Policies on Information and Communication Technology (ICT) in Nepal: A Review of the Agricultural Sector

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Abstract

Background: The integration of Information and Communication Technology (ICT) into agriculture is increasingly recognized as a means to improve productivity, facilitate knowledge dissemination, and enhance rural livelihoods. In Nepal, various policy initiatives have been formulated to promote ICT in the agricultural sector. Despite these initiatives, issues related to coordination, digital literacy, infrastructure, and financing have posed significant implementation challenges.

Areas Covered: This paper critically reviews key ICT policies and strategies in Nepal, particularly in relation to agriculture focusing to their effectiveness, challenges, and future directions for enhancing digital integration. Policies analyzed include the National Communication Policy (1992), Information Technology Policy (2000), Telecommunication Policy (2004), and National ICT Policy (2015), along with agriculture-specific policies such as the Agriculture Development Strategy (2014). It explores how these policies align with digital integration in agriculture and identifies major gaps and overlaps in policy execution.

Expert Opinion: A coherent national ICT-agriculture strategy is critical. Nepal must adopt a unified governance framework, enhance rural connectivity, invest in digital literacy, and promote public-private partnerships. Strengthening these areas would foster inclusive agricultural transformation and sustainable rural development.

1 Introduction

Agriculture is a vital sector in Nepal, contributing significantly to the country's GDP and employing a large portion of the population (MoALD, 2021; World Bank, 2020). However, the sector faces numerous challenges, including inadequate policy implementation, lack of coordination, and insufficient technological advancements (ADB, 2021; Ghimire & Joshi, 2019). Information and Communication Technology (ICT) is increasingly recognized globally as a powerful tool to enhance food security and support rural livelihoods, as endorsed at the World Summit on the Information Society (WSIS) (Rodrigues & Rodriguez, 2013). There is a need to explore existing situation focusing to the ICT policies in Nepal, with a particular focus on their role in promoting agricultural development.

Since the liberalization of Nepal's telecommunications sector in 1992, various policies have emphasized digital inclusion. The National Communication Policy (1992) laid the foundation for ICT development in the country. Later policies, such as the National ICT Policy (2015), sought to integrate ICT across multiple sectors, including agriculture. However, the successful adoption of ICT in Nepal's agricultural sector is still limited, largely due to fragmented policy implementation and financial constraints. Globally, ICT adoption in agriculture has demonstrated significant positive impacts, particularly in improving productivity and enhancing market linkages. Mobile-based advisory services, digital weather forecasting, and precision agriculture tools have transformed farming practices in countries such as India and Bangladesh. Yet, Nepal continues to lag behind in these advancements due to insufficient coordination, a lack of infrastructure, and financial limitations.

Nepal's agricultural sector struggles with fragmented extension services, limited access to timely information, and market barriers (Subedi & Bhandari, 2019). The adoption of ICT in agriculture offers significant opportunities for improving knowledge dissemination, enhancing decision-making, and increasing efficiency (FAO, 2017; Pant & Gautam, 2016). However, ICT adoption is hindered by gaps in infrastructure, inadequate technical training, and high costs associated with digital tools (UNESCAP, 2020; Dahal et al., 2018). The country has formulated several policies aimed at leveraging ICT to improve agricultural extension services and enhance market access. (MoIC, 2015; MoAD. 2014). Despite these efforts, effective implementation remains a challenge due to infrastructure gaps and low levels of digital literacy among farmers (Adhikari & Khanal, 2021; Regmi et al., 2019).

This paper aimed to assess Nepal's ICT policies, their agricultural applications, and the challenges hindering their effective implementation in the sector by reviewing pertinent and relevant policy documents.

2   Methodology

This review is based on a systematic analysis of existing literatures, policies, and sectoral reports related to the use of ICT in Nepal's agricultural sector. A qualitative content analysis and meta-analysis of policies and scrutiny of government documents were conducted to assess the effectiveness and limitations of current ICT initiatives in agriculture (MoIC, 2015; MoAD, 2014; GoN, 2000). Secondary data from government institutions, including the Ministry of Agriculture and Livestock Development (MpALD), the Nepal Telecommunications Authority (NTA), and international organizations such as FAO and UNESCAP, were extensively reviewed to identify emerging trends, policy gaps, institutional challenges, and technological opportunities related to digital integration in rural agricultural systems (MoALD, 2021; NTA, 2020; FAO, 2017; UNESCAP, 2020).

Accordingly, this review employed a qualitative content analysis approach to understand and explore existing policy frameworks. Policy documents from 1992 to 2015 were systematically analyzed to assess their alignment with agricultural development goals. Additionally, reports from key institutions such as the Ministry of Agriculture and Livestock Development (MoALD) and the Nepal Telecommunication Authority (NTA) were reviewed to understand the institutional landscape of ICT implementation.

3   Results

3.1   ICT Policies in Nepal

Key policy documents reviewed include:

National Communication Policy (1992): Initiated liberalization of the telecom sector (GoN, 1992).

This policy marked the beginning of liberalization in Nepal's telecommunications sector, allowing private sector participation and ending the monopoly of state-owned services. It emphasized the development of telecommunication infrastructure as a national priority and initiated efforts to expand basic communication services to rural areas. The policy laid the foundation for future digital communication strategies by recognizing communication as a tool for development (GoN, 1992).

Information Technology Policy (2000): Promoted e-governance and rural digital access (GoN, 2000).

The IT Policy of 2000 focused on the widespread use of ICT in governance, education, health, and agriculture. Key provisions included in this policy were:

- Expansion of internet and telecentres to rural municipalities.

- Promotion of software development and local IT industries.

- Development of human resources for the ICT sector.

- E-governance initiatives to improve service delivery and transparency.

- The policy also envisioned ICT as a tool to reduce the urban-rural digital divide (GoN, 2000).

Telecommunication Policy (2004): Aimed to expand rural network infrastructure (GoN, 2004).

This policy further strengthened the liberal approach by prioritizing rural access and private investment in telecom. Specific goals included:

- Expansion of basic telecommunication services in underserved areas through a Rural Telecommunications Development Fund (RTDF).

- Increased competition to improve service quality and reduce costs.

- Promotion of wireless and mobile technologies to reach remote communications.

- Capacity development and regulation to ensure equitable service provision.

National ICT Policy (2015): Emphasized sector-wide ICT integration (MoIC, 2015).

As a comprehensive framework, the 2015 ICT policy emphasized integration of ICT across all development sectors, including agriculture, education, and health. Major elements included:

- Promotion of ICT in agriculture, especially in market access, agro-advisory services, and mobile-based extension.

- Strengthening digital infrastructure and broadband connectivity in rural areas.

- Encouragement of public-private partnerships (PPPs) for innovation and service delivery.

- Development of digital literacy programs and local content to ensure inclusive ICT use.

- Establishment of e-government frameworks and data centers to improve administrative efficiency (MoIC, 2015).

3.2 Agricultural Policies Promoting ICT

National Agricultural Policy (2007): Endorsed ICT for extension (GoN, 2007).

This policy recognized Information Technology (IT) and mass communication as essential tools for modernizing Nepal's agriculture. It explicitly encouraged:

- The use of ICT in agricultural extension, including audio-visual tools and radio programs to reach rural farmers.

- Development of agricultural information systems to disseminate science knowledge and market information.

- Integration of ICT-based education and awareness campaigns for farmers to adopt new technologies (GoN, 2007).

Dairy Development Policy (2007): Proposed ICT-based dairy monitoring.

Focused on improving the efficiency of Nepal's dairy sector, this policy emphasized:

- Establishment of a centralized digital database for tracking milk production, collection, distribution, and marketing.

- Use of ICT tools for quality assurance and supply chain monitoring.

- Facilitation of data sharing among cooperatives, processors, and government agencies to enhance decision-making (GoN, 2007).

Agri-business Promotion Policy (2007): Introduced ICT in market systems.

This policy aimed to commercialize agriculture by leveraging modern technology, including:

- Introduction of e-commerce platforms to link producers with buyers and consumers directly.

- Establishment of ICT-based market information systems for real-time price updates and demand forecasts.

- Support for ICT-enabled agri-logistics management, promoting traceability and efficient supply chains (GoN, 2007).

National Agriculture Extension Strategy (2006): Advocated ICT-based communication centers.

The strategy explicitly addressed the need for ICT-enabled extension systems. Its core features included:

- Use of mobile phones, community radio, and digital platforms for delivering timely extension messages.

- Creation of toll-free call centers to provide advisory support to farmers.

- Encouragement of multi-channel communication to ensure inclusive and responsive service delivery in rural areas (GoN, 2006).

Agriculture Development Strategy (2014): Promoted ICT for advisory services and market access.

The ADS provided a long-term (20 year) vision for agriculture, with strong emphasis on digital transformation. It proposed:

- Promotion of mobile applications and web-based platforms to disseminate agro-climatic and market information.

- Establishment of Agro-Information Centers (AICs) at district levels for centralized knowledge access.

- Encouragement of public-private partnerships to scale up ICT innovations for precision farming, e-extension, and market linkages.

- Strengthening of digital literacy and capacity building of extension workers and farmers (MoAD, 2014).

3.3 Major Implementing Agencies

High-Level Commission for IT (HLCIT)

- Established to provide strategic direction on ICT development in Nepal, HLCIT functions as a policy think tank and coordination platform.

- It advises the government on ICT planning, investment, and infrastructure development.

- Plays a role in promoting digital governance frameworks and ensuring that ICT is integrated across sectors, including agriculture.

- Its limited engagement with sector-specific ministries, however, contributes to policy fragmentation, as highlighted in the review.

Ministry of Information and Communications (MoIC)

- MoIC is the primary ministry responsible for formulating and implementing national ICT policies.

- Oversees the National ICT policy (2015) and coordinates cross-sectoral digital initiatives.

- Facilitates telecommunication infrastructure expansion, essential for rural digital connectivity.

- The lack of institutional linkage between MoIC and the Ministry of Agriculture affects coordinated ICT-agriculture integration.

National IT Center (NITC)

- NITCC operated under MoIC and is responsible for developing IT infrastructure, managing government data centers, and promoting e-governance.

- Supports ICT infrastructure and software solutions for service delivery.

- Has the potential to support real-time agricultural data systems, but its role in agriculture-specific applications remains limited.

Nepal Telecommunication Authority (NTA)

- NTA is the regulatory authority for telecommunication services in Nepal.

- Manages the Rural Telecommunications Development Fund (RTDF) to support connectivity in underserved areas.

- Facilitates mobile and internet service expansion, which is foundational for ICT-based agricultural services like mobile advisories, weather forecasts, and market apps.

Agriculture Information and Communication Center (AICC)

- AICC, under the Ministry of Agriculture and Livestock Development (MoALD), is the lead institution for agricultural communication and extension.

- Develops and disseminates audio-visual content, mobile-based information, radio programs, and ICT-based extension services.

- It plays a direct role in bridging the gap between digital content and rural farmers, yet is constrained by limited resources and digital capacity.

Communication, Publication and Documentation Division (CPDD)

- This division supports the documentation, publication, and outreach of agricultural knowledge.

- It manages the dissemination of print and digital media on agriculture, policy briefs, and success stories.

- Though traditionally focused on print, it has increasing relevance in transitioning to digital communication tools for farmer education and policy outreach.

- These institutions are crucial to Nepal's ICT ecosystem. However, lack of coordination among them-especially between general ICT bodies (MoIC, NTA) and agriculture-specific entities (AICC, CPDD)- has led to fragmented implementation. For meaningful digital transformation in agriculture, collaborative frameworks and inter-agency alignment are urgently needed.

3.3.1 Synthesis

The integration of ICT into Nepal's agricultural sector presents significant opportunities and challenges. An analysis of the sector's ICT policies and practices has revealed several key findings.

Policy gaps and fragmentation:
One of the major challenges identified is the lack of coherence between ICT and agricultural policies, leading to fragmented implementation. Multiple agencies are responsible for ICT initiatives, resulting in overlapping responsibilities and inefficiencies. The lack of a unified strategic

framework hinders the smooth integration of ICT within agriculture, creating redundancies and inconsistencies in execution. Fragmented policy implementation, without adequate coordination, results in duplicated efforts that are misaligned with the sector's needs. A unified national strategy, with clear delineation of responsibilities and a centralized governance framework, would streamline efforts and reduce inefficiencies.

Limited rural connectivity and infrastructure:
A significant portion of rural Nepal still lacks reliable ICT infrastructure, hindering access to agricultural information and digital tools. Internet and mobile penetration rates remain low, and the absence of broadband connectivity in remote areas limits farmers' ability to utilize digital platforms for market access, weather forecasting, and extension services. Despite progress in telecommunications, rural connectivity remains a critical barrier. Expanding internet and mobile network infrastructure is essential for enabling the adoption of ICT-based agricultural solutions in these areas.

Digital literacy barriers and training needs:
Farmers often lack access to ICT tools and need additional training to use them effectively. Many smallholder farmers are unaware of available ICT solutions or lack the necessary skills to benefit from them. The absence of structured digital literacy programs prevents the full realization of ICT's potential in rural areas. To address this, digital literacy must be significantly improved. Farmers need practical, hands-on training on how to use mobile phones, computers, and online platforms effectively for farming purposes. A targeted approach to digital literacy programs would enhance farmers' abilities to adopt ICT solutions.

Funding shortfalls and financial constraints:
ICT projects in agriculture are often underfunded, limiting their scalability. Government budgets allocated to ICT initiatives remain insufficient, and the lack of financial incentives discourages private sector investments. This financial barrier hampers the growth of ICT in agriculture. To overcome this, government support must increase, with a stronger focus on funding and mechanisms to encourage private sector investment. A well-established public-private partnership (PPP) model could mobilize resources and leverage expertise, improving the scale and sustainability of ICT-based agricultural solutions.

Limited Public-Private collaboration:
There is inadequate involvement of the private sector in agricultural ICT solutions. Private companies can play a crucial role in expanding ICT infrastructure and offering digital services tailored to farmers' needs. A well-structured PPP framework could enhance efficiency, scalability, and innovation in ICT-driven agricultural initiatives. The government should incentivize private sector participation through tax breaks, subsidies, or funding opportunities to ensure that ICT solutions are both affordable and accessible.

Lack of localized content and context-specific solutions:
Many ICT solutions in Nepal's agriculture sector are based on generic or international models that may not be suitable for local farmers. There is a need to develop region-specific, language-friendly content that caters to the unique challenges faced by Nepali farmers. Localized content would increase the usability and relevance of ICT solutions, improving adoption rates and ensuring that tools meet the specific needs of rural communities.

Weak integration with traditional extension services:
ICT-based extension services are not fully integrated into traditional agricultural advisory systems, limiting their reach and effectiveness. Traditional extension systems need to undergo digital transformation to enhance the dissemination of information. A hybrid model combining ICT-based and face-to-face extension services could address the diverse needs of farmers, increasing the accessibility and effectiveness of agricultural advisory services.

Absence of Real-Time data sharing:
There is currently no centralized platform for real-time information sharing on weather patterns, market trends, pest outbreaks, and other critical agricultural data. The absence of such a system

reduces the effectiveness of ICT tools in helping farmers make timely and informed decisions. Developing a robust, real time data sharing infrastructure would bridge this gap and enhance the impact of ICT on agricultural productivity and sustainability.

4   Discussion

The integration of Information and Communication Technology (ICT) into Nepal's agricultural policies demonstrates progressive intent but reveals significant implementation shortcomings. This review highlights several critical areas where policy ambition and on-the-ground impact diverge, raising both challenges and opportunities.

Firstly, the review confirms that policy fragmentation remains a major obstacle. While multiple ICT and agriculture-related policies exist—such as the National ICT Policy (2015) and the Agriculture Development Strategy (2014)—they lack a unified strategic framework. Overlapping mandates among institutions like MoIC, MoALD, NTA, and AICC have resulted in disjointed efforts, leading to duplication, inefficiency, and weak accountability. This disconnect has hindered the holistic adoption of ICT in agriculture, despite clear governmental recognition of its value.

Secondly, infrastructure and access constraints have significantly limited rural ICT integration. Many rural communities lack basic digital infrastructure, including broadband and mobile networks, which restricts access to market information, weather updates, and digital extension services. This infrastructure gap not only exacerbates the urban-rural digital divide but also undermines the potential of even well-designed ICT initiatives. Although policies acknowledge this issue, progress remains slow due to limited public investment and underutilized PPP models.

A third theme emerging from the findings is the lack of digital literacy and user-friendly content. Many farmers, especially smallholders, are unfamiliar with available ICT tools or are unable to use them effectively. This is compounded by the scarcity of local-language, context-specific content and training programs. Without practical support and capacity-building, digital inclusion risks remaining a policy objective rather than a tangible reality for most farmers.

Furthermore, the findings underscore the underutilization of private sector capabilities in driving ICT-based innovation. While the policies endorse public-private partnerships, actual engagement with private actors remains limited. Structured PPPs could accelerate digital tool development, data systems, and infrastructure expansion. However, current policy environments offer insufficient incentives and regulatory clarity to attract sustained private investment in rural agricultural services.

Finally, the absence of a centralized, real-time data-sharing platform remains a key weakness. In an age of climate uncertainty and fluctuating markets, farmers require timely access to information on pest outbreaks, price trends, and weather conditions. The current lack of such a system constrains farmers' capacity to make data-driven decisions and limits the responsiveness of extension systems. Overall, while Nepal's policy landscape provides a strong conceptual foundation for digital agriculture, effective implementation demands a more coordinated, inclusive, and localized approach. Addressing the policy gaps, infrastructure weaknesses, and institutional silos will be critical to achieving a transformative ICT-enabled agricultural sector.

5   Conclusion

ICT holds substantial potential for transforming Nepal's agricultural sector, but its successful adoption and integration requires coordinated efforts across various sectors. The challenges identified in the previous sections-such as policy gaps, limited rural connectivity, digital literacy barriers, funding constraints, weak public-private collaboration, and a lack of localized content must be addressed to unlock ICT's full potential in agriculture.

While Nepal has laid the groundwork for ICT adoption in agriculture through policy support, the country faces significant barriers that hinder the widespread use of digital tools among farmers. Fragmented policy implementation, poor rural connectivity, inadequate digital literacy programs, limited funding, and weak private sector involvement are critical factors that must be addressed to overcome those challenges and ensure that ICT solutions are accessible and beneficial to all farmers, especially those in remote and rural areas.

6 Recommendations

Develop a National ICT-Agriculture Strategy:

- Create a unified strategy that links ICT and agriculture. Define roles, improve coordination, and reduce overlap.

Strengthen rural connectivity and digital literacy:

- Expand the internet and mobile networks in rural areas. Provide simple, practical ICT training for farmers.

Promote public-private partnerships and local content:

- Encourage private investment through PPP models. Develop ICT tools in local languages with real-time data.

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Author's contribution

The author was responsible for the conceptualization, literature review, data collection, analysis, and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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