DIGITAL INTERVENTION IN THE AGRICULTURE SECTOR: CURRENT SCENARIO AND THE STAKEHOLDERS OF NEPAL

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ABSTRACT

The Government of Nepal, through a $22 billion investment in the Digital Nepal Framework, aims to achieve digital advancement and address hurdles like poor digital literacy. An Integrated Information and Communication Technology Policy seeks to improve access to technology and reduce the digital gap, particularly in agriculture. Presently, women's internet usage is low, and only 54.88 percent of the population has internet access due to limited telecom networks and electricity. To overcome these barriers, infrastructure investments and comprehensive digital training are essential. Additionally, developing localized tools and reducing gender disparities in education and resources shall contribute positively. Organizations like CABI offer digital tools to enhance agricultural practices and promote gender-equitable advisories. The tools support evidence-based decision-making for extension advisors, researchers, and farmers. A joint stakeholder's workshop in 2023 with PQPMC, Nepal, involved major stakeholders and led to a joint action plan focusing on policy regulation, capacity-building, and resource provision for smallholders, youth, and women. CABI's collaborative approach aims to foster sustainable agricultural solutions and inclusive growth in Nepal's digital journey.

Key words : Advisory tools, CABI, digital agriculture, PlantwisePlus, policy

INTRODUCTION

Agriculture is the mainstay of Nepal's economy as more than 60% of the population depend on it for their daily livelihood (Chaudhary, 2018). Digital interventions can play a major role in improving agricultural ecosystems, and hence efficiency and effectiveness (MacPherson et al., 2022). Digitization can facilitate the purchase and sale of farm input and output, provide advisory services on Package of Practices, Good Agriculture Practices, Plant Health Management, organic or non-chemical farming, climate change solutions, and more.

The government of Nepal invested 22 billion in the Digital Nepal Framework which is directed towards achieving digital advancement in the country and overcoming current hurdles like poor digital literacy (Dinesh, 2022). An integrated National Information and Communication Technologies (ICT) Policy has been drafted to improve access to information technology across the layers of society, which would significantly reduce the digital gap in many sectors including Agriculture.

However, out of the many barriers, the internet penetration rate (Tata et al., 2016) and the percentage of women using the Internet are the major barriers to digital outreach. To overcome these barriers, along with infrastructure investments, comprehensive training on digital tools is essential (MacPherson et al., 2022). Localized digital tools making information accessible would be required

as drivers (Okonkwo et al., 2023). Reducing gender disparities in education and resources is crucial for creating a more inclusive digital landscape.

The Government of Nepal has taken various initiatives to modernize ICT. Practices range from disseminating information using traditional radio channels to digital platforms on smart devices. E-commerce platforms have been launched to connect farmers directly to the end consumers. In this paper, we present the current scenario of digitalization in the agriculture sector of Nepal and the role of factors such as demography, number of devices, and internet connectivity on digitalization.

MATERIALS AND METHODS

This study utilized two primary research methodologies: a review of secondary data and primary information exchange with key stakeholders. Each method is detailed below.

a. Desk Review / Secondary Data

The review involved an analysis of digital reports, data published on the web, and information compiled by developmental agencies. Key sources included digital reports and data from international and national developmental agencies, online databases and repositories, scholarly articles and publications related to digital intervention in Nepal's agriculture (Gupta, 2022; FAO et al., 2024; Markets and Markets, 2024). The collected data were compiled and studied to develop a perspective of the digital intervention landscape in Nepal's agriculture. The secondary data review assisted in identifying the major themes and challenges in the digital extension system and the dissemination of information in Nepal.

b. Primary Information Exchange

To complement the review and gain deeper insights, information was directly gathered from important stakeholders during a stakeholder workshop. This workshop was essential for understanding the nuances of digital intervention in Nepalese agriculture, including identifying key players in the agri-digital ecosystem, recognizing the challenges in the extension system, and exploring the digital dissemination of information for facilitating appropriate interventions.

A stakeholder workshop was held on 30th December 2023 in Kathmandu, Nepal. The workshop was facilitated by CABI in collaboration with the Plant Quarantine and Pesticide Management Centre (PQPMC) and included participation from significant stakeholders of the Nepalese agricultural sector. The attendees represented different organizations, including the Ministry of Agriculture and Livestock Development (MoALD), the Department of Agriculture, the National Centre for Fruit Development, Plant Protection Society Nepal, Plant Protection Laboratories (PPL), International Development Enterprises (iDE), Nepal Agricultural Research Council (NARC), Meteorological Forecasting Division, National Farmers Group Federation (NFGF), Pesticide Entrepreneurs Association Nepal (PEAN), Kisan Care and Dream Work Solution.

The workshop focused on understanding digital advisory services and their constraints. To facilitate this, participants were engaged in a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis exercise based on four major topics -1) Sources of Information: availability, accessibility, and reliability of information for farmers; 2) Knowledge: stakeholders' and farmers' knowledge of digital tools and agricultural practices; 3) Transfer of Technology: effectiveness and challenges in

transferring digital technology to farmers; 4) Financial Resources and Funding: financial aspects, including resource allocation and barriers to adopting digital tools.

The insights from the SWOT analysis were integrated with the review findings to develop a comprehensive discussion. Combining secondary data analysis with primary stakeholder information provided a robust understanding of digitalization in Nepalese agriculture. It also helped in identifying key areas for improvement and strategies for enhancing digital advisory services.

RESULTS AND DISCUSSION

The findings of the two approaches – desk review and the direct information from the stakeholders are discussed below.

Desk Review Findings:

Demography: According to the report from DATAREPORTAL - "Digital-2024—Nepal," Nepal's total population was 31.07 million in January 2024. Among them, 6.85 million (22.1%) lived in urban areas, and 24.20 million (77.9%) in rural areas. The population grew by 347 thousand (+1.1%) from early 2023 to early 2024. The report highlights that 52.1% of Nepal's population is female (16.2 million) and 47.9% is male (14.87 million). In urban areas, 3.58 million females and 3.28 million males were recorded, while in rural areas, there were 12.61 million females and 11.58 million males (Simon Kemp, 2024).

Digital Usage and Development in the recent past: As of early 2024, Nepal had 15.40 million internet users, representing an internet penetration rate of 49.6%. Additionally, there were 37.47 million active cellular mobile connections, equating to 120.6% of the total population (Simon Kemp, 2024). These statistics show a clear upward trend in digital usage.

Further, digital agriculture cannot be discussed without basic infrastructure such as smart devices and internet connectivity. Globally, over 66% of the population (5.35 billion people) uses the Internet, with an annual growth rate of 1.8%. Nepal's digital growth aligns with these global trends (Simon Kemp, 2024). The rapid technological advancements in agriculture are driven by increasing populations, climate change, food security concerns, and sustainable practices. Over the next five years, the global digital agriculture sector is projected to grow at a CAGR of 10.3%, with Asia Pacific, led by India, contributing significantly (Research and Markets, 2024). Governments in the region are actively promoting digital technology for resource optimization and food security.

Major Blockers: Despite progress, several obstacles hinder the effective implementation of digital technologies in Nepal. A few major blockers are as follows.

Table 1. Major blockers of Digital Outreach

Major Blocker	Details
Adoption	Farmers often stick to traditional practices that may not suit current conditions.
Technology Reach	Although the technology and infrastructure are available in the country, communication with the right stakeholders who require timely technology-related information is still limited.
Training and Capacity Building	Limited technical training restricts wider adoption and implementation (Paustian and Theuvsen, 2017)
Government Policies	Current policies focus on production and post-harvest issues, with less emphasis on promoting decision-support agricultural tools accessible to farmers.
Real-Time Information	Available tools lack specific real-time solutions.
Socioeconomic Barriers	Gender and socioeconomic differences hinder access to digital resources, particularly for small and marginal women farmers.

Need of the Hour

a. Knowledge Transfer Services: Effective dissemination of knowledge is crucial for adopting sustainable practices.
b. Policies: Advancement of digital platforms and open data policies can enhance knowledge dissemination.
c. Regulation: Ensuring agricultural product safety and pest control through inspection services
d. Accessibility: Systems supporting resource access for small, marginal, and women farmers.
e. Localized Information: Tailored programs and information in local languages

Recent Initiatives

The use of ICT in agriculture can be categorized based on factors like usage, stakeholders, connectivity, devices, and purpose. It is crucial to understand the type of information needed, the stakeholders who need it, and the delivery methods, whether through web or mobile devices, and the Internet. This paper classifies areas where digitalization in agriculture has occurred and discusses initiatives in Nepal, focusing on plant health advisories, weather-based advisories; market-based advisories, crop management, packages of practices, and input-based advisories (details in additional information).

Nepal has seen the development of various digital tools through the efforts of the government, private sector, and NGOs. The list of digital interventions undertaken in Nepal is provided as Additional Information in this paper.

Primary review findings through stakeholders' workshop

The stakeholders' workshop included presentations on topics related to advisory and digital interventions from the representatives of different participating organizations, followed by group activities. The results of the SWOT study are discussed here.

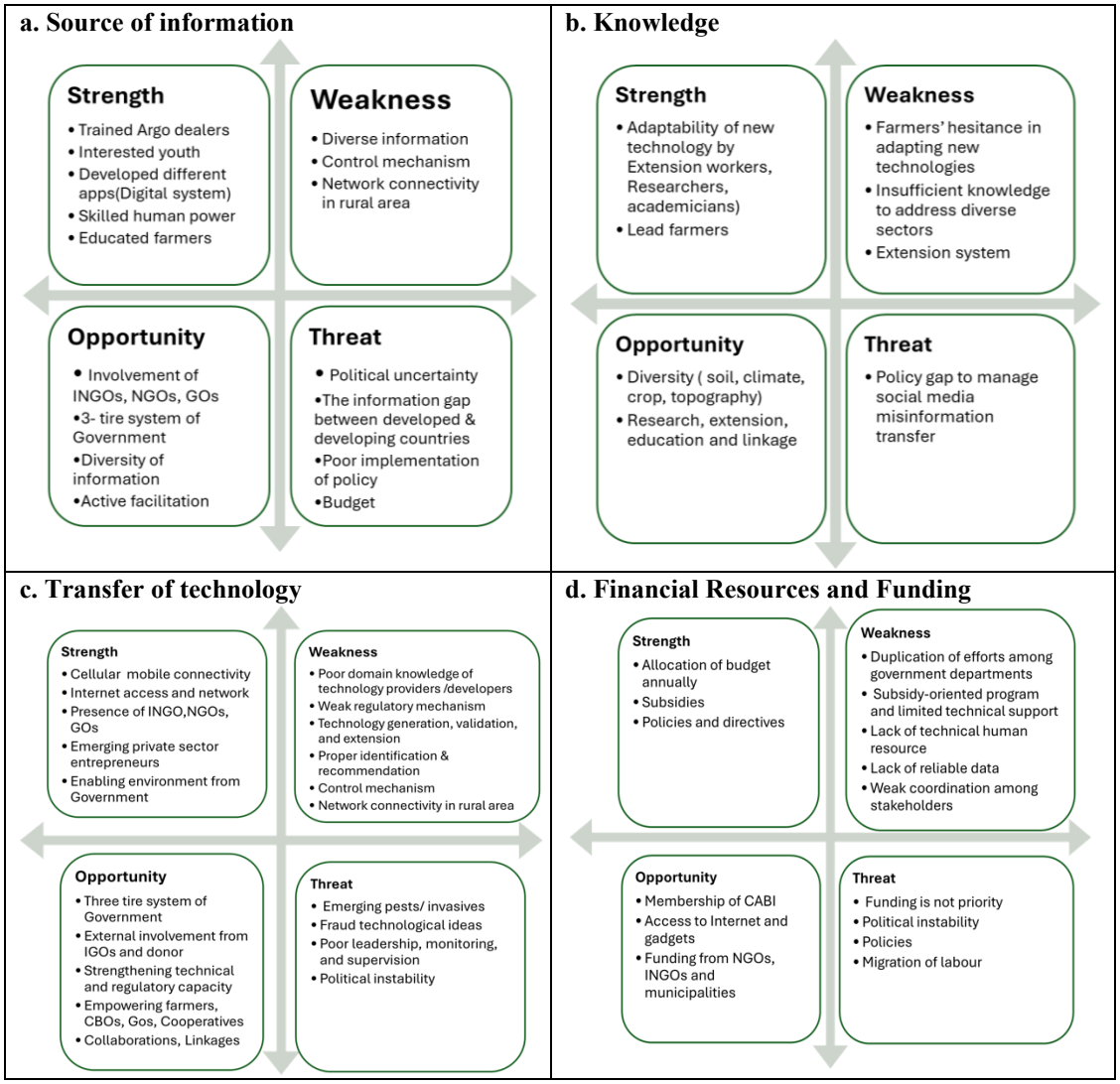

Fig 1: Results of SWOT analysis

Most participants shared a common perspective on most topics. For example, political instability significantly hampers the proper implementation of programs in the agriculture sector. On topics such as knowledge, transfer of technology, financial resources, information sources for extension, and digital advisory, the consensus was that the validation of information and technology transfer is crucial but currently lacking. There is a pressing need to regulate applications and digital interventions in Nepal to develop a few highly effective tools for critical stakeholders. Additionally, private sector players should integrate with the government advisory system for validation and authentication.

The participants also noted that capacity building to effectively utilize the available information was inadequate. During the presentation and recommendation sessions, they emphasized the necessity for more capacity-building initiatives, either through existing programs or new proposals. The shortage of human resources for extension underscored the importance of digital advisory. However, as digital tools need a much deeper understanding of the working and utilization, practical exercises with field-level officers are much needed. Here, CABI digital tools and capacity building followed by backstopping can play a major role.

CONCLUSIONS

The intersection of digital technologies and agriculture presents a transformative opportunity for Nepal to address food security challenges and empower its farming communities. With the rapid expansion of the internet and the proliferation of innovative digital solutions, the country is poised to leverage the advancements to enhance agricultural productivity, sustainability, and resilience. However, this potential requires combined efforts from all stakeholders. Policy support, infrastructure development, research, and stakeholder collaboration are vital to creating an enabling environment for digital agriculture to flourish.

Organizations like CABI play a crucial role. CABI emphasizes collaborations for improving agricultural practices and promoting gender equality in advisory services. CABI's digital tools are made available to various stakeholders in the country and are supporting sustainable practices, food security, and food safety. This collaborative approach is fostering sustainable agricultural solutions and contributing to reducing the digital divide, thus fostering inclusive growth in Nepal's digital journey. As there is a huge growth potential, CABI is continuously customizing its tools to build the capacity of extension officers, plant doctors, and farmers. A few of the tools are in the Nepali language. Through tailored digital tools and capacity-building initiatives, CABI is driving positive change and empowering stakeholders to effectively navigate Nepal's evolving digital landscape.

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Additional information: The list of digital interventions undertaken in Nepal.

SN	Initiative/ Programme	Key Services	Initiated by	Implemented by
1	GeoKRISHI	It targets farmers, extension officials, and students with advisory, detection of PHP, and recommendations. It also provides	Private service provider; +977-1-5901054; info@geokrishi.com.np	Implemented individually but has some integration with "Revitalizing agriculture extension services to support Nepal's agriculture development strategy" (2015-35).
2	Agriculture Tools & APP	Services on agriculture inputs and hiring of the same through tools/ applications	Nepal Government Initiative under "Digital Nepal Initiative-	MoALD, MoCIT, NITC Local levels -Farmer groups, Aama Samuha (Women's Group) and co-operatives
3	Agriculture Input and Output Product Quality Tracking System	Digital record keeping and sharing of quality-related information		MoALD, DoA, DFTQC
4	Education and training programs for farmers	Development of training curriculum for training pool of progressive farmers on new techniques		MoEST, CTEVT Agriculture cooperatives, universities, Agriculture Information and Training Center, Agriculture Knowledge Center
5	Agriculture Management Information System & HAMARO KRISHI	Provides advisory on weather-based PoP for major Cereals; Fertilizer calculator is another essential feature.		Pilot Program of Climate Resilience Project World Bank, MoALD
6	Management information system of the tea and coffee sub-sector of Nepal	MIS for plantation crops		National Tea and Coffee Development Board Supported by the European Union
7	Mobile application on tomato "kausi kheti"	APP for tomato Value Chain intervention		Vegetable Crops Dev.Centre, MoALD, Supported by ICT in Agriculture Nepal, UNDP
8	Digital training method to framers for pesticide analysis and Food and Safety (Pesticide Tracking)			MoALD, DFTQC
9	Smart Krishi	Advisory on the market and any agriculture issues. It also shows interaction with Govt. experts, which looks dubious.	Private App service provider	+977 9802538473 smartagroapp@gmail.com

SN	Initiative/ Programme	Key Services	Initiated by	Implemented by
10	Digital Seed system	It will enable the user to access information on seed demand and supply in real-time.	This is developed under "Nepal Seed and Fertilizer (NSAF) project, funded by the United States Agency for International Development (USAID) and led by the International Maize and Wheat Improvement Center (CIMMYT).	MoALD
12	Digital soil Map	It provides access to location-specific information on soil properties for any province, district, municipality, or particular area of interest.	Produced by the International Maize and Wheat Improvement Center (CIMMYT) in collaboration with the Nepal Agricultural Research Council's (NARC) National Soil Science Research Center (NSSRC), this is the first publicly available soil map covering the entire country in South Asia	MoALD
13.	Krishipath	A mobile and web-based application that provides a single dashboard where users can access localized information about agriculture inputs, input suppliers, extension services, price information of inputs and agriculture products, agro-meteorological advisory services, seasonal calendar, and crop farming technology	CARE Nepal in partnership with Federation of Nepal Cottage and Small Industries (FNCSI), Banke and BEE Group	Nepal Farmers' cooperative
14	Krishi guru	Digital advisory on soil, irrigation etc	Private Mobile App service provider	Private entity
15	E Chautari	Easy access to timely and contextualized information and knowledge products.	Geo Krishi initiative	Housed in the municipality and ward offices, cooperatives and farmer-based organisations