputs**
 - Sensors continually sensing the Earth, crop progress, storage & transportation environment
 - Tacit knowledge existing in the minds of farmers, but also in the form of current best practices for agriculture
 - Agriculture extension procedures/guidelines that have been developed by agriculture scientists based on their extensive scientific research and have not been able to reach out to the farmers effectively
 - Mathematical models and advanced algorithms for Supply Chain Management including Demand Forecasting, Production Planning, Inventory Control etc.

Need for extensive collaborative research between experts of Computing, Communication, Devices, IT Systems, Agriculture, Data Science and Agriculture Regulators and Policy Makers

Leverage 4G/5G Access, AI, IOT & Digitization of Farm Operations for..

- Setup Multi-disciplinary national framework of study
 - Study inter – related parameters (Soil, Water, Crop Growth Enhancer) ensuring optimum balance of environmental resources.
- Evolve “KISAN Call Centre 4.0” :
 - Agriculture Experts reaching out to farmers in suitable evolved business model of association.
 - Addressing any interim or major problems that may come up during the entire crop life cycle
 - Selection of crop, variety & seed source
 - Production methodology (conventional/ chemical free organic/natural farming)
 - Specific operation management practices (e.g., sowing, irrigation, application of fertilizer, growth promoter, weed/pest control) during the growing season, to its harvesting, storage and sales
 - Without diluting on farmer’s ownership on his farm enterprise.
- Develop alternate market for better returns to farmers
 - for global reach
 - connecting consumers with the farmers

Digital Technologies Ready to Achieve

- Agriculture Digital Platform for determining actual cost of production, productivity and profit as experienced by farmers
- Usage of smart sensors for online monitoring crops health progress and the soil condition
- Reducing “Time to Adopt” new seeds by farmers
 - Collaboration between farmers and Seed Breeder
 - Extensive use Digital Platform & Crop Health Monitoring
- Create online framework of “Soil Status Profile”
 - Innovative and Complex application of ML and Sensors
 - Agriculture Production Quality Assurance & Quantity Estimates
 - Regulatory Intervention for Chemical-Free production growth
- Automation of Farm Production Predictive Analytics
 - Soil as the productive asset
 - Automatic creation of “Soil Status profile” and associated actions
 - Digital description of the crop for all possible seed & geographic options
 - Farm Operation advisory based on available online crop status & weather forecast
- Establishing Trust of Certified Organic farm production and sustaining it all through the supply chain
 - Online monitoring of the “Soil Health Status” of certified chemical free farms
- Knowledge representation of “Natural Farming Practices (NFP)”
 - delivery of systematic guidance to farmers adopting NFP based chemical-free farming
 - Create alternate market for organic produce

Enabling Technology for Creating online Soil-Health-Profile



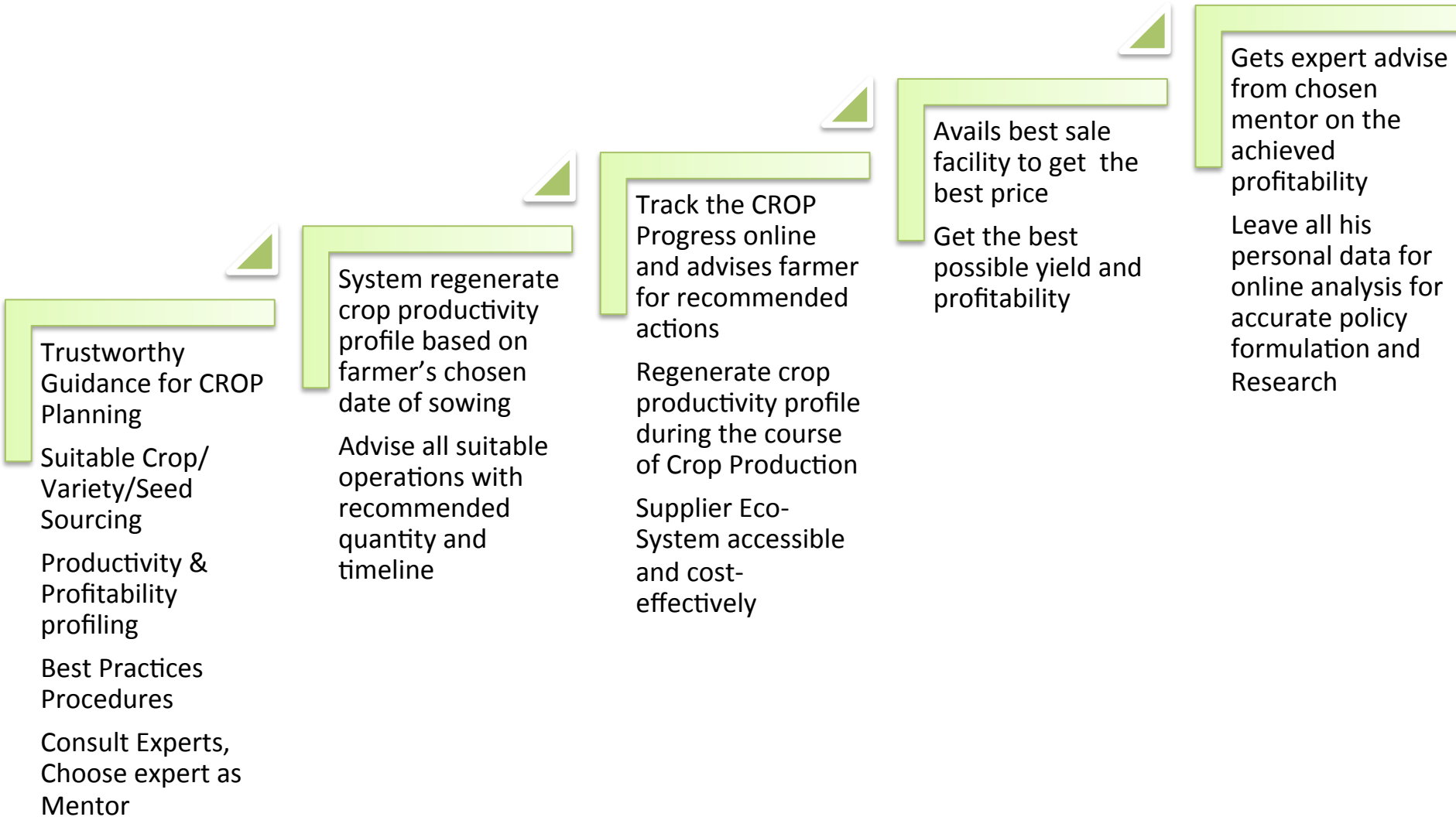
COMPREHENSIVE Wireless SOIL PROBE 26 sensors beaming microclimate and soil data

Microclimate SURFACE	Air Temperature Humidity Light
Soil Sensors 6IN, 18IN, 36IN DEPTHS (15CM, 45CM, 91CM)	Soil Moisture Salinity Soil Temperature pH Nitrate Potassium Phosphorus
Gas Sensors 18IN / 6IN DEPTHS (45CM / 15CM)	Aeration (O ₂) Respiration (CO ₂)

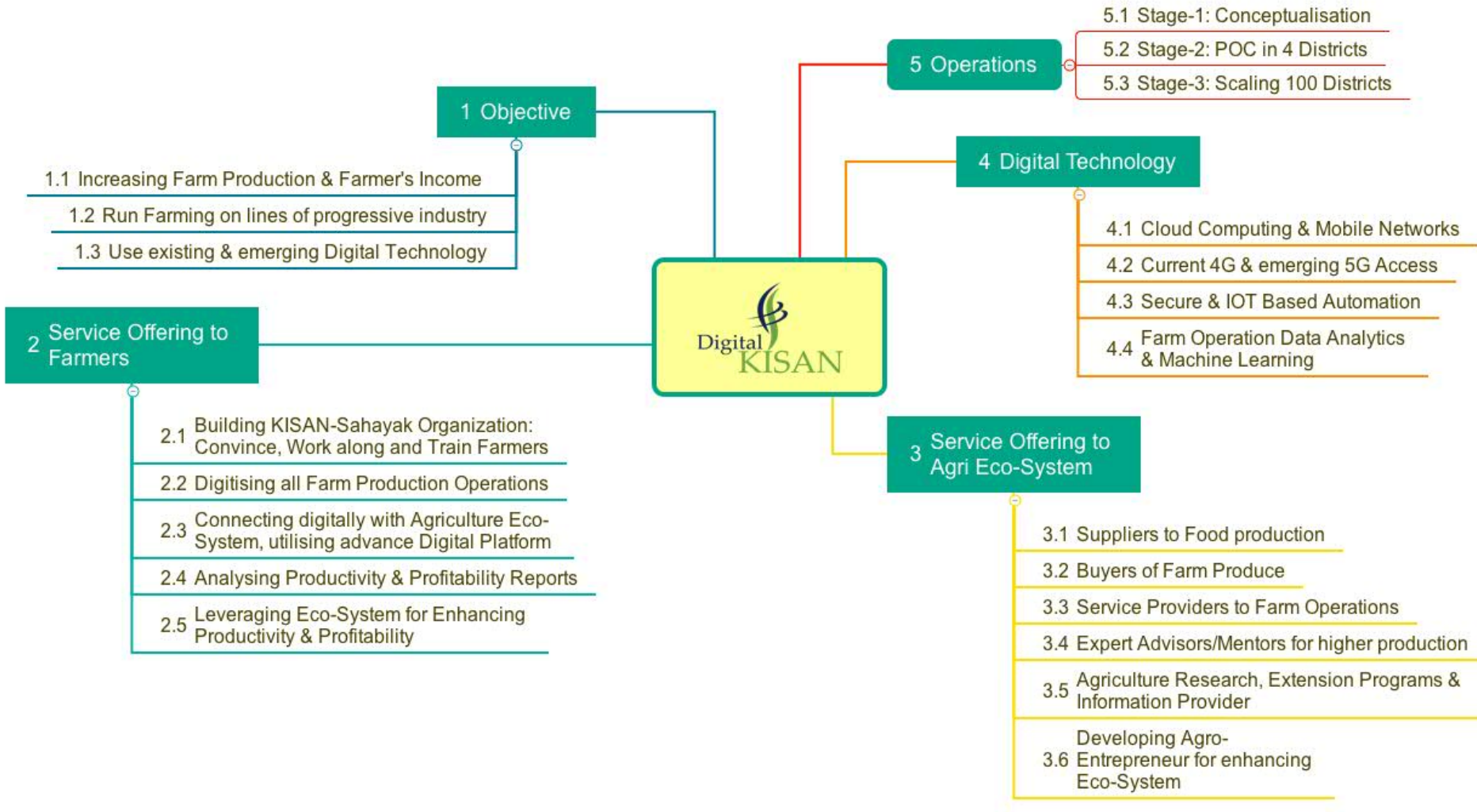
Source: <https://teralytic.com/probes.html>

Developing sustainable IOT Infrastructure & ML Prediction Model for creating online Soil Health Profile is a good problem to attempt

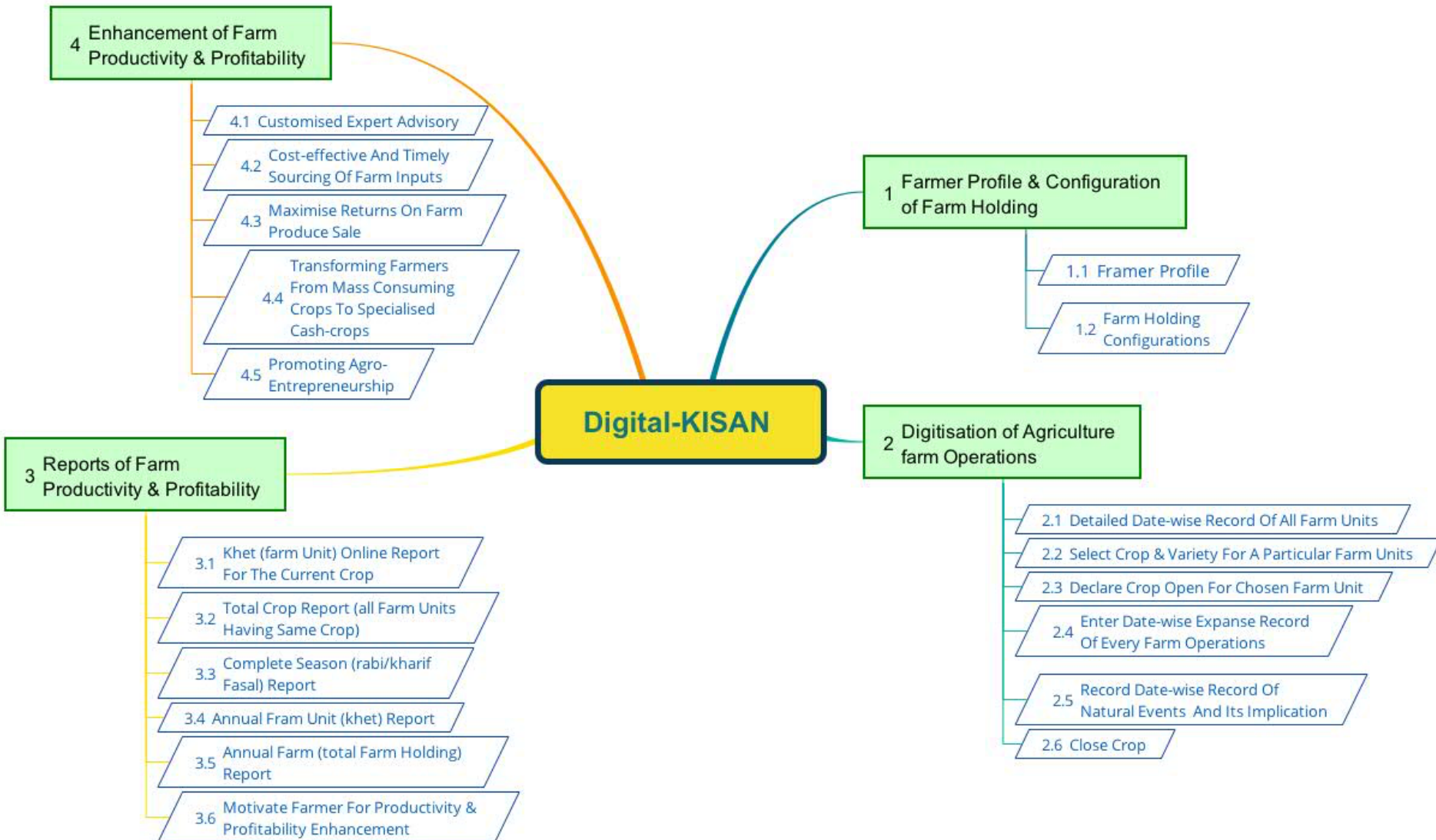
Indian Farmer expects from the System



i2TB Initiative of Agriculture Digital Platform



Agriculture Digital Platform Functions



Digital Technology Intervention for Promoting Natural Farming Practices

- Forming Farmer's Self help groups adopting NFP and putting them on Agriculture Digital Platform
- Knowledge Dissemination about NFP by expert organizations like SSIAST.
- Connecting new NFP farmers with experts and already successful farmers to make up their mind to drop Chemical usage
- Creating effective community of NFP farmers and the consumers
- Enhanced trust about NFP products among consumers
- Systaltic & Absolute visibility in farm operational practices adopted by certified farmers adopted NFP.
- Net Benefits:
 - Reducing cost of production,
 - enhancing the quality for produce
 - Enhancing Quality of Soil
 - Higher returns on Direct market
 - Success stories to reach& affect other farmers faster

Rural Connect

250,000

No of village blocks BharatNet aims to connect through optical fibre cable

March 31, 2019

Deadline for the project



121,652:

No of gram panchayats connected

301,154 km:

OFC layed as on Dec 2



116,411: No of gram panchayats where OFC laying & equipment installation is completed

39,359: No of gram panchayats where WiFi hotspots have been installed



10,775: No of panchayats where service is being provided

Planning Index: 0.4

Assets Connectivity Index: 0.25
(Assumed)

Fiber Equipment Installation Index: 0.5

Wi-Fi Hotspot Installation Index: 0.33

Hotspot Operational Index: 0.25

AI Potential Index (Today)

$$= 0.4 \times 0.25 \times 0.5 \times 0.33 \times 0.25$$

$$= 0.004125 \text{ or } \mathbf{0.4\%}$$

AI-IOT-Digitization Potential Example

	1 Family Monthly Exp. INR	1 Family Annual Exp. INR	1L Family Exp. INR Crs	Farmer Share INR Crs
Poisonous	8,000	96,000	960	240
Organic	20,000	2,40,000	2,400	1,800
Difference	12,000	1,44,000	1,440	1,560

Agriculture Digital Platform & Trust created by AI Techniques ! Direct Benefit to Farmer !!

Total No of Villages: 641,000

What is inadequate, Planning or Implementation?

Connectivity Objectives:

All villages or GP?

All Citizen or Tele-density?

Only Citizen or & their Assets

Which Assets of Rural Citizen?

AI & IOT need Connected Assets

If Rural Citizens and their Assets are not connected!

“AI Divide”

Rural Citizen is deprived of Opportunity!

Nation is deprived of Growth!!

Thank You

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