

EMPOWERING AGRICULTURE EXTENSION

INNOVATIONS IN DIGITAL AUGMENTATION

The majority of the smallholder agriculture production and profit is characterized by absolute uncertainty, which is often attributed to a lack of system-level resilience, high resource use inefficiency and low agronomic gains. The innovation in empowering farmers and agriculture extension is critical in filling the technological gaps. The demand for site-specific resilient agronomic and agro-ecological practices and timely advisories on crop choice, rotation, water-saving, reducing farm inputs, carbon sequestration and closing yield and nutrition gaps are needed to achieve economically viable and ecologically sustainable agriculture.

Digital technologies are penetrating the agriculture sector rapidly but lack dynamics, granularity, and demand-driven advisory. At the same time, agri-food systems are undergoing a transformation. The systems are marching towards economically viable and ecologically sustainable options for healthy diets, healthy people, and a healthy planet.

Such eco-agriculture transformation requires a systematic characterization of farming system dynamics and farm typology. This must happen at much higher spatial and temporal granularity with real-time analytics and advisory. The data-driven digital augmentation to quantify farming systems and site-specific recommendation on a real-time basis (in-season) is made possible by recent advances in Geo-Agro. These are driven big-data analytics in deep learning intelligence, cloud computing along with smartphone-enabled citizen science. Precision decisions at farm-level are now smarter, efficient, economical and much more useful than ever before. Such a digitalization level helps to address the gaps at multiple levels (e.g., data, soil health, yield, ecology, economy, resilience) for demand-driven agro-

ecological interventions across the scale (e.g., space, time, and package).

The GeoAgro Pro

The leveraging of the latest cutting-edge technological innovation driven by geo big-data, earth observation, citizen science and ICTs made digital agriculture extension possible through GeoAgro Pro. It is a demand-driven digital augmentation platform for accelerating sustainable intensification with a bimodal agricultural extension advisory for targeting site-specific interventions. The GeoAgro Pro is designed to empower extension agents, farmers, cooperatives for on-farm data collection and disseminating in-season advisory services to target site-specific technology interventions for sustainable intensification.



ABOUT THE AUTHOR



Dr Chandrashekar Biradar is a Research Team Leader and Principal Scientist at CGIAR Research Center. Dr Biradar has authored and co-authored over 225 scientific publications and received numerous international awards. He has developed several innovative methods and models for sustainable farming, agro-ecology, and pioneered biodiversity farming for diet diversity

Digital extension is the most viable alternative for smallholders for accelerating agro-ecological transition. This can happen through on-demand analytical services. These aim at quantifying functional domains (farming systems, farm typology, crop rotations), soil and water resources (irrigation, soil moisture, nutrients, carbon sequestration), and drivers (climate, access, diet pattern, socio-economics). The purpose is to target site-specific interventions for accelerating agri-food system transformation.

It also aims to identify a potential niche for scaling across the regions and discuss foster development in the agro-ecology context. The objective is to provide a comprehensive decision support system for transforming agroecosystems for better food, nutrition, soil, and planetary health. It also enables vital services to policymakers. This becomes possible by providing quantitative and spatially distributed information about impacts and tradeoffs for different policy and technological development options.

First bimodal smartphone app for Digitalization of Agriculture with real-time advisories, backed by science-based evidence, field experience, and thousands of research and outreach data points in each season across the agro-ecosystems.

GeoAgro for Digitalization of Agriculture

- Digitalization and precision



fun FACT

I had opted for a career in engineering when a friend gave me a great novel titled *Malegalli Madhumagalu* by Rastrakavi Dr Kuvempu. I was so charmed by the amazing narration of nature in the novel that I quit engineering and joined the Forestry Programme at Sirsi in the lush Western Ghats

agriculture made simple, accessible, affordable and scalable

- Thousands of research and outreach data points in each season across the agro-ecosystems
- Open source near-real-time earth observation data at the field, farm to landscape scales
- The enormous power of cloud

Geotagging can help users find a wide variety of location-specific information from a device. Geotagging-enabled information services can find location-based interoperable data, information, news, websites, or related resources

computing, open access, algorithms, analytics to process data on time Smartphone enabled apps and cloud web-GIS for decision making at the point, farm, and administrative units

How it works

Registration: Register to add your land (farm, field, and parcel) with basic details, then digitize farmland boundary using geotagging and crop details using agro-tagging

Digital Diary: Update day to day activities as a digital daily to keep track of on-farm activities, inputs, and the market access for better advisories and precision decisions

Advisories: Get satellite advisories, digital assistance, and extension advisories and socialize on-farm experience and expertise with fellow farmers via likes, comments, and Q&A.

Geotagging: Geotagging is a simple process of adding geographical identification such as GPS location information (e.g., latitude and longitude) to photos, farms, fields, and surveys. Geotagging can help users find a wide variety of location-specific information from a device. For instance, someone can find images taken near a given location by entering latitude and longitude coordinates into a suitable image search engine. Geotagging-enabled information services can also find location-based interoperable data, information, news, websites, or related resources. Geotagging can give life to the data, location of the content of a given picture or other media or the point of view, and conversely on some media platforms show media relevant to a given location.

Agro tagging: Agrotagging is a process of adding additional agricultural information such as on-farm activities to the geotagged farm, field, photo, and/or geotagged field data such as agronomic practices (variety, date of sowing, harvest, tillage, preceding and following crop, etc.), inputs added (water, fertilizers, seeds), yield harvested (grain yield, biomass) and farm type to which the field belongs, etc.