



A REVIEW OF FACTORS INFLUENCING THE ADOPTION OF AGTECH SOLUTIONS BY AGRIPRENEURS

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ABSTRACT

The adoption of Agricultural Technology (AgTech) solutions by agripreneurs is a dynamic and crucial phenomenon within modern agriculture, with the potential to revolutionize traditional farming practices. This study presents a comprehensive exploration of the factors that influence the adoption decisions of agripreneurs concerning AgTech solutions. Based on the review of literature, this paper develops a framework that divides these influencing factors into three main dimensions: demographic, socio-economic, and institutional. The objective of this review was to assess the factors affecting the adoption of agricultural technology solutions. The outcomes revealed that, demographically age and gender shape technology acceptance. Socio-economically, income level, education, and farm size, shape the landscape of AgTech adoption and influence the ability of agripreneurs to embrace these technologies effectively. Institutionally, government policies and support mechanisms, such as subsidies and extension services, play a pivotal role in facilitating technology uptake.

KEYWORDS: Agricultural Technology, Adoption, Agripreneurs

INTRODUCTION

India plays a significant role in the global agriculture industry, serving as the primary source of livelihood for approximately 55% of its population. The country boasts the world's largest cattle (buffaloes) and dedicates extensive land to cultivating wheat, rice, and cotton. India also leads the world in producing milk, pulses, and spices while ranking second in producing fruits, vegetables, tea, farmed fish, cotton, sugarcane, wheat, rice, and sugar. Notably, India possesses the second-largest agricultural landmass globally, providing employment to approximately half of its population. As a result, farmers play an indispensable role in ensuring our sustenance through their contributions to the agricultural sector [2].

Throughout the history of human civilization, agriculture has consistently been essential for sustenance and livelihoods, offering numerous opportunities for entrepreneurship. In the past, during the era of industrialization, agriculture was often perceived as an unprofitable endeavor. Remarkably, this perception remains largely unchanged even today. Nevertheless, agriculture continues to play a pivotal role in people's livelihoods worldwide. The agricultural sector continually witnesses the emergence of new technologies aimed at enhancing farming practices. These technologies are introduced to farmers and various stakeholders to improve their methods. However, the adoption of these innovations is influenced by a complex interplay of factors, which have been extensively analyzed in various studies [5].

AGRICULTURE TECHNOLOGY (AGTECH)

Sustainable agricultural technology, also known as "AgTech," is a rapidly growing economic sector that has the potential to fundamentally alter the way that agriculture is practiced around the world by significantly increasing agricultural productivity while lowering the environmental and social costs associated with current agriculture production methods. AgTech advances will be essential, given that we must produce more food in the next 40 years than we have in the entirety of human history, and we must do so in a world that is already exhibiting severe environmental stress [7].

The agricultural sector, a cornerstone of global food security and economic stability, has undergone remarkable transformations in recent years, driven by technology integration, collectively referred to as Agricultural Technology (AgTech). This technological revolution has the potential to revolutionize agricultural practices, making them more efficient, sustainable, and resilient. Within this landscape, agripreneurs, entrepreneurial individuals engaged in agricultural activities, play a pivotal role as early adopters and drivers of AgTech innovation. Understanding the factors influencing the adoption of AgTech solutions by agripreneurs is of paramount importance in shaping the future of agriculture [10].

MODERN AGRICULTURE TECHNOLOGY (AGTECH)

Food demand will increase 70% by 2050 on pace with the increasing population rise. According to a UN report, 9.9% of the world's population still experiences hunger, making the idea of providing food for roughly 10 billion people a difficult task. With unpredictable environmental changes, we must rely on advancements in agricultural technology (AgTech) Solutions [3].

AgTech solutions include the development and usage of hybrids, greenhouse technology, genetically modified food, chemical fertilizers, insecticides, tractors, and other scientific applications. AgTech solutions are production factors that have been altered in some way from their initial state with the goal of improving their performance [13].

There are various AgTech solutions that are being used worldwide i.e., Bee Vectoring Technologies, Precision Agriculture, Indoor Vertical Farming, Livestock Farming Technology, Laser Scarecrows, Farm Automation, Real-Time Kinematic (RTK) Technology, Mini chromosome Technology, Farm Management Software, Water Management Technology, etc. [3].

ADOPTION OF AGRICULTURE TECHNOLOGY (AGTECH)

According to Farmers' Global Insights Survey, Asia currently has the lowest rate of AgTech adoption, with only 9% of farmers utilizing or intending to utilize at least one AgTech solution in the near future. The region is catching up to the 4% adoption rate of sustainable technologies, though. The good news is that Indian farmers utilize more AgTech items than farmers in China, the largest agricultural market in the world [17].

The adoption of cutting-edge methods made possible by technology is anticipated to fuel the agriculture sector's expansion in India, where it is predicted that the agricultural business will reach \$24 billion by 2025. In fact, AgTech-enabled sustainability technologies that facilitate measurement, reporting, and verification, together with data-collection technologies like remote sensing, are progressively beginning to address the massive data sets [4].

FACTORS AFFECTING ADOPTION OF AGTECH SOLUTIONS BY AGRIPRENEURS

The adoption of AgTech solutions by agripreneurs is influenced by a complex interplay of factors, including Demographic, socio-economic, and institutional factors. Understanding these factors is essential for promoting the successful integration of technology in agriculture. The factors related to the demographics of agripreneurs include age and gender. The socio-economic factors include income level, education level, and farm size of agripreneurs. The institutional factors include extension services, government support, technology providers and agribusiness companies, access to credit and finance, etc.

DEMOGRAPHIC FACTORS

The adoption of agricultural technology (Agtech) solutions by agripreneurs is intricately intertwined with various demographic factors that shape their decision-making processes. Age, for instance, plays a pivotal role in this context. Younger agripreneurs, who have grown up in the digital age, often display a higher propensity to embrace AgTech innovations due to their innate tech-savviness (Pannell et al., 2006). In contrast, older farmers, who may not have been exposed to technology in their formative years, may exhibit more resistance to change, potentially hindering the adoption of AgTech solutions [15].

Gender can exert a notable influence on the adoption of agricultural technology (Agtech) solutions among agripreneurs. Gender-based disparities often manifest in access to resources, information, and decision-making power, which, in turn, affect the propensity to adopt AgTech innovations. For instance, women in agriculture frequently face structural barriers such as limited access to land, financial resources, and extension services, which can impede their ability to invest in and adopt AgTech solutions. In contrast, male agripreneurs may have relatively greater access to resources and decision-making authority, making them more likely to adopt AgTech. Gender disparities in access to information and technology can also play a significant role. Women may encounter challenges in accessing and using AgTech due to a lack of training or restricted mobility, while men may have greater access to these resources [6].

Moreover, social norms and cultural expectations often restrict women's mobility and participation in decision-making processes, further limiting their access to AgTech information and training. In contrast, men may have greater freedom to attend training programs, access information, and participate in AgTech adoption efforts [12].

To address these disparities, various organizations and government programs are working to promote gender-inclusive AgTech adoption in India. For example, the Indian government has implemented initiatives like the Mahila Kisan Sashaktikaran Pariyojana (MKSP) to empower women in agriculture through capacity building, training, and financial support [15].

SOCIO-ECONOMIC FACTORS

Socio-economic factors play a crucial role in determining the adoption of agricultural technology (AgTech) solutions by agripreneurs in India. These factors, which include income level, education, and farm size, shape the landscape of AgTech adoption and influence the ability of agripreneurs to embrace these technologies effectively.

Income level is a fundamental determinant of AgTech adoption. Higher-income agripreneurs have more financial resources at their disposal, making it easier for them to invest in AgTech solutions. For instance, they can afford the initial costs of purchasing technology and are better positioned to manage ongoing expenses, such as maintenance and upgrades. In contrast, lower-income agripreneurs may find it challenging to allocate funds to AgTech adoption, potentially limiting their access to these innovations [16].

Education level is another significant socio-economic factor. Agripreneurs with higher levels of education are more likely to understand the potential benefits of AgTech and the means to effectively implement these solutions. They tend to be more receptive to training programs and are better equipped to make informed decisions about technology adoption. This group is often more adaptable to new technology, making it more likely for them to embrace AgTech solutions [1].

Farm size is also a critical determinant. Larger farms often find it more cost-effective to adopt AgTech because the benefits of increased efficiency and productivity can offset the initial investment costs. Larger landholdings provide a stronger economic incentive to implement AgTech solutions, while smaller-scale agripreneurs may perceive these investments as less viable [18].

INSTITUTIONAL FACTORS

The adoption of agricultural technology by agripreneurs is significantly impacted by a myriad of institutional factors. Government policies and support mechanisms, such as subsidies and extension services, play a pivotal role in facilitating technology uptake. An essential institutional component that varies farmers' adoption status is the extension service. Currently, the extension system handles most of the delivery of agricultural technology. The factors that most frequently fall under this category—access to training—include age, education, household size, landholding size, and other indicators of farmers' wealth status. Larger farmers are considered to be able to afford more advanced equipment and to take on more risk if the technology fails [10]. Another important

measure of extension is farmers' experience in extension service. It is anticipated that farmers' exposure to agricultural extension will raise their demand for yield. With the advent of new technologies, there is a greater need for information that helps with decision-making. Consequently, organizations dedicated to agricultural extension provide valuable insights into novel agricultural innovations. Having access to these informational resources can be essential for improved variety adoption [8].

Equally crucial are robust research and development institutions, which act as knowledge hubs and disseminators of cutting-edge innovations. The presence and effectiveness of R&D institutions, agricultural universities, and research organizations play a crucial role. Access to cutting-edge research, technical knowledge, and innovation through these institutions can facilitate technology adoption [9]. Lack of financial resources often hampers the adoption of technology. Adequate access to credit, loans, or financial support specifically tailored for acquiring agricultural technologies can encourage agripreneurs to invest in new tools and techniques [18].

For households with medium and lower incomes, access to credit services provides the funding needed to purchase inputs for agricultural production. Several authors stated to the fact that farmers with access to credit services were more likely than non-users to embrace new agricultural technologies. Daniel and Kafle confirm that by compensating for a household's financial shortfall, credit availability can raise the likelihood that new agricultural technologies will be adopted [11].

CONCLUSION

AgTech, a rapidly growing field, brings hope for transforming worldwide agriculture by enhancing productivity while lessening its impact on the environment. Factors influencing AgTech adoption among agripreneurs are diverse and encompass demographic, socio-economic, and institutional aspects. Demographically, age and gender shape tech acceptance; younger farmers display a higher inclination due to tech familiarity, while gender disparities impact resource access and decision-making, hindering women's adoption. Socio-economically, income levels affect affordability, higher education facilitates understanding and adaptation, and larger farms find AgTech more cost-effective. Institutionally, government policies, extension services, research and development institutions, and access to credit play vital roles; effective extension services and financial support significantly influence technology adoption.

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