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DIGITAL EXTENSION SERVICES IN PUNJAB, PAKISTAN

Digital extension services are transforming agricultural extension in Punjab, Pakistan. In this blog, Dr. Muhammad Anjum Ali Buttar illustrates the range of digital applications and how these are supporting farmers in the region.

CONTEXT

Punjab, the largest agricultural province in Pakistan with 12.6 million hectares of cultivated land (57% of the national total of 22 million hectares), accounts for over 70% of the country's agricultural output. This remarkable contribution is facilitated by Punjab's location within the fertile Indo-Gangetic plain, which is blessed with rich alluvial soils, an extensive canal irrigation network, and distinct ecological zones favourable for diverse crop production.

Despite these advantages, Punjab's agriculture sector faces a range of challenges that threaten its sustainability and productivity. Climate change poses significant risks, disrupting weather patterns and reducing crop yields. Soil health is deteriorating due to overuse and insufficient nutrient replenishment, while water scarcity, driven by inefficient irrigation practices and declining freshwater availability, further hampers agricultural growth. Additionally, land fragmentation (5.2 million farms) caused by population pressure and inheritance laws has led to an increase in small, less productive farms.

There is also a significant gap between potential and actual crop yields, highlighting inefficiencies in farming practices and limited adoption of modern technologies. The slow pace of innovation and the underutilization of advanced agricultural methods exacerbate these issues, hindering the sector's ability to reach its full potential. Therefore, effective agricultural extension services are crucial to addressing these challenges and unlocking the full potential of Punjab's agriculture sector.

Promotion of balanced use of fertilizer and drill planting in wheat

AGRICULTURAL EXTENSION IN PUNJAB

The public sector extension in Punjab has undergone significant transformation since the inception of the Training and Visit (T&V) program in 1978. Currently, a robust primary extension setup operates at the Union Council level, catering to clusters of 5-7 villages. This frontline extension workforce comprises Field Assistants armed with a three-year diploma in Agricultural Sciences (DAS).

To amplify the impact of extension services, a hierarchical structure has been established, wherein five Union Councils are aggregated to form a Markaz (Town), overseen by an Agriculture Officer holding an M. Sc. in Agriculture. Punjab has around 350 Markaz at the moment to cover over 22,000 villages in eight ecological zones. Supervisory technical staff is posted at the Tehsil, District, Division, and provincial levels, including roles such as Assistant Director Agriculture Extension (AE), Deputy Director AE, Director AE, and Director General Agriculture. This setup includes over 10,000 employees, supported by agricultural training institutes that offer training for field assistants and arrange courses for field staff.

Training of Extension Staff on Mobile Applications in Agriculture

Farmer training and the Adaptive Research wing also support field extension services by conducting fortnightly training sessions on critical crop stages and refining production technologies for demonstration and evaluation. A multifaceted approach is employed to disseminate knowledge and promote best practices among farmers.

The private sector plays a pivotal role in promoting cutting-edge agricultural technologies alongside providing essential inputs such as high-quality seeds, fertilizers, pesticides, and agricultural credit. Nevertheless, the challenges of reaching millions of farmers are formidable. In this context, leveraging Information and Communication Technology (ICT) tools presents a viable solution to maximize outreach and engage a vast number of farmers.

Traditionally, extension services relied on in-person interactions, print materials, and field demonstrations. Extension workers played a crucial role in disseminating knowledge on modern farming practices, pest control, and crop management. However, limitations in outreach, inefficiencies, and delayed information delivery hindered the system's effectiveness.

DIGITAL EXTENSION SERVICES IN PUNJAB

In Punjab, the integration of digital technologies in agricultural extension has been a game-changer. Digital platforms, including SMS services, mobile apps, and GIS-enabled tools, have significantly enhanced extension services. These innovative solutions enable precise data collection and analysis, real-time advisory services, weather forecasting, and pest monitoring. Ultimately, this digital transformation has empowered farmers with timely, actionable insights, revolutionizing the agricultural landscape.

Control and Command Centre for monitoring of extension work and training on various mobile applications

Numerous ICT initiatives have been undertaken in Punjab to disseminate information to farmers, focusing on productivity enhancement, diversification, intensification, and value addition, while minimizing harm to soil, water, and the environment. A list of these applications is detailed below:

S. No.	System	Description
1	KPI Based Public and Private Extension	A mobile application monitors field extension staff's performance, capturing data on farmer interactions, pest scouting, and trainings.
2	Mandi App	This app provides real-time market data on prices, auctions, and fee collections, enhancing decision-making and reducing operational costs.
3	E-Complaint Management System	The E-Complaint Management System empowers farmers to report issues with damaged vouchers or subsidy claims. It includes a centralized tracking mechanism for complaints, fostering accountability and transparency.
4	Bulldozer Booking Management System	This system simplifies the process of booking bulldozers for agricultural use, eliminating manual interventions and reducing corruption. A related application for tracking agricultural machinery has also been developed.
5	Fertilizer and Pesticide Monitoring System	Developed to automate the price monitoring of agricultural inputs, this system eliminates inefficiencies in manual inspections. Fertilizer and pesticide companies input product details and base prices online, which are then synchronized with mobile applications used by inspection staff. The system identifies price variations and notifies authorities in real time, promoting transparency and compliance.
6	Pesticide Distribution Management Information System	This digital platform streamlines the registration and licensing of pesticide distributors. It ensures proper regulatory compliance, eliminates manual errors, and enhances transparency in the distribution process.
7	e-Credit/Agri Loan	The Agriculture E-Credit Scheme provides interest-free loans to small farmers with less than 1.25 acres of land. The centralized system automates loan allocation processes, reducing the number of required visits to banks and government offices from over 10 to just three.
8	Crop Insurance	Punjab's crop insurance initiative has provided critical support to farmers facing losses due to disasters. Over 1.9 million insurance policies have been issued through a web-based application, offering financial protection and stability during crises.
9	Meri Zameen	This platform (source) links soil testing data with ICT-enabled extension services, empowering farmers with soil health insights and best practices. Over 2.2 million entries have been recorded, transforming extension services and promoting sustainable farming.
10	AMIS	The Agriculture Marketing Information System (source) enhances transparency and efficiency in agricultural marketing by providing real-time market price data. This one-stop platform empowers farmers, traders, and stakeholders with accurate commodity intelligence for informed decision-making.

11	Agri Smart	AgriSmart digitizes agricultural practices, including pest scouting, soil testing, and farmer advisory services. With 2.2 million entries and contributions from over 2,700 field workers, this app has significantly improved agricultural productivity.
12	Green Tractor Scheme	An online system supports farmers owning 1-50 acres of land in applying for tractor subsidies. E-balloting ensures transparency, benefiting 9,500 farmers and boosting mechanization.
13	Kissan Card Scheme	The Punjab Kissan Card project issues credit cards for interest-free loans to small farmers. Over 472,000 cards have been issued, enabling the disbursement of Rs. 22 billion to farmers.
14	Kissan Indraj	KISSAN INDRAAJ has transformed farmer registration in Punjab using data from the Punjab Land Records Authority. This centralized platform streamlines online registration, provides crop insights, and supports informed decision-making. With over 5.7 million farmers registered, it promotes transparency, accountability, and accessibility to government services. Its scalable design makes it a strong candidate for nationwide expansion.
15	Database of Crops & Livestock Farmers	A comprehensive database capturing the details of farmers, initially focusing on livestock and later expanding to crop growers, was developed across Punjab. This initiative is aimed at maintaining accurate farmer profiles under the "Know Your Customer" approach. Key details include demographic and contact information, livestock-specific data, land ownership, and crop details.
16	Market Committee Management Information System	This digital system modernizes market committee operations by digitizing administration, financial management, and reporting. It enhances transparency, accountability, and operational efficiency.
17	Agriculture Subsidies	Through a web portal, fertilizer companies generate unique codes for products, enabling farmers to claim subsidies via SMS. This system ensures real-time updates and transparency, benefiting 1.6 million farmers annually, with Rs. 26 billion disbursed each year.
18	PES - Command and Control Center (CCC)	The CCC provides real-time advisory services and complaint resolution through a centralized call center and social media platforms. It handles over 20,000 daily calls, reaching more than 2 million farmers annually.

END NOTE

Digital agriculture in Punjab has immense potential to transform farming practices, yet its adoption remains hindered by persistent challenges. A major obstacle is the lack of digital literacy and technical skills among farmers, particularly older generations. This knowledge gap significantly limits their ability to navigate and effectively use digital tools. Furthermore, unreliable or limited internet access in rural areas poses a critical barrier to the widespread implementation of these technologies.

Language barriers compound the issue, as most digital agriculture platforms and tools are predominantly available in English, restricting their accessibility for Punjabi-speaking farmers, who

make up the majority in the region. Additionally, awareness of the advantages and opportunities offered by digital agriculture remains low among small-scale farmers. In contrast, larger farmers have demonstrated a more favourable response to these innovations.

Cultural resistance further impedes the adoption of digital solutions. Agriculture in Punjab is deeply rooted in family traditions, and many farmers are reluctant to adopt new tools or practices that deviate from established methods passed down through generations. Financial constraints add another significant challenge, as many farmers cannot afford smartphones or other digital devices, despite the increasing availability of such technologies in Punjab.

Concerns over data privacy also deter farmers from sharing their farming information online, due to fears of misuse or lack of transparency. Moreover, many digital agriculture solutions are not tailored to address Punjab's unique farming conditions, reducing their relevance and effectiveness in the local context.

Acknowledging these challenges, the Government of Punjab is proactively working to promote the adoption of digital agriculture. Initiatives are focused on improving digital literacy, enhancing financial inclusion, and developing localized, cost-effective solutions tailored to the specific needs of Punjab's farmers. These efforts aim to boost transparency, lower costs, and improve productivity through diversification, intensification, and value addition, while minimizing environmental impacts on soil and water resources.

Dr. Muhammad Anjum Ali Buttar is a seasoned agricultural extension professional with over 30 years of experience at national and provincial elite positions. He served as Director General of Agriculture (Extension and Adaptive Research) Punjab, Pakistan for 16 years and is currently the Project Director of an ICT-led Extension Project within the Punjab Agriculture Department. He can be reached at dgaextar@gmail.com.