

Determinant Factors of Digital Inclusion of Digital Divide Groups: A Tale of Smallholder Farmers of Bangladesh

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Abstract

Digital inclusion is pivotal for smallholder farmers in developing nations, as it profoundly impacts agricultural productivity, food security, and rural livelihoods. Access to digital infrastructure, encompassing internet connectivity and hardware availability, plays a substantial role in enabling farmers to engage effectively with digital tools. Digital literacy and education initiatives are equally vital to empower farmers to navigate and leverage digital resources. The relevance of digital services in agriculture is instrumental in driving their adoption, but several influencing factors must be considered, among others: usability, education, data security, and financial and professional support. A collaborative partnership among the government, farmers, and other actors is indispensable for narrowing the digital divide among smallholder farmers in developing nations. Understanding these determinant factors is pivotal for crafting effective strategies that equip farmers with the digital tools needed for success in an increasingly interconnected world. The paper gives an overview of the influencing factors to establish the related strategies.

1. Introduction

In an increasingly interconnected world, the digital divide has emerged as a significant barrier to economic development, social equity, and access to vital resources and information. While the benefits of the digital age have touched nearly every corner of the globe, certain marginalized groups, particularly in developing countries [1], continue to grapple with limited access to digital tools and resources [2]. Among these underserved populations, smallholder farmers in Bangladesh stand as a poignant example, navigating a complex and often unforgiving terrain where the divide between the digital haves and have-nots is acutely pronounced.

Smallholder farmers constitute the backbone of Bangladesh's agrarian economy [3], representing a substantial portion of the population and contributing significantly to the nation's food security and rural livelihoods. Smallholder farmers typically cultivate in small plots of land using their limited resources and face several external challenges, i.e., volatility of prices, climate change effects, and fragmentation of their lands. As a result, smallholder farmers' access to digital technology and inclusion is not just a problem of suitability but a fundamental factor of their capacity to bloom in a gradually interconnected and data-driven world [4].

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This study initiates a quest to reveal the complex web of factors that stimulate the digital inclusion landscape for smallholder farmers in Bangladesh. It deeply explores the various aspects of digital inclusion, digital infrastructure, digital skill development, affordability of digital resources, the influence of governmental policies, promotion of gender equity, the consequences of community support, and the necessity of environmental sustainability [5]. In this context, within the array of complex factors, the study delves into both the challenges and opportunities that configure the narrative of digital inclusion for the smallholder farmers in Bangladesh, the landscape of vibrant portrayal of their efforts to bridge the digital divide. As we pilot the narratives, it is indispensable to highlight the broader context within which Bangladesh finds itself. Bangladesh deals both with the challenges and opportunities of rapid technological innovations that are brought to it. The agriculture sector of Bangladesh is a vibrant one that engages millions of smallholder farmers to interconnect with the digital alteration sweeping across the globe.

The study followed a secondary research method to attain the research objectives and answer the research questions it intends to address. It identifies the previous studies and their analysis, data, and conclusions to navigate the research objective. As we did not conduct any primary survey to gather data, we relied on existing literature of published resources, i.e., academic journal papers, reports of different organizations and institutions, including government and private institutions, books, and freely available resources. This method was chosen due to its cost effectiveness and time-efficiency benefits, capacity to convey historical background and a broader perspective on the research topic. Besides, the authors also acknowledge the study limitations, including data relevance, accuracy, and accessibility, when considering the credibility and reliability of the sources used.

2. Theoretical Framework for Digital Inclusion: Unraveling Disparities in the Digital Age

Due to the complex and multidimensional nature of challenges in digital farming, developing a flexible framework model is worthwhile, considering models of the affected scientific fields. The following theories help to constitute the foundation for underpinning the challenges and opportunities connected to digital inclusion for smallholder farmers.

The 'Digital Divide Theory' primarily concentrates on the complex interaction between technological advancement and socioeconomic inequalities, focusing on the substantial divide between the groups with equitable access to digital technologies and those without [6]. The theory illuminates the disparities in access, skills, and usage of digital tools and services among different socioeconomic groups, including smallholder farmers. Originating from historical, economic, and social factors, this divide manifests in various ways, including discrepancies in technology adoption, digital skills, and access to meaningful online content. Bridging the digital divide demands a multifaceted approach involving infrastructure development, affordability initiatives, digital literacy programs, and comprehensive public policies, all designed to ensure that the benefits of the digital age are accessible to all members of society, irrespective of their socioeconomic status or background [7]. Everett Rogers' theory of the 'Diffusion of Innovation' [8] and the 'Technology Adoption Model' (TAM) [9] can be considered for exploring the influencing factors of new technology adoption. It explains the spread of innovations in social systems by recognizing the relative advantages of technology use, the harmony of prevailing practices, complications, and observability. The theories advocate that the adoption of digital services, tools, and techniques by any individual, including smallholder farmers, depends on its practicality, ease of use, and social influence. ICT4D (Information and Communication Technologies for Development) is an area of study that addresses the development challenges emphasizing the application of information and communication technologies. It helps to configure the framework to design and implement digital inclusion initiatives that are context-specific and associated with the desires of smallholder farmers in developing countries [10].

Furthermore, the gender gap plays a crucial role in digital inclusion. Women among smallholder farmers frequently face distinctive hurdles to accessing and using digital technologies. The 'Gender and Technology' framework underlines gender-sensitive policies that need to guarantee that both male and female smallholder farmers benefit from digital inclusion efforts [11].

The degree to which new technology complements their current practices will determine how well smallholder farmers adopt them. Over time, trends in technology use can be explained by the idea. Furthermore, some programs and agricultural spread innovations must use targeted models as their theoretical foundation. Moreover, it is imperative to devise practical strategies and interventions tailored to the specific contexts, needs, and resources of smallholder farmers while also addressing the systemic barriers contributing to the digital divide.

3. The Digital Divide: A Global Challenge

The digital divide denotes the uneven access to digital technology and the internet, exceeds national boundaries, and touches people in both developed and developing countries [12]. However, the divide is expressed differently in various contexts; its predominant impact is deep-rooted inequity that extends to social, economic, and educational disparities [13].

The digital divide in developed nations often concentrates on the issues of access to high-speed internet, with rural and urban low-income groups confronting limitations in connectivity. Meanwhile, the challenges in developing countries are multidimensional, all-embracing not only access to them but also affordability, digital literacy, and applicability of digital resources. The digital divide is intensely noticeable for smallholder farmers as they are marginalized groups. These people experience exceptional barriers to digital inclusion that could be financial, educational, social, or even geographical. The global community is gradually relying on digital technologies for everyday life, from communication and commerce to education and healthcare; linking this gap is commanding that no one is left behind in the rally for development.

4. Bangladesh: An Agrarian Nation in Transition

Bangladesh is a riverine country of the world with remarkable diversity and resilience. It is one of the most densely populated countries in the world, with 160 million people and sharing borders with India and Myanmar [14, 15]. The geographical location of Bangladesh, nuzzled within the Ganges-Brahmaputra Delta, provides an upswing to fertile plains, which become the lifeblood of the agriculture sector in the country.

Agriculture is considered the cornerstone of Bangladesh's economy, occupying a substantial part of the labor force, particularly in rural areas [16]. Smallholder farmers are the driving force of the food grain production of Bangladesh, often cultivating less than two hectares of land. Besides, these people are engaged in widespread agricultural activities, from rice production to vegetable farming and poultry and cattle rearing [17]. Although the agriculture sector plays and remains pivotal in the economy of Bangladesh, it is also fast modernizing and incorporating technology and digital solutions in diverse sectors. The country has also observed significant economic progress in recent years, powered by trades such as Ready-Made Garments (RMG), information technology, and remittances from Bangladeshi migrants [18]. This two-fold uniqueness of a primarily agricultural nation incorporating digital transformation highlights the difficulty of the digital inclusion challenge.

5. The Imperative of Digital Inclusion for Smallholder Farmers

Digital inclusion is not only a meager amenity but also a primary facilitator of economic progress, social equity, and access to fundamental information for smallholder farmers in Bangladesh. It grasps the potential to discourse many challenges that smallholder farmers usually face, ranging from weather forecasts for farming decisions to relating with the markets to get fair prices and mounting their knowledge throughout the online services.

Access to Digital Infrastructure: The accessibility of digital set-up, including dependable internet service and digital devices, is the foundation of digital inclusion [19]. It is also essential to have an affordable internet facility with trust to include digitally divided groups in digital platforms. Smallholder farmers living in rural areas often face network coverage gaps and a lack of high-speed internet for daily usage and access to digital platforms to get desired information. Besides, smallholder farmers living in remote areas have unpredictable and severe problems with internet speed and electric supply. As a result, harnessing the benefits of digital technologies and the

inclusion of smallholder farmers essentially warrants overcoming the above infrastructural challenges.

Digital Literacy and Education: The knowledge of digital technology and schooling programs plays a central role in empowering farmers to use digital tools and techniques efficiently [20]. Knowledge about digital resources, navigating them, translating weather data, or utilizing agricultural apps can significantly increase their capacity to improve farming practices and access market information. Smallholder farmers' access to training programs and enduring support helps them understand and use digital technologies, which can bridge the literacy gap [21].

Affordability and Financial Accessibility: The price of digital devices and internet packages can be a major barrier for smallholder farmers who live and operate their lives on tight budgets. Ensuring that digital tools are affordable and that financial services are accessible is vital for their participation in the digital economy [22, 23]. Access to digital payment systems and financial services can empower farmers to engage in digital transactions and manage their finances more effectively [24].

Government Policies and Regulations: Government policies and regulations can either facilitate or hinder digital inclusion efforts [25]. Supportive policies that promote digital infrastructure development and digital literacy initiatives are essential to creating an enabling environment for smallholder farmers. Government policies and initiatives to expand digital infrastructure in rural areas can significantly impact digital inclusion. Private sector investments in rural digital infrastructure can also contribute to narrowing the digital divide [26]. Besides, Tailored information is crucial. Digital platforms should offer information and services relevant to agriculture, including weather forecasts, market prices, and farming techniques. Moreover, Access to digital marketplaces can help farmers connect with buyers and access a broader market for their products [27, 28]. Nonetheless, government policies that support digital inclusion, such as subsidies for digital devices or tax incentives for telecom companies, can be critical, especially for smallholder farmers.

Gender Equity Considerations: Gender plays a role in digital inclusion, and efforts should be made to ensure both male and female farmers have equal access and opportunities [29]. Gender equity is a critical aspect of digital inclusion. Recognizing and addressing the unique challenges faced by female farmers in accessing and utilizing digital technologies is essential for promoting equal opportunities and empowerment [30].

Community Support and Local Partnership: Building strong support networks within farming communities can enhance digital inclusion [31]. Peer learning and community-led initiatives can play a significant role in fostering digital literacy and adoption [32]. Collaborations between NGOs, local governments, and tech companies can help tailor digital solutions to the specific needs of smallholder farmers.

Environmental Factors: Given Bangladesh's vulnerability to climate change and its dependence on agriculture, digital tools that provide weather forecasts and guidance on climate-resilient farming practices are of paramount importance for the sustainability of smallholder farming [33]. Digital tools can help farmers adapt to changing weather patterns and manage resources sustainably [34].

6. A Holistic Exploration of Determinant Factors

The digital inclusion narrative for smallholder farmers in Bangladesh is not a single-threaded story but a tapestry woven from myriad determinant factors. It is a tale of challenges and opportunities, of barriers that need dismantling and pathways that beckon toward progress. Over the course of this exploration, we delve deep into each of these determinant factors, seeking to understand their nuances, their interplay, and their collective impact on the lives of smallholder farmers. Our journey traverses the fertile fields of rural Bangladesh, where the agricultural rhythms of planting and harvest are increasingly synchronized with the digital pulse of smartphones and data connectivity. We steer with the policies of the government that have been taken with the aim to bridge the digital divide, community activities that advocate digital literacy, and the embryonic role of women in agriculture and technology adoption.

Besides, we also scrutinize the broader landscape of digital inclusion on a global scale, sketching lessons and intuitions from initiatives in other countries that contributed successfully to empowering marginalized smallholder farmers groups through digital tools and techniques. By

comparing the global depiction with the domestic realities of smallholder farmers in Bangladesh, the study endeavors to configure a holistic image of the digital inclusion narrative and its consequences on rural development. It is crucial to acknowledge that digital inclusion is not an end in this far-reaching journey but a means to enable smallholder farmers to develop their farming practices and market access, increase resilience to climate change, and improve their general well-being. It is a journey toward greater equity, opportunity, and sustainable development for those who labor on the frontlines of agriculture in Bangladesh. The tales of these smallholder farmers, their aspirations, and the determinant factors that shape their digital inclusion can serve as both a mirror reflecting the challenges faced by marginalized communities worldwide and a beacon guiding us toward solutions that can pave the way for a more inclusive and equitable digital future.

7. Conclusion

The pursuit of digital inclusion for smallholder farmers in Bangladesh has many determinant factors. A review of them offers valuable insight into the complex landscape of digital inclusion efforts for this vulnerable demographic. The emerging access to digital infrastructure is foundational, but more is needed. Internet connectivity and hardware accessibility remain critical prerequisites for farmers to engage with digital tools effectively. While significant strides have been made in expanding connectivity, particularly in rural areas, challenges persist, and further infrastructure investments are needed to bridge the access divide fully. Digital literacy and education programs play an equally pivotal role. The initiatives must be context-specific and tailored to the unique needs and challenges of smallholder farmers in Bangladesh.

Moreover, the relevance of digital services, particularly within the agricultural context, has proven instrumental in driving adoption. Digital tools must align with the specific needs of farmers, offering practical solutions that enhance productivity, support sustainable farming practices, and facilitate market access. Market access and supply chain integration serve as catalysts for economic empowerment. Assuring digital data security is the next level problem to be solved. Moreover, gender-sensitive strategies that address these disparities are crucial for ensuring that all farmers benefit equitably from digital inclusion efforts. Community support mechanisms, peer learning, and the adaptability and scalability of digital solutions contribute to comprehensive inclusion.

Understanding the impacts of the above factors is required for establishing practical actions. The strategies for digital inclusion must be holistic, context-specific, and responsive to the evolving needs of smallholder farmers in Bangladesh. It can bolster agricultural productivity, enhance food security, improve rural livelihoods, and contribute to sustainable development. The expected outcome is developing a sustainable framework for smallholder farmers in Bangladesh. The study's findings are intended to guide future research directions. It will function with the aid of digital tools and meet the demands of a world that is becoming more interconnected.

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