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SWOT analysis of women extension agents in the state of Tamil Nadu

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Abstract

Women extension agents play a crucial role in strengthening agricultural extension systems by facilitating technology transfer, promoting farmer participation and enhancing rural livelihoods. Understanding the factors that influence their professional effectiveness is essential for developing responsive extension policies and support mechanisms. The present study was undertaken to analyse the strengths, weaknesses, opportunities and threats (SWOT) perceived by women extension agents in Tamil Nadu and to identify strategic interventions for enhancing their effectiveness in agricultural extension service delivery. A descriptive research design was adopted and primary data was collected from women extension agents using a structured questionnaire. The data was analysed using Simplified AHP with frequency, percentage, mean score, relative weight, percentage weight, ranking and SWOT index. The findings indicated that the respondents were predominantly young, highly educated and professionally trained, with substantial field responsibilities and regular interaction with farming communities. Effective communication skills, technical competence and commitment to service emerged as the major strengths, whereas heavy workload, mobility constraints, and work-life balance issues were identified as key weaknesses. Expanding digital extension initiatives, capacity-building programmes and supportive institutional policies provided significant opportunities, while administrative burden, resource limitations and environmental uncertainties posed major threats. The study highlights the need for strengthening institutional support, enhancing professional capacity through continuous training, improving access to digital technologies, transport facilities and implementing strategic measures to address organizational constraints. Such interventions will improve the effectiveness of women extension agents and contribute to more efficient, inclusive and sustainable agricultural extension service delivery.

Keywords: Agricultural extension, extension service delivery, professional effectiveness, strategic planning, SWOT analysis, women extension agents

1. Introduction

Agriculture is one of the most important sectors of the Indian economy, contributing to food security, rural employment and the overall sustainability of livelihoods. Agricultural extension serves as an essential mechanism for disseminating scientific knowledge, innovative technologies and improved farm management practices to farming communities. Effective extension systems bridge the gap between research and practice by facilitating technology transfer, strengthening farmers' decision-making capacity and promoting sustainable agricultural development (Ponnusamy and Padaria, 2021; Rana *et al.*, 2023)^[9, 11]. The role of agricultural extension has evolved from a technology-transfer approach to a more participatory, demand-driven and knowledge-intensive system. Contemporary extension services emphasize digital advisory systems, climate-resilient agriculture, market-oriented production and farmer empowerment, requiring extension personnel to possess strong technical, communication and managerial competencies. Agricultural extension has become increasingly important in addressing

the emerging challenges faced by the agricultural sector, including climate variability, declining natural resources, changing market dynamics and rapid technological advancements. Extension personnel act as facilitators who connect farmers with research institutions, government agencies, input suppliers and markets. They play a significant role in promoting climate-smart agriculture, digital technologies, sustainable farming practices and farmer-led innovations. The effectiveness of extension services largely depends on the competence, motivation and institutional support available to extension professionals, making their role indispensable in achieving agricultural transformation and rural development.

Women extension agents have emerged as key contributors to strengthening agricultural extension by promoting inclusive development, improving outreach to women farmers and facilitating participatory learning processes. Their involvement has enhanced the accessibility of extension services among rural households, particularly women farmers, through effective communication, capacity

building and community mobilization. Previous studies have highlighted that gender-responsive extension approaches contribute to improved access to agricultural information, greater participation in decision-making and enhanced adoption of improved agricultural practices. Despite their increasing participation in extension services, women extension agents continue to face several professional and organizational challenges. Heavy workload, mobility constraints, inadequate logistical support, increasing administrative responsibilities, limited institutional resources and the need to balance professional and family responsibilities often affect their efficiency and job performance. Addressing these challenges requires strategic interventions that strengthen institutional support while enhancing the professional competencies of extension personnel (Singh *et al.*, 2025) ^[16]. SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is a widely recognized strategic management tool used to evaluate internal capabilities and external environmental factors influencing organizational performance. In agricultural extension, SWOT analysis facilitates the identification of organizational strengths, existing constraints, emerging opportunities and potential threats, thereby supporting evidence-based planning and decision-making. It provides a systematic framework for developing practical strategies to improve extension effectiveness and institutional performance (Rana *et al.*, 2023) ^[11]. SWOT analysis has been extensively applied as a strategic planning tool across various

disciplines, including agriculture, agribusiness, rural development and public administration. The approach provides a structured framework for examining internal strengths and weaknesses alongside external opportunities and threats, thereby facilitating strategic decision-making and long-term planning. In agricultural extension, SWOT analysis enables organizations to identify priority areas for capacity building, policy support, institutional reforms and resource allocation. The outcomes of SWOT analysis further assist in formulating practical strategies that enhance organizational performance and improve the delivery of extension services to farming communities.

Although several studies have examined agricultural extension systems and the role of extension personnel, limited research has specifically focused on women extension agents using a comprehensive SWOT framework. In Tamil Nadu, empirical evidence on the strategic strengths, professional constraints and future opportunities of women extension agents remains scarce. Such information is essential for designing targeted interventions that enhance professional effectiveness and improve agricultural extension service delivery. Therefore, the present study was undertaken to analyse the strengths, weaknesses, opportunities and threats perceived by women extension agents in Tamil Nadu and to identify strategic interventions for strengthening agricultural extension service delivery.

2. Methodology

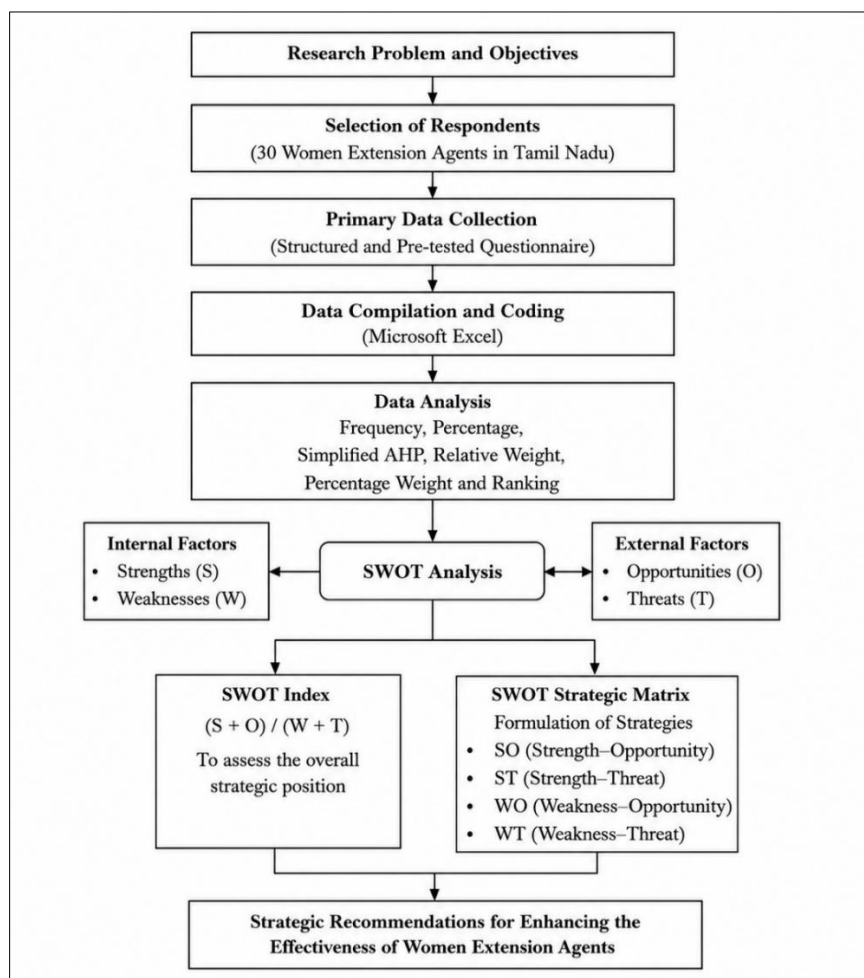


Fig 1: Methodological framework adopted for the study.

The present study was conducted to analyse the strengths, weaknesses, opportunities, and threats (SWOT) perceived by women extension agents in Tamil Nadu and to suggest strategies for improving their professional effectiveness. A descriptive research design was adopted for the study. The respondents consisted of 30 women extension agents working in agricultural and allied departments across Tamil Nadu. They were selected using purposive and snowball sampling techniques based on their active involvement in extension activities. Primary data were collected using a structured and pre-tested questionnaire prepared according to the objectives of the study. The questionnaire was validated by experts before data collection and was circulated through Google Forms. The responses received were checked for completeness and accuracy through follow-up communication with the respondents whenever required. The collected data were coded, classified and tabulated using Microsoft Excel. The data was analysed using descriptive statistics to summarize the socio-personal and professional characteristics of the respondents. The SWOT factors were prioritized using the Simplified Analytic Hierarchy Process (AHP), and the results were interpreted through relative weights, percentage weights, ranking, SWOT Index and SWOT Strategic Matrix to identify suitable strategies for enhancing the effectiveness of women extension agents. Based on the findings, the SWOT factors were prioritized and

appropriate strategic recommendations were developed to improve their effectiveness in agricultural extension services.

2.1 SWOT Index

The SWOT Index was used to determine the overall strategic position of women extension agents by comparing the cumulative positive factors (Strengths and Opportunities) with the cumulative negative factors (Weaknesses and Threats). It was calculated using the following formula:

$$\text{SWOT Index} = \frac{S + O}{W + T}$$

Where,

- S = Total score of Strengths
- O = Total score of Opportunities
- W = Total score of Weaknesses
- T = Total score of Threats

A SWOT Index value greater than 1 indicates that strengths and opportunities outweigh weaknesses and threats, whereas a value less than 1 indicates the opposite.

3. Results and Discussion

3.1 Prioritization of SWOT Factors of Women Extension Agents

Table 1: Prioritization of SWOT Factors of Women Extension Agents

SWOT Dimension	Factor	Mean Score	Weight (%)	Rank
Strengths	Communication and Interpersonal Skills	4.15	20.38	I
	ICT and Innovation Capacity	4.13	20.28	II
	Personal Attributes	4.09	20.09	III
	Participatory and Extension Skills	4.05	19.89	IV
	Technical and Professional Competence	3.94	19.35	V
Weaknesses	Mobility and Logistic Issues	3.69	22.35	I
	Institutional Constraints	3.59	21.74	II
	Work-Family Balance Issues	3.52	21.32	III
	Resource and Capacity Gaps	3.18	19.26	IV
	Gender-related Challenges	2.53	15.32	V
Opportunities	Professional Support and Leadership	4.23	21.07	I
	Digital Technological Advancements	4.12	20.52	II
	Policy and Institutional Support	3.97	19.77	III
	Collaboration and Networking	3.91	19.47	IV
	Community and Social Support	3.85	19.17	V
Threats	Technology and Competitive Pressure	3.87	21.60	I
	Safety and Security Concerns	3.77	21.04	II
	Economic and Resource Constraints	3.69	20.59	III
	Institutional and Political Issues	3.64	20.31	IV
	Socio-cultural Barriers	2.95	16.46	V

The findings presented in Table 1 indicate that Communication and Interpersonal Skills emerged as the most important strength (20.38%), followed by ICT and Innovation Capacity (20.28%) and Personal Attributes (20.09%). The high ranking of communication skills reflects the ability of women extension agents to effectively interact with farmers, organize extension programmes and promote the adoption of improved agricultural technologies. The importance of ICT and innovation capacity highlights the growing role of digital advisory services and online extension platforms. Although Technical and Professional Competence received the lowest weight (19.35%), the narrow variation among the scores indicates balanced competency across

different professional areas.

Among the weaknesses, Mobility and Logistic Issues ranked first (22.35%), followed by Institutional Constraints (21.74%) and Work-Family Balance Issues (21.32%). These findings indicate that inadequate transportation, administrative workload, limited institutional support and family responsibilities continue to affect field performance. In contrast, Gender-related Challenges received the lowest weight (15.32%), suggesting that respondents perceived operational and institutional barriers as more significant than gender-specific issues.

Regarding opportunities, Professional Support and Leadership ranked highest (21.07%), followed by Digital

Technological Advancements (20.52%) and Policy and Institutional Support (19.77%). This suggests that leadership development, institutional encouragement and digital technologies are viewed as key opportunities for improving professional competence and extension effectiveness through continuous capacity-building.

Among the threats, Technology and Competitive Pressure emerged as the most significant challenge (21.60%), followed by Safety and Security Concerns (21.04%), Economic and Resource Constraints (20.59%), and Institutional and Political Issues (20.31%). These findings emphasize the need for continuous professional training, institutional support, improved safety measures, and adequate logistical facilities to enhance extension service delivery.

Overall, the results indicate that women extension agents possess strong communication skills, digital competencies, and professional commitment, providing a solid foundation for effective agricultural extension. However, addressing mobility constraints, institutional barriers, technological challenges, and resource limitations is essential for maximizing their professional effectiveness. These findings are consistent with earlier studies of Ponnusamy and Padaria, 2021; Rana *et al.*, 2023; Singh *et al.*, 2025 ^[9, 11, 16].

3.2 Overall Ranking of SWOT Dimensions

Table 2: Overall Ranking of SWOT Dimensions

SWOT Dimension	Total Mean	Relative Importance (%)	Rank
Strengths	20.36	Highest	I
Opportunities	20.08	High	II
Threats	17.92	Moderate	III
Weaknesses	16.51	Lowest	IV

The overall ranking of the SWOT dimensions presented in Table 2 indicates that Strengths attained the highest normalized weight (20.36%), followed by Opportunities (20.08%). The higher ranking of strengths reflects the availability of essential professional competencies and personal attributes that enable women extension agents to effectively communicate with farmers and deliver extension services. Similarly, the prominence of opportunities highlights the existence of a favourable institutional and policy environment that supports capacity development, adoption of digital technologies and increasing recognition of women's contributions to agricultural extension. These findings suggest that women extension agents possess a strong foundation of internal capabilities and external support that can be effectively utilized to enhance extension service delivery.

In contrast, Threats (17.92%) and Weaknesses (16.51%) received comparatively lower normalized weights, indicating that although these factors constrain performance, they are perceived to have a relatively lesser influence than the positive dimensions. The identified weaknesses primarily represent operational and organizational challenges, whereas the threats comprise external constraints such as technological demands, workplace safety concerns and institutional limitations that may affect the quality and effectiveness of extension services if left unaddressed.

Overall, the higher relative importance assigned to strengths and opportunities demonstrates favourable conditions for improving the performance of women extension agents. Strengthening existing competencies through continuous professional development, digital capacity building, and institutional support, while addressing mobility constraints, infrastructure deficiencies, and external challenges, can further enhance the effectiveness and sustainability of agricultural extension services.

3.3 SWOT Index Analysis

Table 3: SWOT Index Analysis of Women Extension Agents

Component	Mean Score
Strengths (S)	20.36
Opportunities (O)	20.08
Weaknesses (W)	16.51
Threats (T)	17.92
S + O	40.44
W + T	34.43
SWOT Index	1.17

The results presented in Table 3 indicate a SWOT Index of 1.17, signifying that the positive factors outweigh the negative factors and reflecting a favourable strategic position. An index value greater than one suggests that the existing strengths and available opportunities are sufficient to compensate for the identified weaknesses and threats, thereby providing a conducive environment for effective extension service delivery.

The positive strategic position reflects the combined influence of professional competencies, including communication skills, ICT proficiency, leadership abilities and commitment to work, together with external opportunities such as capacity-building programmes, digital extension initiatives and supportive institutional policies. These factors enhance the ability of women extension agents to effectively disseminate agricultural technologies, strengthen farmer engagement and improve extension service delivery. Mobility constraints, workload, safety concerns and limited infrastructural support continue to influence field-level performance. Addressing these challenges through improved institutional support, continuous professional development and gender-responsive organizational policies would further strengthen the effectiveness and sustainability of agricultural extension services delivered by women extension agents.

3.4 SWOT Strategic Matrix

The prioritized strengths, weaknesses, opportunities and threats were integrated into a SWOT Strategic Matrix to formulate practical strategies for improving the effectiveness of women extension agents. The matrix generated four categories of strategies, namely Strength–Opportunity (SO), Strength–Threat (ST), Weakness–Opportunity (WO), and Weakness–Threat (WT), by combining internal and external factors. The resulting strategies provide a framework for leveraging existing strengths, addressing weaknesses, utilizing available opportunities, and minimizing external threats. The SWOT Strategic Matrix is presented in Table 4.

Table 4: SWOT Strategic Matrix

Internal Factors	Opportunities (O)	Threats (T)
Strengths (S)	SO Strategies - Utilize strong communication and interpersonal skills to promote digital extension services and government programmes. - Leverage ICT competence to improve outreach, information dissemination, and farmer advisory services. - Capitalize on leadership opportunities through continuous professional development and capacity-building programmes.	ST Strategies - Use professional competence and leadership skills to overcome technological competition and institutional pressures. - Employ effective networking and communication skills to address safety concerns and field-level challenges. - Strengthen extension–farmer relationships to mitigate socio-cultural barriers and organizational challenges.
Weaknesses (W)	WO Strategies - Organize regular training programmes to address skill gaps and improve professional competence. - Utilize institutional support and digital technologies to overcome resource and operational constraints. - Promote mentoring and professional networking to enhance confidence, leadership, and career advancement.	WT Strategies - Improve transportation facilities and safety measures to reduce mobility and security-related challenges. - Reduce administrative workload and procedural complexities to minimize institutional pressures. - Develop supportive workplace policies to improve work–life balance and reduce vulnerability to external threat.

These strategies provide a structured framework for utilizing existing strengths, addressing operational limitations, capitalizing on emerging opportunities and minimizing the impact of external challenges. The SO strategies emphasize leveraging the communication skills, professional competencies, leadership abilities and ICT capabilities of women extension agents to maximize opportunities such as institutional support, digital extension initiatives, capacity-building programmes and policy interventions. These strategies focus on strengthening extension service delivery through continuous professional development, technology adoption, and enhanced farmer engagement.

The ST strategies focus on utilizing existing strengths to overcome external threats, including technological advancements, resource constraints, workplace safety concerns and institutional challenges. Strengthening technical expertise, digital literacy, and leadership skills would enable women extension agents to adapt effectively to changing extension environments and sustain their professional performance.

The WO strategies aim to address identified weaknesses by utilizing available opportunities. Improving mobility support, expanding access to training programmes, strengthening institutional collaboration and promoting the use of digital technologies can reduce operational limitations while enhancing professional competence and work efficiency. These interventions can further improve the quality and effectiveness of agricultural extension services.

The WT strategies emphasize minimizing both weaknesses and threats through appropriate organizational and policy interventions. Providing adequate logistical facilities, improving workplace safety, strengthening institutional support systems, implementing gender-responsive workplace policies and promoting transparent career advancement opportunities would create a more enabling work environment for women extension agents. In addition, collaboration with research institutions, farmer organizations and development agencies can facilitate knowledge exchange and improve the outreach of extension programmes. Overall, the SWOT Strategic Matrix provides a comprehensive strategic framework for improving the performance and effectiveness of women extension agents. Implementing the proposed strategies through coordinated policy support, institutional strengthening, continuous capacity building, and

digital empowerment will enhance the professional capabilities of women extension agents and contribute to a more inclusive, efficient, and resilient agricultural extension system.

4. Conclusion

The study concludes that women extension agents have considerable professional capabilities and organizational potential to contribute effectively to agricultural extension and rural development. Their effectiveness can be further enhanced through continuous capacity building, professional development and access to appropriate digital technologies. The findings imply the need for gender-responsive institutional policies, improved workplace facilities, better mobility support and adequate safety measures to create a more enabling working environment. Regular training programmes focusing on communication, leadership, digital tool and emerging extension approaches can strengthen their professional competencies. Institutional mechanisms for career advancement, recognition, mentoring and participation in decision-making should also be strengthened to encourage greater professional engagement. Improving access to digital infrastructure and integrating women extension agents into technology-enabled extension initiatives can further expand the reach and efficiency of extension services. Overall, supportive organizational policies, capacity-building interventions and improved infrastructural facilities can enhance the performance of women extension agents and contribute to a more inclusive, efficient and sustainable agricultural extension system.

5. Limitations

The present study was conducted among women extension agents in the state of Tamil Nadu; Therefore, the findings may not be directly generalizable to other states or organizational settings. The study was based on respondents' perceptions at a specific point in time, which may vary with changing institutional and policy environments. Future studies involving a larger geographical area and longitudinal assessments could provide broader insights into the strengths, weaknesses, opportunities, and threats faced by women extension agents.

Declaration of AI use

The authors used ICT tools solely to improve the language, grammar, readability and overall presentation of the manuscript. The AI tools were not used to generate, analyze, or interpret the research data or results. All scientific content, interpretations, conclusions and the final manuscript were reviewed, verified and approved by the authors, who take full responsibility for the accuracy and integrity of the work.

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Competing Interests

Authors have declared that no competing interests exist.

Authors' Contributions

SS^{1*} designed the study, conducted the field investigation, collected and analyzed the data, interpreted the results and prepared the first draft of the manuscript. SSa² supervised the research, reviewed the methodology, assisted in interpretation of the findings and critically revised the manuscript. PK³ and PB⁴ contributed to data interpretation, manuscript review and refinement of the scientific content. PGV⁵, SC⁶, and SSw⁷ assisted in field investigation, data collection, and manuscript review. All authors read and approved the final manuscript.

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