



# Agri Articles

(e-Magazine for Agricultural Articles)

Volume: 04, Issue: 06 (NOV-DEC, 2024)

Available online at <http://www.agriarticles.com>

© Agri Articles, ISSN: 2582-9882

## Transition of Extension Advisory Services

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Agriculture is considered as the backbone of economies in many countries and it acts as a source of strength for food security all over the world. As many countries in the world have experienced economic development in their transitioning economies, with this development the demand for food products has been increased and shifted with a greater focus on high-value crops like fruits and vegetables as well as livestock and fishery products. This has led to a change where agriculture should shift from the traditional method of crop production/ management to a modern practice by using digital technologies in crop production and management. These technologies may include precision agriculture technologies, remote sensing, and GIS technologies. This journey of shifting from traditional to digital agricultural practices has been triggered by technological advancements, societal needs, and climate challenges. With this scenario of changing food demand, to bridge the gap between farmers and innovation as well as to assure the sustainability, the extension system has shifted their focus towards developing a new range of organizational, technical, and management skills. These skills are important for farmers to take advantage of changing market demand for both staple and high-value food items. Some important digital agricultural technologies are:

### Using satellite imagery and GIS for boosting agricultural management in India

Aerial imagery has been used in agriculture but particularly limited to certain areas. This remote sensing technology is extensively used in India to monitor and predict environmental states that involve droughts and floods, forecast harvests as well as measure the health of crops. To assimilate satellite data into farming practices, the Indian Space Research Organization (ISRO) works with agricultural organizations. So, to ensure the stability of agricultural production, a platform like the 'Bhuvan' portal provides very important services that include crop health alerts, monitoring the drought at any place, and advice on fishing zones. Remote sensing will be capable of recognizing the problematic regions along the large agricultural fields through these satellite images which will allow specialized treatments. For instance, remote sensing can tell regions with pest infestations or having water shortages. This allows water, fertilizers, and pesticides to target effectively areas where wastes may be observed but with minimal harming of the environment. Furthermore, geographic information systems enable better farm management through full mapping of soil types, water supply, agricultural patterns, and infrastructure. Such insights inform resource management and land use planning for sustainable farming methods.

## Precision Farming for Improvement in Productivity and Resource Management for Sustainable Agriculture in India

Precision agriculture, has followed on with the great adoption of sensor-based systems in India to monitor soil and crop health. In order to enable farmers to make well informed decision on crop management, fertilization, irrigation and temperature these sensors monitor the factors such as moisture, pH, nutrients, temperature, and humidity. In addition, research in nanotechnology has produced sensors that identify even more tiny abnormalities in soil, improving farming sustainability. The industries are furthermore switching on the automated technology which possess drones and robotic tractors, that involve in labour intensive activities such as planting, weeding and spraying with ease, without damaging productivity or increasing environmental effect. The extension advisory service bridges the gap between the future landscape of agriculture driven by technology, climate change and market demands and farmers by ensuring that new technology is accessible, comprehensible to them as well as used on their farms which requires training, tailor-made recommendations for specific conditions, promotion of sustainability practices and capacity building (knowledge transfer) among farmers. These digital tools satellite imagery, remote sensing and GIS technologies, and precision farming techniques must be integrated in ways that farmers understand (and how to apply them) through the transformative role of extension advisory services.

### Extension advisory services a shift from traditional ways to digital technology

The agriculture extension in India has experienced a significant transformation with the introduction of digital technology over the last decade. We are aware that the world is moving so fast into digitalization, and agriculture is catching up to adopt such technology-driven solutions by upgrading productivity, knowledge dissemination, and access to market. Conventional agricultural extension methods, that largely relied on face-to-face interaction and print media, are giving way to more life- giving and interactive digital platforms. These platforms are very effective at reaching a large number of farmers across diverse regions at a very short interval of time, which enables them to access more relevant and timely information, helping farmers to improve their farming practices.

The *Kisan Suvidha* mobile application is one of the prominent digital platforms for agricultural extension in India that was introduced by the Ministry of Agriculture. This app provides important information regarding weather updates, market prices, agricultural advisories, and plant protection tips to the farmers. This app will give farmers the whole real-time information that directly impacts their crop productivity and profitability for better decision- making.

However, the other online interface through which the farmers and the extension workers and the researchers communicate with each other is *e- Krishi samvad*. It is a platform that will provide the space to the farmers so as to take the experts advice on various farm-related issues such as the crop selection, pest management, oil health, etc. It acts as a bridge between the rural farming community and the wide range of agricultural knowledge environments that permit knowledge exchange and collaborative problem solving.

*Digital green* is another creative innovation of digital technology it is a global organization that use the videos that are locally-produced to disseminate the agricultural information to the small holder farmers. These videos are disseminated through social media platforms, which serves as peer- to peer learning and offer an opportunity for farmers originating from similar background to communicate their experiences and depict successful farming practices. This integration of digital technology with the agricultural extension services in India has marked an effective transformation towards the more effective, flexible and understandable support for farmers. The continuous advancement of these platforms can provide an evolutionary opportunity for the Indian agricultural sector. These digital

technologies help farmers to discover the resources, knowledge and support with which they can advance their crop managements, productivity and income.

To summarize the transition from conventional to modern era has given an edge to agricultural production, sustainability and strengthening of farmers. Current techniques are holistic, participatory, research and technology-based for sustainability in agriculture and allow farmers to adapt and improve yield. Agricultural extension services are key to modern agriculture in India and ensure sustainability as well as efficiency of farming, while enhancing the socio-economic status of farmers. Digital technologies have increased the capacity for all these functions, but the digital divide has to be addressed (again). The advantages notwithstanding, agricultural extension is also constrained by a lack of resources, socio-cultural factors and policy-related challenges. This will require innovative and systemic approaches to reform. In the future, agricultural extension would always play its key role in meeting new challenges and taking advantage of opportunities needed to promote increased productivity and sustainability. Much continuity is required to strengthen these services, with adaptation that would be relevantly effective for the changing agricultural landscape in India