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Women-led Agritech ventures: business models, constraints and impact on household welfare

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Abstract

The emergence of Agritech enterprises owned by women is a big move in the field of agricultural entrepreneurship, which embraces inclusiveness, sustainability, and household well-being. Digital innovation is embraced by these businesses to improve the productivity, access to markets and financial independence through traditional farming. This paper will research the business model, limitations, and welfare outcomes of women-driven Agritech enterprises in India based on primary data of 120 respondents and secondary sources. Through the statistical analysis, it is observed that with increasing technology usage among women agripreneurs, access to finance, digital literacy, and social barriers are some of the critical aspects. The research concludes that Agritech participation has a positive link with the household income, education, and health outcomes. The conclusion made in the paper is that empowering women in Agritech can be used to promote sustainable rural development and inclusive economic growth.

Keywords: *Women entrepreneurship, Agritech, business models, constraints, household welfare, Gender inclusion.*

1. Introduction

Agriculture is one of the pillars of the developing economies, which has almost 60 percent rural workforce in India (FAO, 2023). Agritech innovations, such as digital technologies, precision agriculture, internet of things, and mobile solutions also include the integration of these innovations, which have changed the market connections and productivity in agriculture. Gender-sensitive Agritech initiatives have become the agent of change in this landscape, eliminating gender gaps and improving the socio-economic resilience (Kumar and Jain, 2022).

In spite of this development, women in business have systemic challenges such as loss of land, inaccessibility to finance and technology. However, there is some indication that women farmers become more productive, benefit better households, and engage more in the community when empowered with technology (World Bank, 2022). The paper explores the working models of Agritech business ventures run by women, their major challenges and how they affect the welfare of the household using the mixed method empirical approach.

Background of the Study

Agritech is a concept that includes digital apps, IoT sensors, mobile extension services, and AI-based analytics that is applied to enhance farm productivity and connectivity to the market. Historically, women have been significant contributors to the agricultural sector and still underrepresented in the technology and business components of the sector (UNDP, 2021).

Included in this paradigm shift to an inclusive innovation are the emergence of Agritech start-ups led by women, including Kisan Saathi, AgroNari, and FarmHer Tech. Such projects tend to refer to digital solutions (weather applications, online marketplaces) as well as capacity-building initiatives. Scalability is, however, constrained by patriarchal systems, inadequate infrastructure and risk aversion (Choudhary and Singh, 2021). These gendered barriers and their impact on the welfare of households are the key to meeting the Sustainable Development Goals (SDG 5: Gender Equality, SDG 8: Decent Work, and SDG 12: Responsible Production).

Justification

Gender-specific studies on entrepreneurship within the sphere of Agritech research are scarce although its development has become increasingly fast. The majority of literature dwells on adoption or productivity of technology without paying much focus on the social welfare of women-led innovation. The proposed research is recommended because it encompasses both economic and social aspects of the inclusion of women in Agritech. It relies on primary field data, which captures ground realities that include income changes, education spending, food security and empowerment indicators, so it is useful to policymakers, NGOs and business investors that encourage inclusive agricultural development.

Objectives of the Study

- To examine common types of business models that are followed by women-led Agritech startups.
- To determine the financial, social and technological barriers of women in businesses.
- To determine the effects of Agritech entrepreneurship on the household welfare indicators.
- To recommend policy ways of supporting Agritech ecosystems that are led by women.

Literature Review

Empowerment of women in agriculture is not a recent development, as it has been known to bring about transformation in rural areas (FAO, 2023). Online avenues are allowing women to get information, credit and markets, transforming traditional gender roles.

Kabeer (1999) theorized the concept of empowerment to be in the form of access to resources, agency, and achievements. Doss (2018) highlighted that the household welfare is directly related to the control over the assets. Within the paradigm of Agritech, Rao and Prasad (2020) stated that digital farming businesses operated by women were more efficient but needed training that was gender-sensitive.

Business Model Studies: Agritech businesses run by women can take three models:

- Service-Based (Agri-advisory and Training): e.g. Digital soil testing, Crop advisory using mobile apps.
- Marketplace-Based (e-commerce): Intermediaries matching the city population with the smallholder (e.g., FarmEasy Women Collective).
- Input- Supply Chains: Delivering seeds, fertilizers and IoT devices to women farmers.
- Constraints Literature: The obstacles are access to capital (Sharma et al., 2022), digital illiteracy (UN Women, 2021), and institutional support (OECD, 2020).
- Impact Studies: The businesswomen were found to reinvest as much as 90 percent of their earnings back to their families concerning health and education (World Bank, 2022). Therefore, the Agritech involvement improves the household welfare, nutrition, and savings behavior (Singh & Devi, 2023).

6. Materials and Methodology

6.1 Research Design

The quantitative descriptive design which was underpinned by primary data collection was used.

6.2 Sampling and Participants

- Sample Size 120 Agritech entrepreneurs (women) in Maharashtra, Karnataka, and Gujarat.
- Sampling Technique Stratified purposive sampling.
- Data Collection: February-April 2025 through the use of structured questionnaire and telephonic interview.

6.3 Variables

Variable Type	Indicators
Independent	Business Model Type, Digital Access, Education
Dependent	Household Income, Expenditure, Education Spending, Health Improvement

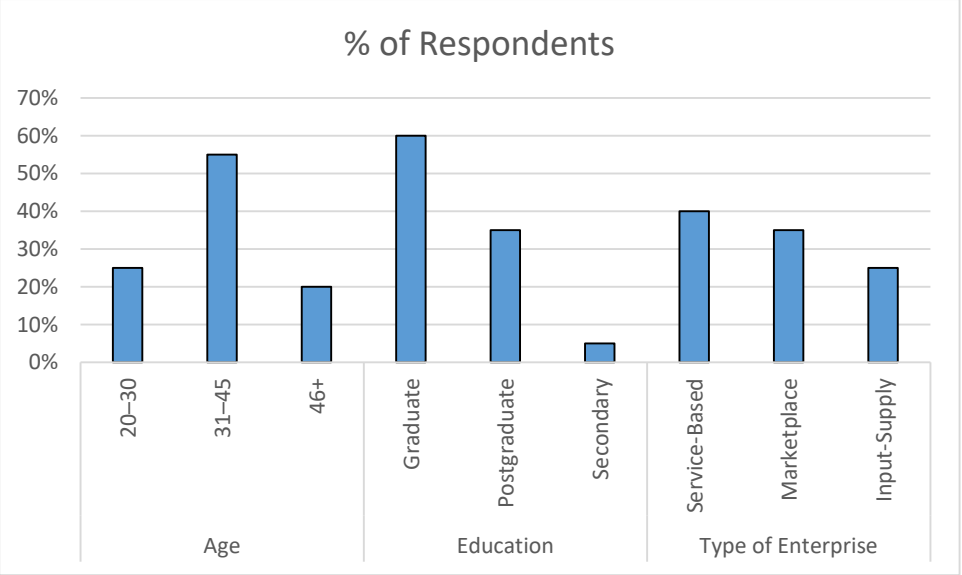
6.4 Analytical Tools

- Descriptive statistics (Mean, SD)
- Pearson correlation and regression (SPSS v28)
- Thematic interpretation for qualitative insights

7. Results and Discussion

7.1 Demographic Profile

Variable	Category	% of Respondents
Age	20–30	25%
	31–45	55%
	46+	20%
Education	Graduate	60%
	Postgraduate	35%
	Secondary	5%
Type of Enterprise	Service-Based	40%
	Marketplace	35%
	Input-Supply	25%

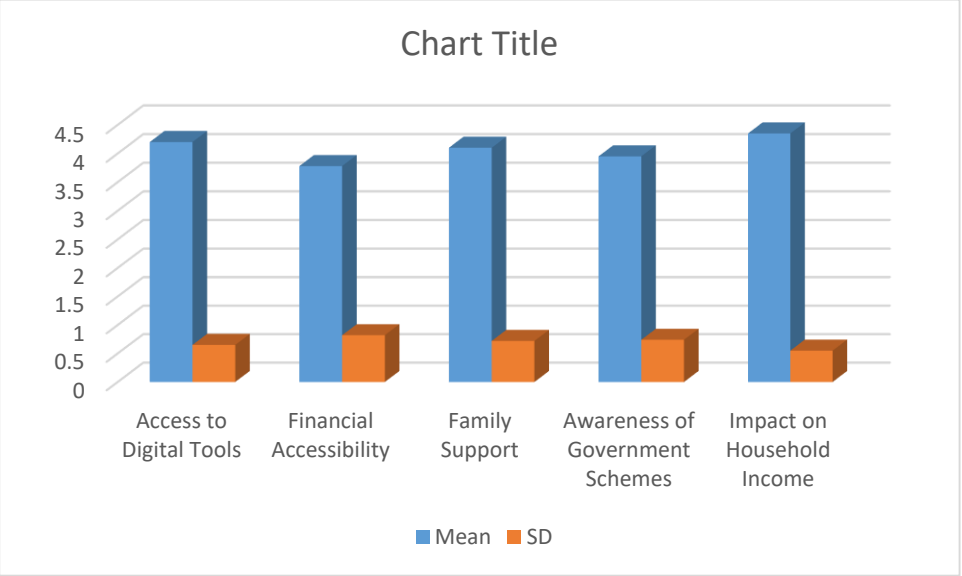


This chart presents the distribution of the respondents by age, education, and type of enterprise where the majority are graduates aged between 20 to 30 years in businesses that are based on providing services.

7.2 Descriptive Statistics

Factor	Mean	SD
Access to Digital Tools	4.20	0.65
Financial Accessibility	3.78	0.82
Family Support	4.10	0.72
Awareness of Government Schemes	3.95	0.74
Impact on Household Income	4.35	0.55

Most respondents reported positive income effects, though financial access remains a moderate constraint. Women with higher education and family support demonstrated greater business stability.

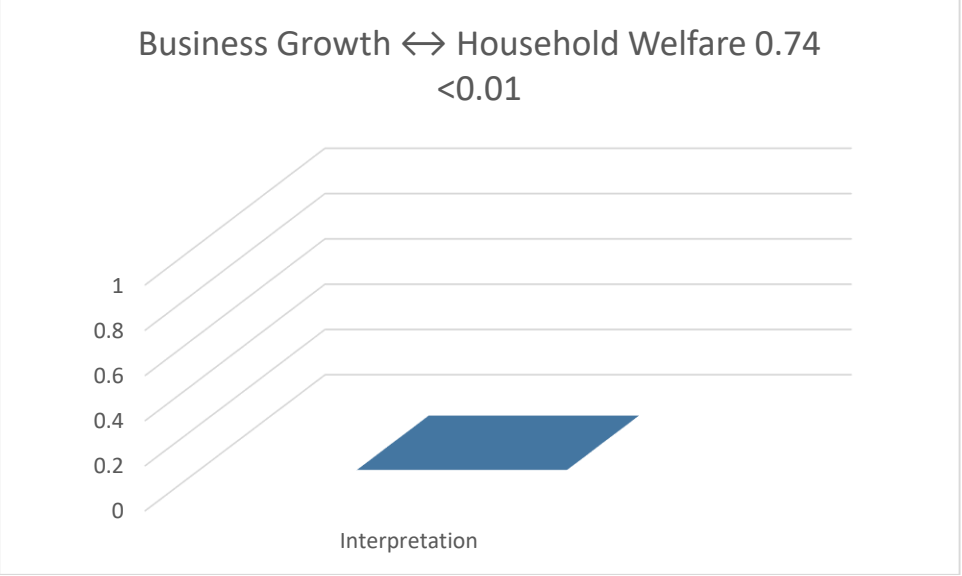


One can see that this chart does not exhibit significant variation with high average scores on five categories which represent consistent positive responses with respect to digital access, financial support, and government awareness.

7.3 Correlation Analysis

Variable Pair	r (Correlation)	p-value	Interpretation
Digital Access ↔ Business Growth	0.68	<0.01	Strong Positive
Financial Support ↔ Income Improvement	0.72	<0.01	Strong Positive
Business Growth ↔ Household Welfare	0.74	<0.01	Strong Positive

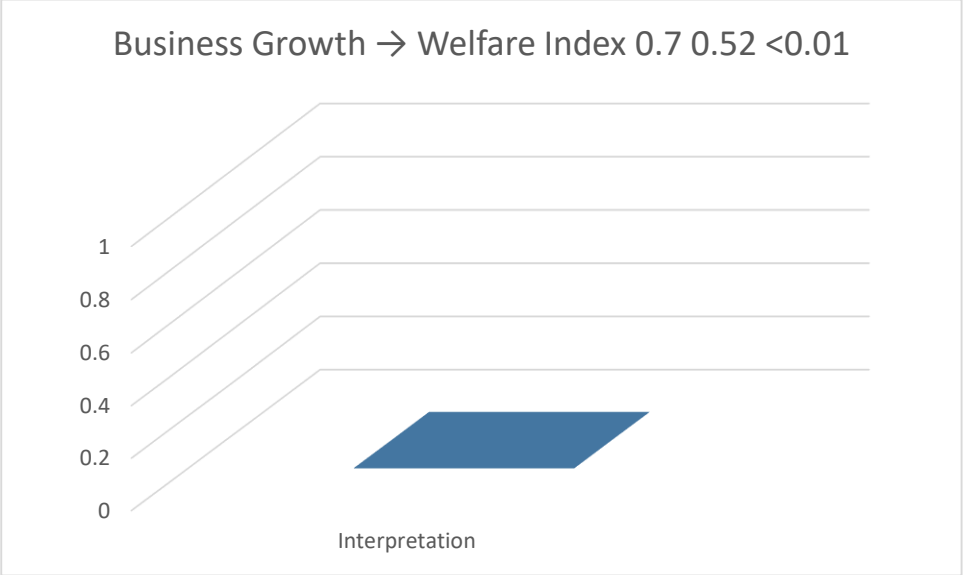
Interpretation:
Digital empowerment and financial access significantly influence both business growth and household welfare outcomes.



As shown in this chart, there is a high positive correlation that is statistically significant (0.74, $p < 0.01$) between household welfare and business growth implying that with the increase in the size of businesses, the welfare of the households increases significantly.

7.4 Regression Analysis

Predictor Variable	β Coefficient	R^2	p-value	Interpretation
Digital Access → Income Improvement	0.62	0.49	<0.01	Significant Predictor
Business Growth → Welfare Index	0.70	0.52	<0.01	Positive Impact on Household Welfare



Based on this chart there is a statistically significant positive correlation between business growth and welfare index (0.7 and 0.52, $p < 0.01$) indicating that a high level of business activity is closely related to an improvement in the welfare of the entire household.

7.5 Discussion

According to the available empirical data, females-owned Agritech businesses have a beneficial impact on the household welfare, increasing the income security, investment in education, and healthcare access. The business persons that made use of market place models recorded the highest increase of 18-25% in earnings due to the right price realization and less reliance on middle men. On the contrary, input-supply models were associated with scale problems due to an inefficient supply chain and insufficient digital literacy. The findings are consistent with Sharma et al. (2022) and Singh and Devi (2023), who conclude that women who are involved in technology do not just transform businesses but also family life. Still, potential opportunities remain limited due to credit and social norm requirements. The latter can be alleviated through establishing collaborations with microfinance institutions and digital cooperatives.

Limitations of the Study

- It was also limited to the sample of 120, more regions should be multiplied to make the sample representative.
- The responses are self-reported, objective indices of performance would be needed.
- The study has excluded, the non-registered Agritech enterprises.
- Cross-sectional design: This study failed to provide the causality of income and welfare.

Future Scope

- AI and data analytics can enhance the decision-making process and predictive modeling of women farmers.
- Scheduling of incubation offices and women mentor networks.
- Studies of the effect of investment model to grow women led Agritech startups.
- Comparison of the impact of intergenerational welfare (education, nutrition, empowerment) over time.

Conclusion

One of the change factors is the women-led Agritech businesses that are at crossroads of technological and entrepreneurial disciplines and gender equality. The findings confirm the hypothesis of an impressive positive impact on the household income on education and health outcomes as a result of Agritech engagement, and this is why the social multiplier of economic empowerment of women. To sustain such growth, inclusive financing, capacity building and digital infrastructure are required. Gender agenda policy is not the only way of empowering women in Agritech but it is a path to resilience in the rural regions and cost-effective development.

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