

Government of India Policies Enabling Adoption of Smart Digital Tools for Atmanirbhar Bharat

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Abstract

Agriculture is the backbone of India's economy, directly supporting 55% of the population and contributing 18% to the GDP. To realize the vision of a developed India by 2047, it is imperative to address challenges such as climate change, resource degradation, and socio-economic disparities while accelerating agricultural growth. This article highlights the pivotal role of advanced technologies such as Artificial Intelligence (AI), Internet of Things (IoT), drones, and blockchain in transforming Indian agriculture. It explores the impact of government initiatives like PM-KISAN, e-NAM, and the Agriculture Infrastructure Fund in enhancing farmer welfare, income stability, and productivity. Agri-startups leveraging digital tools and renewable energy solutions, including solar-powered devices and AI-enabled pest management systems, are driving precision farming and sustainable practices. The integration of digital platforms and policy support ensures transparency, accessibility, and empowerment for farmers. These combined efforts build a resilient agricultural ecosystem, setting the foundation for a Viksit Bharat, where agriculture continues to lead India's journey toward inclusivity, prosperity, and sustainability.

Introduction

The transformation in agriculture and allied sectors is pivotal in making India a developed country by 2047. India is a nation where the heartbeat of the economy is connected with the toil and efforts of farmers. For making our nation truly a Viksit Bharat – a developed and inclusive India, we must rely on spirit of resilience, innovation and hard work. The vision of India to become a developed nation by 2047 needs to gain pace and the economy has to grow at the rate of 8% per year. However, other than the over-mounting population, climate change, degradation of natural resources and land use change, socio-economic and the institutional stressors are the stumbling blocks to the Indian agriculture. According the report of Ministry of Agriculture and Farmers Welfare (MoA&FW) published in the year 2023 agriculture contributes to 18% of the GDP. Based on the Census Of 2011 it has been found out that around 55% of the Indian

population relies directly on agriculture. It is imperative in this regard to increase the income of the farmers so that they can sustain their livelihood.

For enhancing the stability in income of farmers emphasis has to give on strengthening the digital infrastructure. The most significant in this context is providing digital platforms for accessing soil security schemes, the role of IoT, AI in precision agriculture, blockchain technology for managing the supply chain, role of smart digital tools in crop production, crop protection, and distribution. This article highlights the important social security schemes launched by Government of India (GOI) which are accessible using digital platforms, role of agri-startups based on IoT, AI and drones which can help the farming community in carrying out agricultural practices with more control and precision.

Strengthening social security as well as welfare measures is not only an economic necessity but also a moral commitment, which boosts the fostering of bright future for farmers and the nation as whole. The government budgets over the past three years have reinforced the dedication of inclusion of all by strengthening rural economies and bolstering indigenous infrastructure, which forms the backbone of India's villages. The key challenge in this face is ensuring the delivery of social services at affordable costs to economically weaker services at affordable costs. One of the most significant steps towards farmer welfare has been the introduction of income support programmes, the Pradhan Mantri Kisan Samman Nidhi (PM-KISAN). The scheme employs advanced technology to ensure hassle-free access for beneficiaries. The integration of Digital Public Goods such as Aadhar Authentication, Aadhar based payment systems and land records management guarantees that all eligible farmers receive benefits without intermediaries which has ensured transparency. The scheme supports direct benefit transfer of Rs. 6000 distributed in three equal installments every four months. To further enhance the accessibility, PM-Kisan mobile applications allows farmers to complete their e-KYC face authentication and through the mobile application farmers can check their eligibility, payment status.

The role of agri-startups and contribution of AI in the field of agriculture is well-known. Similarly, PM KISAN AI chatbot, Kisan e-Mitra launched recently serves as a path breaking solution for addressing the beneficiary queries in multiple languages which can support all 22 official languages. There are chatbots created by several Indian Council of Agricultural Research Institutes which can cater to different queries of farmers. Tele-Consultation for farmers at the Common Service Centres (CSC) functioning through Krishi Vigyan Kendra helps farmers to get a crop and agriculture related consultation and advice with KVK scientists. For many farmers old age brings an additional burden, especially when they are no longer physically active. Pradhan Mantri Kisan Maan-Dhan Yojana (PM_KMY) provides financial support with a pension of Rs. 3000 per month after attaining age of 60 where the monthly contribution of applicants ranges from Rs. 55 to Rs. 200. The Life Insurance Corporation of India manages pension funds where the beneficiaries are registered through the common service centers (CSC) where the interference of broker or middleman is minimized.

The Rashtriya Krishi Vikas Yojana – Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RKVY-RAFTAR) launched in 2017-18 has focused on enhancing pre- and post-harvest infrastructure promoting agri-entrepreneurship, innovation and value addition. The scheme provides with digital infrastructure for ensuring flexibility to promote value chain management, mitigating risks. Digital India, launched by the government of India in 2015, is a flagship programme aimed at transforming India into a digitally empowered society and knowledge economy. The inclusion of digital platform for Farm Mechanization and Technology is a centralized effort for enhancing ease of doing business. The platform supports application for Direct Benefit Transfer of farm machinery subsidies and streamlining the financial assistance process for acquiring agricultural equipment. The Centralized Farm Machinery Performance Testing Portal allows for the online submission of testing applications and facilitates the monitoring of testing activities and related processes. The FARMS mobile application provides a convenient platform for farmers to rent and hire agricultural machines and equipment, which ensures that they have easy access to the necessary tools. The integrated Scheme for Agricultural Marketing helps state governments manage agricultural produce by

marketing for improved market structures, creating capacity, and providing access to information. During 2017-18, the National Agriculture Market Scheme was included. National Agriculture Market (e-NAM) is a pan India electronic trading system that connects current APMC mandis to form a single national market for agricultural commodities. According the report of MoA&FW, 2024 e-NAM platform has integrated 1389 mandis and over 1.76 crore farmers and 2.5 traders across the nation.

The constat boost by the government of India has encouraged various start-ups to invest in agricultural sector. There are several drone manufacturing companies which produce agricultural drones where the 95% of the spare parts are produced indigenously. One such game changer drone in smart farming is IoTechWorld's Agribot. IoTech World develops nearly all components in-house including motor propellers, AC power distribution boards, flight controllers, ground control stations, radar, pumps and more. The startup offers two categories of drones: small and medium. With the help of 4G network drones can transmit data to cloud, allowing users to monitor their drones on a dashboard. The famed point about the drones is the smart-range battery and unique, patentable failsafe features. For collision avoidance they utilize radar technology that not only detects obstacles but also navigates around them. Another such startup in this regard is Fuselage Innovations which provides with crop-spraying drones. The crop spraying drone known as FIA QD10 offers tracking devices to monitor drone performance. Another drone designed for surveillance purpose named Nireeksh has a multispectral range of sensors that capture plant data and process it into 2D and 3D maps. These maps are further analysed to create index maps such as vegetation index data, allowing visualization and understanding of crop growth stages and stress levels.

The harnessing of solar energy as renewable source of energy is pivotal in agriculture and allied sector activities. One such startup that in that line up is ThinkRaw India Private Limited. Their product integrates IT and solar technologies. Dhivara Mitra addresses aquaculture challenges by using IoT and solar power to manage feed distribution, dissolved oxygen levels, and pH level in water bodies. Additionally, they have developed Krishi Dhanu, a solar powered portable device designed to dispense solid fertilizer in the agriculture sector. Dhivara Mitra is a floating vessel equipped with 1.1 kilowatts of solar powered off grid

power. It offers comprehensive aquaculture functionality. It regulates feed distribution, pH levels and aeration, ensuring optimal fish and prawn harvesting. Embedded with IoT sensors, it provides real-time monitoring of the dissolved oxygen and pH levels of the water body and alerts farmers in case of any imbalance. For agriculture purpose, Krishi Dhanu a solar powered portable device that simplifies solid fertilizer dispensing. Unlike traditional methods involving manual spreading or spraying. Krishi Dhanu directly dispenses solid fertilizer. It operates with two motors for grinding and dispersing the fertilizer and includes a moderator to control the application rate. The device features an IoT-enabled weighing scale that records and stores data on fertilizer usage and types. It also integrates with crop and soil monitoring applications, providing insights into fertilizer requirements and soil conditions.

The integration of Artificial Intelligence has helped to work on past data to carry out farming precisely using better decision making and adaptation of optimized approach. One such startup that incorporates the use AI in agriculture is AI-Genix. The startup transforms the pest management for farmers through advanced AI-enabled systems that precisely target harmful pests. The innovative approach boosts efficiency and promotes agricultural health by cutting down on chemical usage. The startup provides with three different three products. One is the Smart Ravager which is solar powered and designed for about 1200 genus species of insects and pests. It effectively controls pest populations without harming crops or beneficial farmer-friendly insects. Second product is BraveHawk which is AI-enabled technology utilizes multiple sensors to identify different types of insects, especially herbivorous pests that damage crops while sparing beneficial species. This product comes with two versions one with solar and wind powered capabilities and another with grid power capability. Third product is named as eBionic which is bioelectronics technology focusing on exterminating specific targeted insect species, including various fruit flies, fruit piercing moths, palm weevils' tea mosquito bugs, and cabbage butterflies.

The boom of startups in agricultural sector harnessing smart digital tools is due to fruitful efforts of the policies of the government of India. The Agriculture Infrastructure Fund has been established as part of the

Atmanirbhar Bharat Package to address current infrastructure shortages and mobilize investment in agricultural infrastructure. The fund aims to transform the country's agricultural infrastructure. Eligible beneficiaries include Farmers, Agri-entrepreneurs, Start-ups, Primary Agricultural Credit Societies, Marketing Cooperative Societies FPOs, SHGs, APMCs. The critical role of inclusion of smart digital tools by government of India and also by start-ups is to ensure a platform where the majority of tasks are carried out hassle free. This ensures that a base for prosperous and inclusive India is being constructed. By adopting to digital tools shift towards participatory and empowering models which highlights the government's commitment for social justice and sustainable development can be seen. Ultimately several efforts and initiatives contribute to the end goal of making our Bharat Viksit where farmers are at the center of realm.

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