

Gender Exclusiveness Of Agricultural Technology And Iot (Internet Of Things) And Its Impact On Agricultural Extension Services

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ABSTRACT

Smart farming, also known as precision agriculture or digital agriculture, is indeed a modern agricultural approach that leverages information and communication technology (ICT) to optimize farming operations and improve overall efficiency. Smart farming integrates various technologies, including machinery, equipment, sensors, and data analytics, to enable precise and data-driven decision-making in agricultural practices. Agricultural extension services play a crucial role in disseminating information, providing modernized and hi-tech training, and offering support to farmers, including women, to improve agricultural productivity, enhance food security, and promote rural development. However, the impact of agricultural extension services on women and the challenges they face vary depending on socio-economic, cultural, and geographical factors. Agricultural extension services help women farmers gain access to information about modern farming techniques, crop varieties, pest management, and post-harvest practices. This knowledge empowers women to make informed decisions about their agricultural activities, leading to increased productivity and income. In many areas, women may encounter challenges related to digital literacy, access to internet connectivity, and use of mobile phones or other digital devices required to access agricultural information and services. The digital divide exacerbates existing inequalities and limits women's ability to benefit from technological advancements and online extension platforms.

Key Words: Agriculture, Extension Services, Women, Technology, IoT, Challenges

Introduction

India's status as a predominantly agrarian rural economy is indeed a significant characteristic of its socio-economic landscape. India predominantly an agrarian rural economy, with around 69 per cent of its population living in rural areas (Aayog 2017) and around 47 per cent of the workforce engaged in agriculture (Labour Bureau 2015-16). India's agricultural sector remains a vital component of its economy and society, contributing to food security, employment, and rural development. As India continues to undergo economic and demographic transformations, the sustainability and modernization of the agricultural sector remain important considerations for the country's overall growth and development. India's agrarian rural economy plays a crucial role in its socio-economic fabric, with a significant portion of the population relying on agriculture for their livelihoods. However, despite its importance, the agricultural sector faces various challenges, and the impact of agricultural extension services on women in this sector is a critical aspect to consider.

Gender Exclusive Technology

Gender equality is a crucial component of the Sustainable Development Goals (SDGs) established by the United Nations (UN). It is recognized as a fundamental human right and is essential for achieving sustainable economic development (White, 2006). Indian agriculture, indeed, faces challenges in achieving gender inclusivity despite the significant contributions of women to the sector. While women play a crucial role in various aspects of agricultural production, their contributions are often unrecognized and undervalued. In India, women have limited access to and ownership of agricultural land due to patriarchal land tenure systems and inheritance laws (Dharamshi, 2022). Land ownership is often skewed towards men, which restricts

women's control over productive resources and decision-making power in agriculture. Women agricultural workers in India face unequal wages compared to men for similar work. They are often engaged in low-paying and labor-intensive tasks such as weeding, harvesting, and post-harvest activities, while men typically occupy higher-paying and more skilled positions. Technological advancements in agriculture often overlook the specific needs, priorities, and constraints faced by women farmers, resulting in a lack of gender inclusivity. Agricultural technologies are often designed with a male-centric perspective, assuming that men are the primary users and decision-makers in farming activities (Rola-Rubzen, 2020). This design bias may overlook the diverse roles, preferences, and constraints of women farmers, leading to technologies that are not well-suited to their needs. Women farmers may have limited access to information about new agricultural technologies and limited opportunities for training and skill development. Lack of awareness and technical knowledge may hinder women's ability to adopt and effectively utilize modern farming tools and techniques. The ergonomics involved explains agricultural machines and equipment are designed based on the average physical attributes of male farmers, including height, weight, and strength. This can pose challenges for women farmers, who may find it difficult to operate machinery that is too large, heavy, or cumbersome for their size and physical strength (Benos, 2019). Some agricultural machinery and equipment may be designed with complex controls or require specialized skills to operate effectively. Women farmers, who may have limited access to training and technical knowledge, may find it challenging to use such equipment efficiently. Gender roles and cultural norms within rural communities may discourage women from operating machinery or engaging in activities perceived as traditionally male-dominated. Women may face resistance, stigma, or discrimination when attempting to use agricultural equipment, limiting their access to these tools and technologies.

Challenges Faced by Women

Women often have limited access to resources such as land, credit, seeds, and agricultural tools, and technology which restricts their ability to practice modern and efficient farming techniques (D. A. Ankrah, et al. 2020). In many regions, women farmers are not paid equally for their work compared to men, even if they perform similar tasks (Akter, S., et al. 2017). Limited access to education and training opportunities hampers women's ability to adopt modern agricultural practices and technologies (Times of India Blog, October 13, 2023). Women's agricultural work is often unpaid and unrecognized, especially in family farming situations. Their contributions to farming and household economies are not always acknowledged. Balancing multiple roles often leads to time poverty for rural women. They have to manage both farm work and household responsibilities, leaving them with little time for self-care or personal pursuits. Deeply rooted social norms and cultural practices sometimes restrict women's involvement in decision-making processes within the family or community, limiting their influence on agricultural matters. Climate change disproportionately affects women, who are often responsible for securing water, food, and energy for their families. Changes in climate patterns can disrupt these responsibilities and increase their workload. Limited access to healthcare facilities and information on health exacerbates the challenges faced by women, affecting their overall well-being. Efforts to empower women in agriculture include providing them with equal access to resources, education, and training. Recognizing and valuing their contributions, supporting women's cooperatives, and promoting gender-sensitive policies are essential steps toward achieving gender equality in agriculture. Empowering rural women not only benefits them individually but also contributes to improved agricultural productivity and sustainable rural development. However, it's worth noting that while agriculture has been a backbone of the Indian economy for a long time, its contribution to GDP has been gradually decreasing over the years as other sectors like services and industry have gained prominence. The Indian government has been working on diversifying the economy and reducing its dependence on agriculture for sustainable and balanced growth.

Agriculture has been a cornerstone of the Indian economy for centuries, and it continues to be a vital sector for various reasons like Employment. Agriculture is a major source of employment in India. A substantial portion of the population, especially in rural areas, depends on agriculture for their livelihoods. This includes not only farmers but also those engaged in various allied activities like animal husbandry, fishing, and agro-processing. Agriculture ensures food security for the country's population. India's diverse agro-climatic conditions allow the cultivation of a wide variety of crops, which contributes to a stable and consistent food supply. Agriculture significantly impacts the rural economy, as it influences the income, purchasing power, and overall development of rural areas. It's also intertwined with various other sectors, like transportation, storage, and market infrastructure. Agricultural products are often a significant contributor to India's export earnings. Commodities such as rice, wheat, spices, tea, coffee, and textiles are important export items that bring in foreign exchange. Indian agriculture is deeply rooted in traditional knowledge and practices that have been passed down through generations. This heritage forms a crucial part of the country's cultural and social fabric. Apart from food, agricultural products also serve as raw materials for various industries, such as textiles, pharmaceuticals, and biofuels. Agriculture plays a role in sustainable development, as it is tied to environmental concerns, including soil health, water management, and biodiversity preservation. Sustainable farming practices are essential for maintaining the long-term productivity of the land. By providing employment opportunities and livelihoods to a significant portion of the population, agriculture contributes to poverty reduction and socio-economic development. However, it's important to acknowledge that challenges exist within the agricultural sector as well. These challenges include issues related to productivity, technological

adoption, market access, land fragmentation, climate change, and more. The Indian government and various organizations have been working on policies and initiatives to address these challenges and promote the sustainable growth of the agriculture sector while ensuring the well-being of farmers and rural communities. Lewis Mumford (1961) eloquently highlights the significance of women's roles in agriculture and how their nurturing and caregiving abilities played a crucial role in the growth of human civilization. Women constitute 48.20 percent of the total population in India with a literacy rate of 54.16 percent (2001 census). But the women working on farm were 92.2 million as against 145.6 million males (1999- 2000). In India 81 percent of women workers are engaged in unorganized sector of the economy and constitute about 75 percent of the total rural workforce. The primary sector consisting of farming, livestock, forestry, fishery, orchards and plantation etc. provides employment for about 75 percent of women. This section of the women forms the most precious resource of any nation and determine the foundation of a meaningful, social and economic development. The fact that the proportion of female workers in agriculture has remained relatively consistent, from 73% in 1911 to 72% in 2001, underscores the enduring importance of women in this sector. Beyond agriculture, Indian women play diverse socioeconomic roles both inside and outside the home. They are involved in family management, education, healthcare, and community development. Women's contributions to food production are substantial, as they are responsible for 50 percent of all food production worldwide. This includes both their roles as cultivators of their own land and as hired agricultural laborers. Women actively participate in nearly all agricultural operations, including sowing seeds, transplanting seedlings, weeding, applying fertilizers, harvesting, threshing, winnowing, and seed and grain storage. Women may lack the technical knowledge and expertise needed to operate and maintain equipment, implement precision farming techniques, or utilize digital tools effectively. Modern ICT technologies, such as the Internet of Things, GPS (Global Positioning Systems), sensors, robotics, drones, precision equipment, actuators, and data analytics, are used to identify the farmers' needs and select suitable solutions to their problems. These innovations increase the accuracy and timeliness of decisions taken, and improve crop productivity. Several multilateral organizations and developing countries around the world have proposed smart farming technologies to increase agricultural output (Kumar, R. et al., 2021). The digital gender gap is a significant issue that affects women's access to information and communication technologies (ICTs) in many rural areas around the world, including those involved in agriculture. According to the report of the Committee on the Status of Women in India (1974) "on sharing of household duties and participation in family decision -making indicates that while the major share of duties is with the female members of the family, they have very little power with regard to decision making and technology utilization". Gender disparities in income -earning and decision-making opportunities are much higher. This highlights a distressing reality of gender disparities in income-earning opportunities and decision-making power, which disproportionately affect women, leading to a phenomenon known as the "feminization of poverty". The "feminization of poverty" refers to the trend where a higher percentage of the world's poor are women and girls. This concept emphasizes that women are more likely to be in poverty or experience greater levels of economic hardship compared to men. The National Planning Committee on women's role (1990), in planned economy categorically remarked that "so long however the very foundation of society is based on a system of private property, women cannot claim equality with men unless, she has the same right as men to hold, acquire .inherit and dispose of property" (S. E. Merry, 2003). The fact that only 15 percent of women are working in organized sectors underscores the gender gap in formal employment opportunities. Organized sectors typically offer more stable jobs with better pay, benefits, and job security. Many women in the unorganized sector are engaged in jobs with seasonal demand, such as agricultural labor or seasonal manufacturing. This seasonality can lead to income instability. Women in the unorganized sector often find themselves in unskilled or low-skilled positions, which can limit their earning potential and opportunities for career advancement.

Conclusion

Farming technologies, the offshoot of agricultural extension services, including those leveraging the Internet of Things (IoT), often lack gender inclusivity. While IoT technologies hold significant potential to enhance agricultural productivity and sustainability. Women farmers may have limited access to and ownership of IoT devices and technology infrastructure due to socio-economic factors, cultural norms, and gender disparities in resource allocation. Extension programs must use diverse communication channels and formats to reach women effectively. Many agricultural extension programs lack gender-sensitive approaches and fail to address the specific needs, preferences, and priorities of women farmers. Training materials, extension messages, and delivery mechanisms should be tailored to the socio-cultural context and preferences of women to ensure their relevance and effectiveness. Addressing these challenges requires a multi-dimensional approach that promotes women's rights, provides targeted support, and integrates gender considerations into agricultural extension policies, programs, and practices. Efforts to strengthen women's access to resources, technological advancements, improve their participation and decision-making power, and promote gender-responsive extension services are essential for realizing the full potential of agricultural extension in empowering women and advancing sustainable rural development.

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