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Empowering Women in Agricultural Business through AI: Opportunities and Challenges

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Abstract:

The integration of artificial intelligence (AI) into agricultural business presents a promising avenue for empowering women in the sector. Women constitute a significant portion of the agricultural workforce globally, yet they often face systemic barriers to full participation and economic empowerment. AI technologies offer a range of opportunities to address these challenges, from enhancing productivity and decision-making to improving access to markets and financial services. This abstract explores the potential benefits and challenges of leveraging AI to empower women in agricultural businesses.

AI-powered tools and applications, such as precision agriculture systems, crop monitoring platforms, and predictive analytics, enable women farmers and entrepreneurs to optimize resource allocation, improve crop yields, and reduce production costs. By providing real-time data and insights, these technologies empower women to make informed decisions and adopt more sustainable farming practices. Additionally, AI-driven market platforms and supply chain management systems facilitate direct access to buyers, markets, and financial services, enabling women to negotiate fair prices, access credit, and expand their businesses.

However, several challenges must be addressed to ensure that women in agricultural businesses can fully benefit from AI technologies. Gender biases in data collection and algorithm design may perpetuate existing inequalities and limit women's access to AI-driven solutions. Furthermore, issues related to digital literacy, access to technology infrastructure, and affordability pose barriers to adoption for women, particularly in rural and marginalized communities. Additionally, concerns about data privacy, security, and ownership require careful consideration to build trust and confidence among women farmers and entrepreneurs.

To overcome these challenges, stakeholders must collaborate to develop gender-responsive AI solutions and promote women's participation in technology design, deployment, and decision-making processes. Investments in digital skills training, infrastructure development, and inclusive technology policies are crucial to ensure that women have the knowledge, tools, and resources to harness the potential of AI in agricultural businesses. Moreover, efforts to address cultural and social barriers, such as gender norms and access to land and property rights, are essential to create an enabling environment for women's economic empowerment in agriculture.

Keywords: Artificial Intelligence (AI), Agricultural Business, Women Empowerment, Precision Agriculture, Crop Monitoring

Opportunities with Artificial Intelligence(AI)

Empowering women in agricultural businesses through the strategic integration of artificial intelligence (AI) presents a promising avenue for fostering gender equality and economic development in rural communities. This abstract outlines key opportunities that AI offers to enhance the participation, productivity, and profitability of women in agricultural enterprises.

Precision Farming: AI-driven precision farming technologies enable women farmers to optimize resource allocation, including water, fertilizers, and pesticides, leading to improved crop yields and reduced environmental impact. These technologies provide real-time data and insights, empowering women to make informed decisions about crop management and resource utilization.

Market Access: AI-powered market platforms and supply chain management systems connect women farmers directly to buyers, markets, and financial services. By eliminating intermediaries and facilitating transparent transactions, these platforms enable women to negotiate fair prices, access credit, and expand their market reach, thereby enhancing their profitability and competitiveness.

Decision Support Systems: AI-based decision support systems offer women farmers personalized recommendations and actionable insights for crop planning, pest management, and risk mitigation. These tools leverage data analytics and predictive modeling to anticipate market trends, weather patterns, and crop diseases, enabling women to adapt their farming strategies and maximize their agricultural output.

Financial Inclusion: AI-enabled credit scoring algorithms and digital lending platforms provide women farmers with access to formal financial services, such as loans and insurance, based on their creditworthiness and production history. By reducing the reliance on traditional collateral and paperwork, these technologies lower the barriers to financial inclusion and empower women to invest in their farms and businesses.

Capacity Building: AI-powered educational platforms and extension services deliver tailored training and knowledge resources to women farmers, covering topics such as agronomy, agribusiness management, and technology adoption. These initiatives enhance women's skills, confidence, and decision-making abilities, enabling them to leverage AI tools effectively and adapt to changing agricultural landscapes.

Innovation Ecosystems: AI fosters innovation ecosystems that encourage women's entrepreneurship and participation in the technology sector. By supporting women-led startups, research initiatives, and technology hubs focused on agriculture, AI creates opportunities for women to contribute to technological advancements and drive inclusive growth in the agricultural industry.

Challenges with Artificial Intelligence(AI)

While the integration of artificial intelligence (AI) in agricultural businesses holds significant promise for empowering women farmers and entrepreneurs, several challenges must be addressed to realize this potential fully. This abstract

highlights key obstacles that women face in leveraging AI technologies in agricultural enterprises and proposes strategies to overcome these challenges.

Digital Gender Divide: Women farmers and entrepreneurs often have limited access to digital technologies, including smartphones, computers, and internet connectivity. The digital gender gap exacerbates disparities in access to AI-driven solutions, hindering women's ability to benefit from precision farming tools, market platforms, and decision support systems.

Technological Literacy: Low levels of digital literacy and technical skills among women in rural areas pose barriers to the adoption and effective use of AI technologies. Many women lack the knowledge and training needed to navigate AI-powered platforms, interpret data analytics, and troubleshoot technical issues, limiting their ability to capitalize on the potential of these tools.

Data Bias and Representation: Gender biases in data collection, algorithm design, and AI models may perpetuate inequalities and marginalize women's experiences and priorities in agricultural decision-making processes. Biased datasets and algorithms can reinforce existing gender norms and stereotypes, leading to unequal access to resources, markets, and opportunities for women farmers and entrepreneurs.

Infrastructure Constraints: Limited access to reliable electricity, connectivity, and technology infrastructure in rural areas undermines the scalability and sustainability of AI-driven solutions for women in agricultural businesses. Without adequate infrastructure, women may struggle to access and use AI technologies effectively, limiting their ability to compete in digital agricultural markets.

Privacy and Security Concerns: Women farmers and entrepreneurs may be reluctant to share personal or sensitive data with AI platforms due to concerns about privacy, security, and data ownership. Inadequate data protection measures and cybersecurity protocols may expose women to risks such as data breaches, identity theft, and exploitation, undermining trust in AI-enabled solutions.

Cultural and Societal Norms: Deep-rooted cultural and societal norms often restrict women's autonomy, mobility, and decision-making authority in agricultural contexts. These norms may hinder women's participation in technology adoption initiatives, limit their access to training and educational opportunities, and reinforce gender-based divisions of labor in farming and agribusiness.

Activity-wise distribution Agri-venture established by women of Maharashtra in Agri Clinics and Agri Business Centre scheme.

		Agri-Venture Established by Women	
S. No.	Activity	No.	(%) Distribution of total
1	Dairy/Poultry/Piggary/Goatary	423	43.7
2	Agri-Clinics	226	23.3
3	Agri-Clinics and Agribusiness Centres	144	14.9
4	Nursery	44	4.5
5	Value Addition	27	2.8
6	Veterinary Clinics	18	1.9
7	Vermicomposting / Organic manure	15	1.5
8	Farm Machinery Unit	12	1.2
9	Crop Production	8	0.8
10	Landscaping + Nursery	6	0.6
11	Organic Production/ Food Chain	6	0.6
12	Bio-fertilizer production and Marketing	5	0.5
13	Mushroom Cultivation	5	0.5

14	Fisheries Development	4	0.4
15	Vegetable Production and Marketing	4	0.4
16	Horticulture Clinic	3	0.3
17	Pesticides Production and Marketing	3	0.3
18	Agro-Eco Tourism	2	0.2
19	Direct Mkt	2	0.2
20	Floricultrue	2	0.2
21	Production & Marketing of Bio-Control Agents	2	0.2
22	Agriculture Journalism	2	0.2
23	Sericulture	2	0.2
24	Animal Feed Unit	1	0.1
25	Fishery clinic	1	0.1
26	Soil Testing Laboratory	1	0.1
	Grand Total	968	100

Note: *The period for analysis is considered from AC &ABC scheme inception (01-04-2002) to till 25-11-2022

Source: ACABC Cell, MANAGE

It is interesting to note that only a small percentage of ventures are in the areas of Soil Testing Laboratory, Animal Feed Unit, Fishery Clinic, Floriculture, Agro-Eco Tourism, and Pesticides Production and Marketing. This suggests that there may be untapped opportunities in these areas for women entrepreneurs in the agriculture sector.

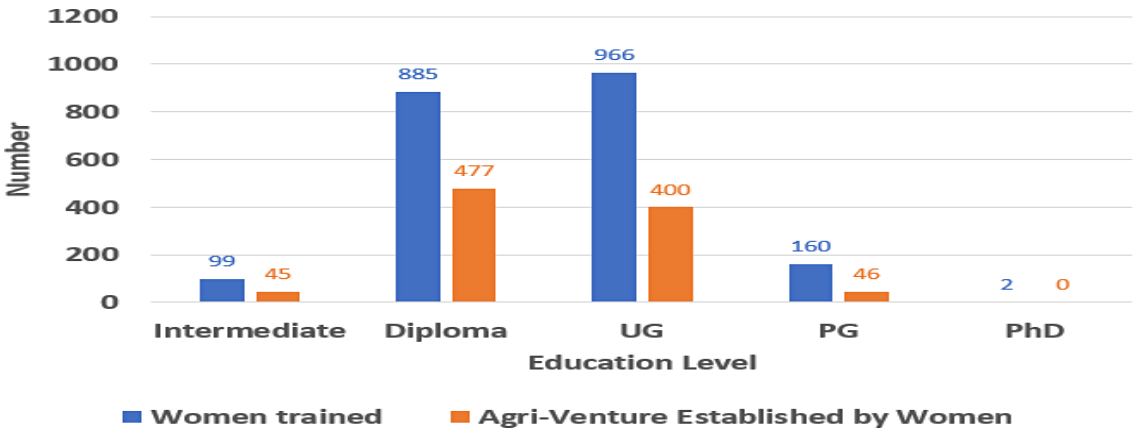
Overall, the data suggests that women in Maharashtra are actively participating in the Agri Clinics and Agri Business Centre scheme and are involved in a wide range of agricultural activities. The distribution of ventures across various activities provides insights for policymakers and other stakeholders to design targeted interventions that can further encourage and support women's participation in agribusiness.

The ACABC program in the Maharashtra state revealed that livestock farming activities such as dairy, poultry, pig farming, and goat rearing were the most favored options among women agripreneurs, constituting 43.7% of the total choices. The subsequent most preferred ventures were agri-clinics and agribusiness centers (23.3%) and agri-clinics alone (14.9%)**.** The surge in popularity for agri-clinics can be primarily attributed to their low investment and risk factor, as they offer consultation services and input supply, leading to prompt revenue generation without any gestation period. Other undertakings were less popular owing to an unsuitable environment, inferior product demand, and scope, as stated by Bairwa et al., 2014[70].

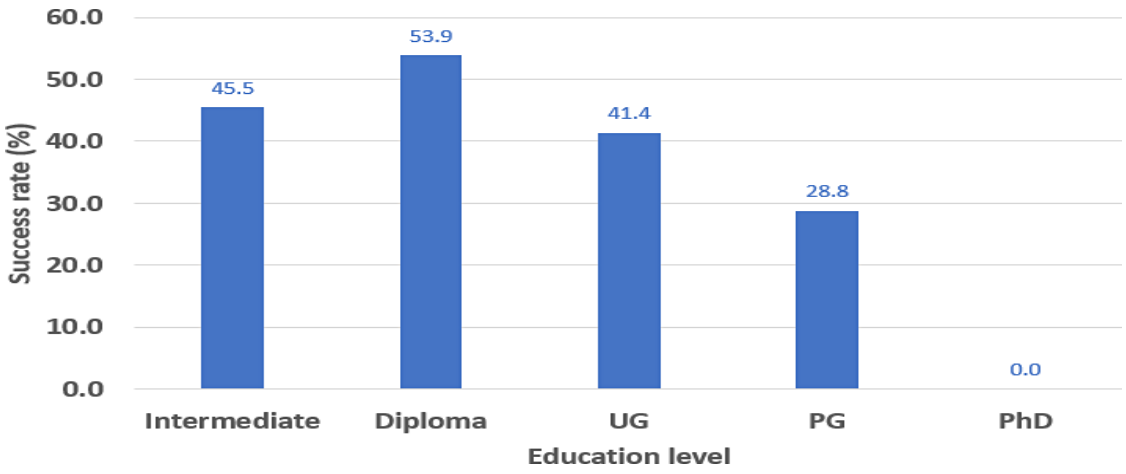
Recent studies have also reported similar findings regarding the popularity of dairy and poultry farming among women agripreneurs in India. A study by Gupta et al., 2019 [71] found that 60% of women agripreneurs in Rajasthan were engaged in dairy farming, while 40% were involved in poultry farming [72]. Another study by Kaushik et al., 2021) in Haryana reported that dairy farming was the most popular venture among women agripreneurs, with 68% of them involved in this activity.

The findings of this study regarding the popularity of dairy and poultry farming among women agripreneurs in Maharashtra are consistent with other studies conducted in different regions of India. The popularity of agri-clinics and agribusiness centers as low-cost and low-risk options for starting a business has also been reported in some studies [74,75]. Overall, these findings can help policymakers and development organizations in designing targeted interventions to support women agripreneurs in starting and scaling up their ventures.

Socioeconomic characteristics (Educational Level and Stream-Wise Distribution) The majority of trained women candidates held bachelor's degrees, but those with diplomas achieved a higher success rate of 53.95% in establishing agriventures.



A. Number of women candidates trained and Number of Agri- Venture established by women segmented by educational level



A. Success rate of turning trained women into agripreneurssegmented by educational level

Fig. 3: Educational level of the women trained under Agri Clinics andAgri Business Centre scheme in the state of Maharashtra, India

Further, it is revealed from the study that diploma holders received more loans compared to those with bachelor's, master's, or doctoral degrees (datanot shown). In Maharashtra under the AC&ABC scheme, 87.5% of trained women were from the agriculture stream, while only 3.2% were from

the horticulture stream. This pattern persisted in a business establishment, with agriculture-backgroundwomen having the highest number of adventures,followed by those with horticulture backgrounds (3.0%).

Table 2: Stream-wise distribution of women of Maharashtra in Agri Clinics and AgriBusiness Centre scheme

S. No.	Name of the Degree	Women Trained		Agri ventures established by women enterpreners	
		No.	(%) Distribution	No. to total	(%) Distribution to total
1	Ag. Engineering	20	0.9	5	0.6
2	Ag. Marketing	3	0.1	1	0.2
3	Agriculture	1847	87.5	850	87.9
4	Animal Husbandry	26	1.2	12	1.3

5	Biotechnology	20	0.9	6	0.7
6	Botany	25	1.2	12	1.3
7	Chemistry	25	1.2	13	1.4
8	Dairy Technology	22	1	14	1.5
9	Environmental Science	1	0	0	0
10	Fisheries	7	0.3	3	0.4
11	Food and Nutrition	2	0.1	1	0.2
12	Food technology	6	0.3	2	0.3
13	Forestry	6	0.3	2	0.3
14	Home Science	4	0.2	0	0
15	Horticulture	68	3.2	30	3.1
16	Intermediate	0	0	0	0
17	Management	0	0	0	0
18	Micro Biology	2	0.1	1	0.2
19	Rural science	0	0	0	0
20	Seed Technology	4	0.2	4	0.5
21	Sericulture	0	0	0	0
22	Zoology	24	1.1	12	1.3
	Grand Total	2112	-	968	-

Note: *The period for analysis is considered from AC &ABC scheme inception (01-04-2002) to till 25-11-2022 Source: ACABC Cell, MANAGE

Additionally, the research found that more diplomaholders secured loans than those with higher academic degrees, possibly because diploma holders are often trained in specific trades and mayneed financial support to start businesses.

Regarding stream-wise distribution, the studyreported that the vast majority (87.5%) of trained women came from the agriculture stream, with onlya small percentage (3.2%) from the horticulture stream. This pattern was also reflected in agriventure establishments, with women from agriculture backgrounds leading in the number of agriventures, followed by those from horticulture backgrounds.

These findings suggest that the AC&ABC programoffers opportunities for women with agricultural backgrounds to become successful entrepreneurs.However, it might be beneficial to explore methodsof encouraging women from other streams, like horticulture, to participate in the program and establish their own adventures.

This study provides essential insights into the educational level and stream-wise distributionof women entrepreneurs in Maharashtra under the AC&ABC program. The findings indicate that practical skills gained through diplomas or vocational training can be valuable in entrepreneurship and that there is a need to encourage women from non-

agricultural streams to participate in the program. The study serves as a solid foundation for future research into the factors contributing to the successof women entrepreneurs in India, with a focus on broadening opportunities for those from diverse educational backgrounds and further promoting theirinvolvement in the AC&ABC scheme.

Table 2 presents the stream-wise distribution of women in Maharashtra who participated in the Agri Clinics and Agri Business Centre scheme, and the agri ventures established by them. The table provides information about the number and percentage of women trained in each degree streamand the number and percentage of agri ventures established by women entrepreneurs. The data covers the period from the inception of the AC&ABC scheme in 2002 till 25th November 2022.

The data indicates that out of 2112 women who participated in the scheme, 1847 (87.5%) were trainedin Agriculture, followed by Horticulture (3.2%), Zoology (1.1%), and Animal Husbandry (1.2%). Onthe other hand, in terms of agri ventures established, the highest percentage was in Agriculture (87.9%),followed by Horticulture (3.1%), and Animal Husbandry (1.3%).

The table also highlights that only a small percentage of women were trained in streams such as Agri Engineering (0.9%), Chemistry (1.2%), and Dairy Technology (1.0%). However, these streams also saw a modest percentage of agriventures established by women entrepreneurs.

Overall, the table provides important insights into the degree streams that have been most effective inencouraging women's participation in the AC&ABCscheme and the types of agri ventures they have established. This information can be useful in designing targeted training programs for womenin Maharashtra and other states to increase their participation in agri-business and entrepreneurship.

Conclusion

The integration of artificial intelligence (AI) into agricultural businesses holds significant potential for empowering women, who represent a substantial portion of the global agricultural workforce. This abstract discusses the opportunities and challenges associated with leveraging AI to enhance women's participation and economic empowerment in the agricultural sector.

Data Insights from Maharashtra:

A study of women in Maharashtra under the Agri Clinics and Agri Business Centre (AC&ABC) scheme revealed that livestock farming (dairy, poultry, piggery, goat rearing) was the most popular venture among women agripreneurs. Agri-clinics and agribusiness centers were also popular due to their low investment and risk factors.

Educational Background:

- Women with diplomas had a higher success rate (53.95%) in establishing agri ventures compared to those with bachelor's, master's, or doctoral degrees.
- The majority (87.5%) of trained women came from the agriculture stream, with a smaller percentage from horticulture (3.2%).
- Diploma holders secured more loans than those with higher academic degrees, possibly due to the practical nature of their training.

Policy Implications:

To fully harness AI's potential for empowering women in agriculture, stakeholders must focus on:

- Investing in digital infrastructure and training programs.
- Developing gender-responsive AI solutions.
- Promoting women's participation in technology design and decision-making.
- Addressing cultural and social barriers to create an enabling environment for women's economic empowerment in agriculture.

By overcoming these challenges and strategically leveraging AI, women can become powerful agents of change and innovation in agricultural businesses, driving economic growth and sustainable development in rural communities.

References:

https://www.agriculturejournal.org

https://www.researchgate.net/publication/380113853_Women's_Agripreneurship_in_India's_Maharashtra_State_An_Analysis_of_the_AC_and_ABC_Scheme