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Enhancing Extensionists' Capabilities in Female Farmers' Groups (FFGs) Empowerment: An Integrative Approach

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HIGHLIGHTS

- Integrated training enhanced extension workers' participatory, pluralistic, and entrepreneurial facilitation competencies
- Business Model Canvas improved goal-setting and business planning among female farmer groups
- Gender-sensitive extension practices increased, though greater analytical and transformative skills remain limited
- Pluralistic approaches strengthened cross-sector collaboration in supporting female farmer groups.

ARTICLE INFO

Keywords: Business model canvas, Extension capability, Female-led farmer groups, Gender-sensitive extension, Participatory, Pluralistic extension.

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ABSTRACT

Strengthening extensionists' skills is crucial for advancing agricultural development. The research aims to assess the extension workers' capacity following online training on integrated extension approaches. The research was conducted from February 2024 to February 2025 in Bogor, Karawang, Subang, and Purwakarta Regencies, West Java, Indonesia, involving 51 extension workers as the primary research participants and supporting 153 farmer groups comprising 3,825 farmers. The extension workers participated in the training focused on supporting female farmer groups. A competency gap analysis highlighted the need for online training modules to enhance extensionists' skills in non-production-related topics. The modules covered four areas, including participatory extension, pluralistic extension, gender-sensitive extension, and the Business Model Canvas. The modules aimed to improve facilitation and entrepreneurial skills. Reflective assessments and field mentoring showed that extensionists enhanced their capabilities in participatory and pluralistic approaches. However, challenges remain in implementing gender-sensitive extension, as many still struggle to identify gender disparities in economic activities and decision-making roles. These results suggest that while integrated training improves professional and technical skills, larger institutional and cultural changes are needed to fully incorporate gender sensitivity into extension. The program emphasizes the importance of continuous participatory learning, gender, and business approaches for inclusive agricultural progress.

INTRODUCTION

Agricultural extension education strengthens female farmer groups (FFGs) through group-based approaches recognized for women's empowerment (Sen et al., 2025). It fosters technological transformation, organizational capacity, reduces post-harvest losses (McNamara & Tata, 2015), and boosts entrepreneurship (Amanah

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& Fatchiya, 2018; Nyathi & Even, 2022; Yaseen et al., 2024). In addition to technical expertise, extension workers need soft skills, communication, and facilitation skills (Shivamuthry & Madhushree, 2023). Resource constraints and wide service areas limit the use of face-to-face methods, making online training a promising, scalable, and sustainable alternative to enhance extension capacity and facilitate inclusive engagement (Gentry et al., 2017; Estefan et al., 2025).

Women's empowerment in agriculture has attracted growing attention. Despite this, women continue to face barriers to extension services, technologies, financial resources, and decision-making (Nain & Kumar, 2010; Quisumbing et al., 2023). Evidence shows that equal access to these resources can significantly improve agricultural productivity (Diaz & Najjar, 2019). However, in many countries, extension systems remain primarily targeted at male farmers. In contrast, participatory, pluralistic extension models better promote women's inclusion (Singh et al., 2014). In Indonesia, decentralization reform efforts still focus on production, with limited gender-responsive facilitation (Indriyani et al., 2024; Dewi et al., 2025). Various initiatives have aimed to enhance women's participation in agriculture, including sustainable food yards and small-scale agribusiness to improve nutrition and income. However, these interventions are frequently project-based, which constrains their sustainability and long-term impact on FFG capacity development (Begum, 2025). Furthermore, numerous programs do not adequately reach female farmers, thereby impeding technology adoption and limiting market access (Curtin et al., 2024). Expanding women's access to training, information, and extension services has been shown to enhance their decision-making authority, access to resources, and participation in farmer groups (Siaw et al., 2024), underscoring the importance of ongoing extension support.

Integrating entrepreneurial concepts into agricultural extension is vital for transforming farming and fostering inclusive agribusiness. The Business Model Canvas (BMC), a strategic tool for entrepreneurs, is increasingly used as a gender-responsive support tool. Many FFGs still face challenges such as limited capacity for inclusive extension, restricted access to capital and markets, and cultural norms that limit women's decision-making, all of which are amplified by resource inequalities (FAO, 2023; Arintyas, 2024).

Given these conditions, strengthening extension workers' capacity through integrated approaches is critical and essential for more sustainable impact on FFGs. Although previous studies have examined participatory, gender-sensitive, and agribusiness-oriented extension separately, integrated frameworks combining these dimensions remain limited. The research addresses this gap by adopting an Integrated Extension Approach (IEA) incorporating participatory, pluralistic, gender-sensitive, and entrepreneurial elements, including the BMC. It aims to evaluate the effectiveness of integrative online training for extension workers and to examine the challenges of implementing such approaches to empower FFGs.

METHODOLOGY

The research was conducted from February 2024 to February 2025 in Bogor, Karawang, Subang, and Purwakarta Regencies, West Java Province, Indonesia, with a focus on their strong agricultural activity, active FFGs, and extension worker capacity. Involving 51 purposively selected extension workers supporting 153 farmer groups with 3,825 farmers, it used a mixed-methods, quasi-experimental design with monthly surveys. A one-group quasi-experimental approach (McLeod-Morin et al., 2023; Capili & Anastasi, 2024), evaluated the extent to which extension workers improved skills to support FFGs. This design was chosen because all 51 workers participated, making the use of control groups impractical. This design suited the limited resources and participant availability.

The training curriculum was designed to enhance extension workers' skills through four materials: participatory, pluralistic, gender-sensitive, and the BMC tool. Data were gathered via pre and post-tests. A rapid rural appraisal (RRA) in June 2024 assessed the extension competency gap (pre-tests) on the integrative extension approach. An online training in July 2024 used a quasi-experimental design to evaluate how extension workers improved their knowledge and skills in the integrative approach.

After training, monthly surveys were conducted to assess the extent to which the extension workers used integrated approaches. Three post-tests were administered from July to August 2024 to measure changes in competency. In September, field visits to eight female farmer groups (FFGs), chosen for extension workers' practical use of at least two training modules, were observed. A final evaluation in November 2024 summarized results.

Both quantitative and qualitative analyses examined learning experiences, challenges in applying gender-sensitive approaches, and the use of participatory methods and the BMC to support female farmer groups. Descriptive statistics (Neuman, 2014) summarized numerical data. Changes in extension workers' competencies were assessed through training implementation, observed changes, and the post-training performance of 51 workers who completed the online training. Qualitative data were collected through field observations, interviews, group discussions, and reflective dialogues with extension workers.

A Context, Input, Process, and Product (CIPP) evaluation model (Stufflebeam & Zhang, 2017) was used to assess extension workers' capabilities. Context evaluation identified needs, problems, and opportunities for the training program. Input evaluation examined resources, strategies, and design, including the curriculum, materials, methods, facilitators, technical assistants, and digital infrastructure. Process evaluation assessed delivery, engagement, and interactions during the training. Product evaluation measured outcomes, focusing on changes in extension workers' capability.

RESULTS

CIPP evaluation of the integrated extension training program

Figure 1 summarizes the evaluation findings. The CIPP model evaluation shows that improvements in extension workers' competencies were significant in applying participatory approaches, facilitating gender-sensitive discussions (82.4%), facilitating goal-setting (92.2%), using the BMC (74.5%), and cross-sector collaboration (54.9%). These findings indicate that the training program strengthened extension workers' capability.

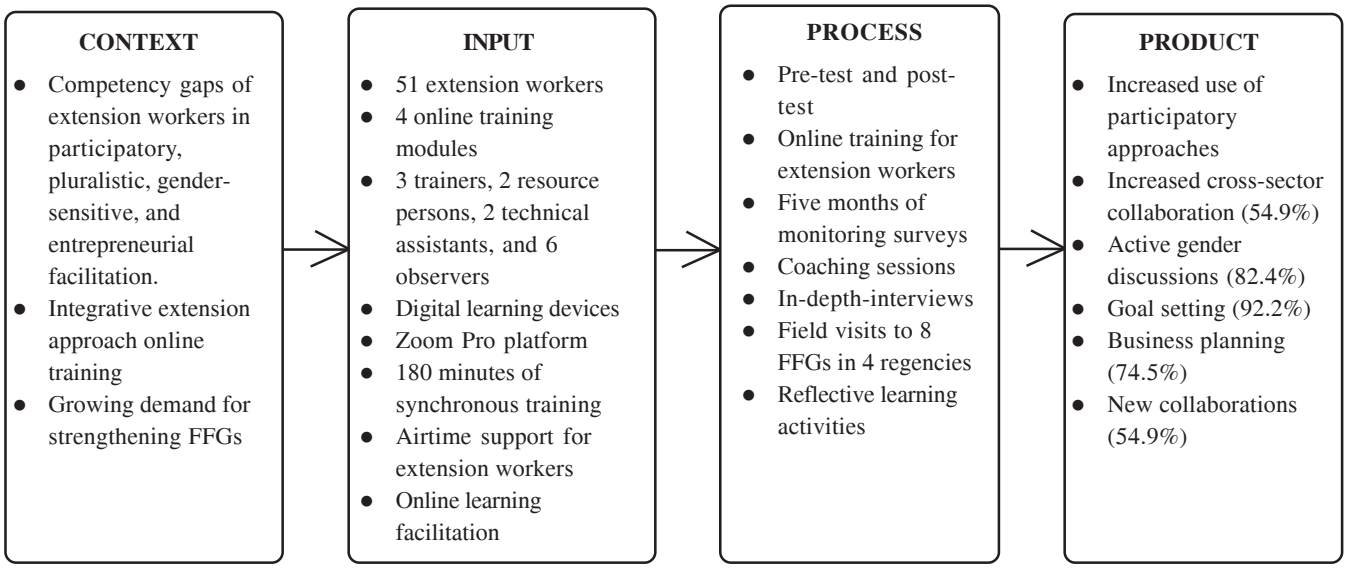

Figure 1. Results of the CIPP evaluation of the integrated extension training program for extension workers

Context

Agricultural extension in Indonesia began in the early 19th century, with a focus on food security. Extension workers have planned programs to boost food-crop production using the T&V approach since the 1980s; these programs have been modified but still lack gender sensitivity, entrepreneurship, and BMC model development. The COVID-19 pandemic prompted Indonesia to develop an Extension Information System that connects extension workers nationwide with virtual training, training one million farmers and workers monthly. However, training primarily focuses on productivity, neglecting needs assessment, strategic planning, and organizational management. Farmer training often emphasizes individual rather than group efforts. Indonesia has about 60,000 farmer groups, mostly in villages, with FFGs more engaged in food processing and selling diverse products to markets, requiring different extension support. A preliminary assessment using RRA found that extension services remained largely production-oriented, while participatory facilitation, gender-sensitive analysis, pluralistic collaboration, and entrepreneurial development received limited attention. The training was implemented as a collaborative effort among IPB University, the University of Illinois Urbana-Champaign, and partners in Indonesia's agricultural extension system. The program aimed to strengthen extension workers' capacity to facilitate the formation of inclusive groups and to support income-generating activities among FFGs.

Input evaluation

A training program was developed to address competency gaps among agricultural extension workers supporting female farmer groups in four West Java Regencies: Bogor, Karawang, Subang, and Purwakarta. These areas have diverse agricultural contexts and varying extension capacities. The program involved 51 extension workers in an online course on integrated extension, including stakeholders from the Ministry of Agriculture, IPB University, the private sector, and training assistants. These workers supported 153 farmer groups with about 3,825 farmers, providing real-world training applications. The curriculum covered four modules: participatory, pluralistic, gender-sensitive extension, and BMC for agribusiness planning, aimed at enhancing facilitation skills, multi-stakeholder collaboration, and entrepreneurship among female farmers. Delivered via an online platform with airtime and internet access, the training included digital modules, facilitation tools, and interactive activities such as discussions and group work to promote engagement and field application.

Process evaluation

The training program included online sessions, discussions, and practical exercises to simulate real-world extension facilitation. Participants were divided into small groups to develop strategies integrating participatory approaches, gender perspectives, and business planning for FFGs. Afterward, extension workers applied these materials to support FFGs. Monitoring through surveys, coaching, interviews, and field visits assessed how extension workers implemented the materials and how FFGs responded. Data showed a steady increase in the use of training materials, with 94.1% of extension workers facilitating discussions with female groups by November 2024. Participation in needs assessments ranged from 82.6% to 92.2%. Discussions on gender issues increased, with those discussing gender differences rising from 52.2% in August to 82.4% in November 2024.

Product evaluation

The evaluation showed improvements in extension workers' skills and facilitation practices after training. Table 1 compares baseline and post-training performance across key competencies, revealing gains in all areas. Participatory facilitation shifted from directive to interactive, group-based learning. Pluralistic skills expanded from a public-sector focus to broader engagement. Gender awareness moved from conceptual understanding to active discussions on the gender gap. BMC facilitation skills, once rare,

Table 1. Competency change and remaining gaps among extension workers

Competency dimension	Baseline condition (before the training)	Post-training performance	Direction of change
Participatory facilitation	Mostly top-down approaches	Widely practiced in group facilitation	High improvement
Pluralistic extension	Primarily public-sector oriented	Increased cross- sector discussions, still limited cross-sector collaboration	Moderate-high improvement
Gender-sensitive analysis	Conceptual awareness, limited practice	Active discussions about gender gaps, but limited discussion on gender-sensitive analysis	Moderate improvement
BMC facilitation skills	Never to rarely practiced	Frequently practised with FFGs	High improvement

became common in supporting FFGs. Most extension workers facilitated goal setting (92.2%), new business discussions (80.4%), and helped start new activities (74.5%) and develop business plans (74.5%) during post-training evaluation.

Pluralistic extension skills improved as practices shifted from a public-sector focus to collaboration with the private sector, civil society, and universities. Of 51 trainees, 25 partnered with these sectors for the FFG program, including *Subang* with a seed company and *Karawang* with *Pertamina*, a state-owned enterprise in Indonesia. Most progressed from conceptual awareness of gender to active discussions of gender gaps in extension. BMC facilitation skills advanced from rarely used to frequently apply with female farmer groups. Overall, competency improvements ranged from moderate to substantial, with the highest gains in participatory facilitation, BMC, pluralistic extension, and gender-sensitive analysis.

Change in extension workers' competency after the training

Table 2 shows changes in extension workers' competencies across knowledge, attitudes, and skills from baseline to post-training. Initially, gender was viewed primarily in terms of women's participation, with few open discussions. After training, 82.4% discussed gender-based work-time gaps, and 100% focused on access to and control over resources.

Practical skills improved notably. Initially, the BMC was rarely used; post-training, 92.2% facilitated goal-setting with FFGs. Additionally, 74.5% helped develop business plans, and 80.4% discussed new business ideas. Facilitation shifted from directive to interactive, with 92.2% of group discussions led. Regarding cross-sector work, early conditions showed limited collaboration. After training, 54.9% reported working with other sectors, and 66.7% engaged in cross-sector discussions.

Figure 2 shows agricultural extension workers' (N=51) mostly positive perceptions of training. For the statement, "This training met my expectations," 68.63% agreed, 27.45% strongly agreed, 3.92% strongly disagreed, and none disagreed.

Extension workers across all dimensions mostly reported positive perceptions. Most extension workers chose "agree" or "strongly agree" for all statements, with only a small percentage selecting "neutral" or "disagree." Concerning understanding, 74.51% agreed, and 17.65% strongly agreed that the training material was clear, while only 5.88% were neutral and 1.96% strongly disagreed. A similar trend appeared for ease of use: 76.47% agreed, and 19.61% strongly agreed that the material was easy to follow, with minimal neutral and strongly disagree responses at 1.96% each.

Regarding readiness to apply the training, 78.43% of respondents agreed, and 15.69% strongly agreed that sufficient knowledge was gathered, while only 1.96% were neutral and 3.92% strongly disagreed. A comparable distribution was observed for perceived relevance: 76.47% agreed, and 17.65% strongly agreed that the training content was relevant to the needs of female farmer groups, while 1.96% were neutral and 3.92% strongly disagreed.

Table 3 summarizes changes in extension worker competencies and performance after training, with 94.1% of workers introducing training materials to female farmers. Additionally, 82.4% conducted

Table 2. Direction of competency change among extension workers (N=51)

Competency aspect	Indicator	Baseline condition	Post-training evidence	Direction of change
Knowledge	Understanding gender concepts in extension	Gender viewed mainly as women's participation	82.4% discussed gender-based work-time gaps; 100% discussed access and control over resources	Strong cognitive improvement
Attitude	Willingness to initiate gender dialogue with farmer groups	Gender issues rarely discussed openly	82.4% initiated gender discussions	Normative and attitudinal shift
Skills	Facilitation of Business Model Canvas (BMC)	BMC rarely used in extension practice	74.5% facilitated business plan development; 80.4% facilitated new business ideas	Substantial practical skill improvement
	Participatory facilitation techniques	Predominantly directive	92.2% facilitated group discussions and goal-setting of FFGs	High improvement in facilitation skills
	Pluralistic and cross-sector engagement	Limited collaboration beyond public extension	54.9% collaborated; 66.7% discussed cross-sector collaboration	Moderate improvement

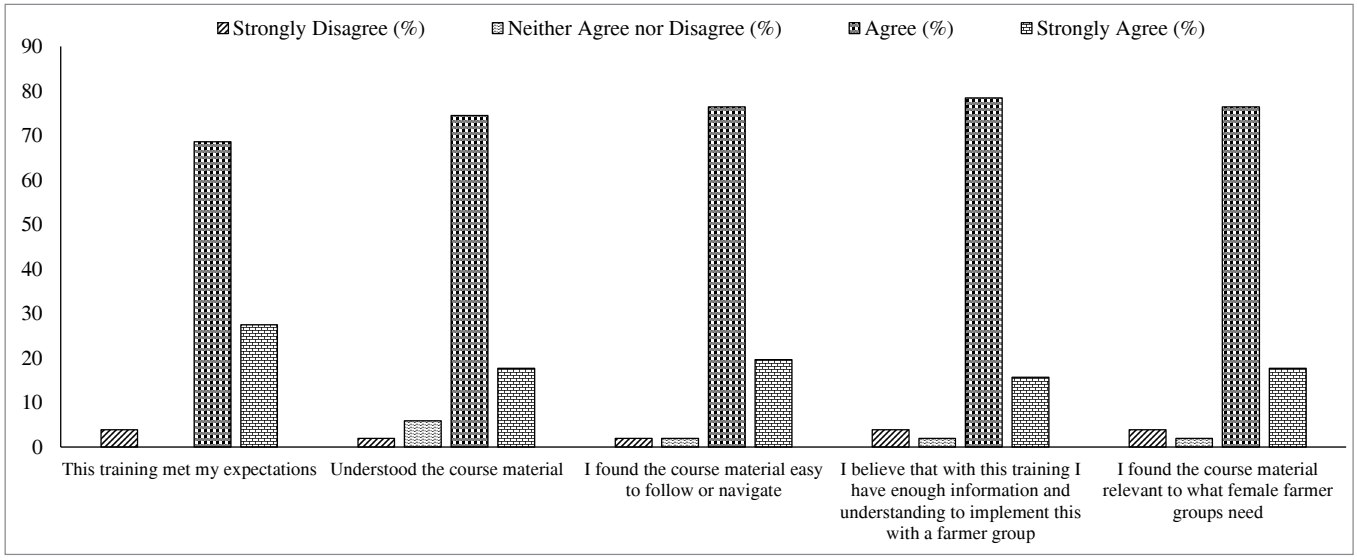

Figure 2. Perceptions of agricultural extension workers regarding the training implementation

Table 3. Changes in extension worker competencies four months after the training and post-training performance achievements

What did the extension workers do after completing the training on the integrative extension approach?	Yes (%)	Not Yet/No (%)
Facilitated training materials with at least one female farmer group	94.1	5.9
Conducted participatory needs assessment with farmer groups	82.4	17.6
Discussed gender differences in farming workloads between men and women	82.4	17.6
Discussed gender-related issues with farmer groups beyond the target groups	66.7	33.3
Discussed differences in access and control over resources between men and women	100.0	0.00
Established communication with external extension partners	58.8	41.2
Discussed cross-sector collaboration to support female farmer groups	66.7	33.3
Collaborated with actors from other sectors in extension activities	54.9	45.1
Facilitated group discussions with female farmer groups	92.2	7.80
Facilitated goal-setting activities with female farmer groups	80.4	19.6
Facilitated discussions on new business ideas	68.6	31.4
Facilitated business plan development using BMC	74.5	25.5

gender analyses on participation and discussed gender gaps in work time within groups.

Beyond primary target groups, 66.7% of extension workers discussed gender issues with other farmer groups, and all extension workers (100%) addressed the gender gap with at least one group. Regarding networking, 58.8% formed new contacts, and 66.7% explored cross-sector collaboration to support FFGs. Direct collaboration with other sectors was reported by 54.9%. Post-training activities on group development and entrepreneurship were common: 92.2% facilitated discussions with female groups, 80.4% helped generate business ideas, 68.6% reported groups starting new activities, and 74.5% helped develop business plans.

DISCUSSION

The training improved participatory facilitation, gender sensitivity, and entrepreneurship through structured modules, experienced facilitators, and interactive methods like discussions and coaching. Studies stress the need to develop facilitation, advisory, and innovation skills in complex agricultural systems (Davis & Sulaiman, 2016; Klerkx & Rose, 2020). Training is an investment for policymakers (Pourjavid et al., 2021). However, gender-sensitive facilitation remains weak, requiring ongoing learning with continuous training, institutional support, and mentoring, not one-off efforts (Ragasa et al., 2019; Lecoutere et al., 2023). The BMC needed more practice and mentoring for effective application in agribusiness. Overall, training outcomes depended on program design, implementation, and post-training support (Stufflebeam & Zhang, 2017; Davis & Sulaiman, 2016).

A higher proportion of female extension workers (FEW) is crucial to advancing FFG empowerment. Of the 51 participants in training, 26 were female. FEW improve women farmers' access to and participation in FFGs by reducing sociocultural barriers and building trust (Nguyen et al., 2021). In Kenya, Fischer & Qaim (2012) reported that collective action in female banana-producing groups, along with other interventions, increases gender equality. In Bangladesh, gender-responsive extension services have also been shown to boost women's empowerment and household income (Islam & Walkerden, 2022).

Regarding the digital infrastructure, although extension workers operate within a stable system, heavy workloads limit their ability to provide intensive support, especially for FFGs. A high number of farmer groups per extension worker reduces performance due to time and energy constraints (Dewi et al., 2025). This highlights the need to combine face-to-face, group, and digital approaches to maintain service quality.

The training improved participatory facilitation and entrepreneurial support via the BMC, with extension workers in four districts applying it with FFGs to assess market-fit products based on group decisions. However, gender-sensitive skills improved modestly, highlighting ongoing challenges with gender norms and decision-making. Findings suggest that gender awareness alone is insufficient without ongoing, transformative learning, as also reported by Wahyuni et al. (2020). High satisfaction with the training materials indicated successful alignment between curriculum design and the actual needs of extension workers.

Participants' confidence in implementing the training increased self-efficacy, a key determinant of training transfer (Ahmadpour et al., 2016). Evidence shows investing in facilitation skills and learning media improves extension performance (Dewi et al., 2025). International research indicates active participation in extension promotes women's empowerment (Das et al., 2023).

The discussion of gender gaps in access and labour division highlights the need for gender-transformative extension practices. Evidence shows that facilitating gender dialogue boosts women's access to extension services and innovations (Diaz & Najjar, 2019; Lecoutere et al., 2023; Snider et al., 2024; Pateriya et al., 2026).

The rise in cross-sector collaboration signals a shift in the roles of extension workers from singular actors to multi-stakeholder platforms. The scholarly literature consistently shows that engaging diverse actors enhances farmer empowerment and strengthens livelihood resilience (Maryono et al., 2024; Timu et al., 2024). The pronounced focus on goal-setting, business planning, and entrepreneurship aligns with findings from agribusiness training initiatives, which underscore the importance of experiential learning and business-oriented facilitation (Kumari et al., 2024).

A limitation of the research is that training was conducted in an area with stable internet access, enabling smooth implementation. This highlights the need to adapt the approach for regions with limited digital infrastructure.

CONCLUSION

An integrated training approach combining participatory, pluralistic, gender-sensitive, and entrepreneurial content strengthens agricultural extension workers' capacity to support FFGs. The results show improvements not only in the conceptual understanding and facilitation skills of the extension workers but also in behavioural outcomes, including increased confidence, stronger self-efficacy, and greater use of the BMC. However, the study highlights persistent institutional and cultural constraints that limit the full implementation of gender-sensitive extension. Despite greater attention to gender and development, challenges remain in addressing structural inequalities and facilitating collective decision-making. Sustaining these gains requires stronger digital advisory tools, expanded multi-stakeholder collaboration, inclusive extension policies, with long-term institutional commitment and support. In practice, the results provide a foundation for developing an online training as a broader, more efficient, and more sustainable capacity-building strategy. Further research needs to test the training's effectiveness across various regional contexts and evaluate its long-term impact.

DECLARATIONS

Ethics approval and informed consent: Informed consent was obtained from the respondents regarding the study during data collection.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The authors declare that during the preparation of this work, they thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

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