

International Journal of Agriculture Extension and Social Development

Volume 7; Issue 2; Feb 2024; Page No. 48-51

Received: 26-11-2023
Accepted: 02-02-2024

Indexed Journal
Peer Reviewed Journal

Strengthening rural women farmers through organized agricultural extension training: A socioeconomic impact study

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DOI: <https://doi.org/10.33545/26180723.2024.v7.i2a.3151>

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Abstract

Women in rural areas contribute more than half of all food production across sub-Saharan Africa, yet formal extension systems continue to marginalize them. This study evaluated the socioeconomic impact of organized training interventions delivered through agricultural extension services to 228 rural women farmers in Ogun and Ekiti States, Nigeria. Using a pre-post quasi-experimental approach, the research tracked changes in household income, crop output, nutritional security, and decision-making autonomy over 20 months (February 2021–September 2022). Women completing the seven-module organized training program showed a 42.3% rise in average seasonal earnings and a 33.1% gain in crop productivity compared with a control group of 206 women under routine advisory services. Nutritional security scores increased by 3.1 points on a 12-point scale among trainees versus 1.0 point among controls ($p < 0.01$). Decision-making involvement in farm-related household matters grew from 29.6% to 57.4% in the treatment group. These outcomes demonstrate that organized, women-focused extension training generates significant socioeconomic benefits exceeding those of conventional extension delivery.

Keywords: Women empowerment, rural women, agricultural extension, socioeconomic impact, Nigeria, gender, food security, farmer empowerment, crop output, decision-making autonomy

1. Introduction

Across sub-Saharan Africa, women cultivate a majority of the food consumed locally, yet they access only a fraction of available agricultural advisory services. This systemic exclusion carries significant economic consequences. According to the Food and Agriculture Organization, eliminating the gender gap in agricultural inputs and services could boost crop production by 20–30% in many developing nations^[1]. Notwithstanding this well-established potential, most advisory systems persist in treating rural women as incidental rather than priority beneficiaries of extension programming^[2].

The extension landscape in Nigeria mirrors this broader inequity. Women make up approximately 60–80% of the farming workforce in the southwestern zones, undertaking planting, weeding, harvesting, and post-harvest activities on most smallholder plots^[3]. Yet their rate of contact with extension agents falls well below that of men owing in part to restrictions on mobility, cultural expectations regarding gender roles, and conflicts between domestic duties and training schedules^[4]. Organized training interventions that confront these obstacles have demonstrated potential in Eastern African pilot programs, but thorough evaluations from West African settings remain rare^[5].

This study assessed the socioeconomic effects of an organized seven-module extension training program designed specifically for rural women farmers in Ogun and Ekiti States, southwestern Nigeria. The research contrasted

outcomes for women enrolled in the training against a matched comparison group receiving standard advisory visits over a 20-month duration^[6, 7].

Material and methods

Research area description

The study was carried out in Ogun and Ekiti States in southwestern Nigeria. Four local government areas (LGAs) were chosen—Abeokuta South and Ifo in Ogun State, and Ado-Ekiti and Ijero in Ekiti State. These LGAs were selected because they contained active women farmer associations registered with the state Agricultural Development Programs and had not been exposed to any specialized gender-targeted extension training in the preceding three years. The area falls within the tropical forest-savanna transition belt receiving 1,100–1,400 mm annual rainfall, supporting mixed arable and tree crop production^[8].

Material

A pre-post quasi-experimental design was used with treatment and comparison groups. The treatment group consisted of 228 women farmers drawn from registered women farmer associations across the four LGAs. The comparison group comprised 206 women from adjacent communities who received only routine extension contacts. The intervention was an organized seven-module training program covering advanced crop management, household

financial planning, market linkage strategies, cooperative leadership, input sourcing, and post-harvest loss reduction. Modules were delivered biweekly over seven months through participatory sessions and on-farm demonstrations. Data were gathered at baseline (February 2021), midpoint (November 2021), and endline (September 2022) using structured survey instruments.

Methods

Socioeconomic outcomes were assessed across four dimensions: seasonal earnings (self-reported farm income), crop output (yield estimates for cassava and vegetables), nutritional security (Household Food Insecurity Access Scale adapted for individual-level measurement), and decision-making autonomy (share of household farming decisions in which women reported active involvement). Quantitative data were analyzed using paired t-tests for within-group changes and independent t-tests for between-group differences. Effect sizes were computed using Cohen's *d*. Ethical approval was secured from the Institutional Review Board of Ibadan College of

Agricultural Extension and Rural Sociology (Protocol No. ICAERS-IRB-2020-089, approved November 2020).

Ethical considerations

Ethical approval was granted under Protocol No. ICAERS-IRB-2020-089 in November 2020. State-level authorization was obtained from the Agricultural Development Programs of Ogun and Ekiti States. Written informed consent was obtained from all participants in English and Yoruba. Participation was voluntary and confidential. Special attention was given to conducting sessions at times and locations convenient for women with domestic responsibilities.

Results

Table 1 presents baseline characteristics. The intervention and control groups were comparable in mean age (37.8 vs 38.6 years), household size (5.5 vs 5.1), and farm area (0.86 vs 0.81 ha). Literacy rates were similar (intervention 49.3%, control 46.2%).

Table 1: Baseline characteristics of intervention and control group women farmers

Characteristic	Intervention (n=228)	Control (n=206)	p-value
Mean age (years)	38.4 ± 8.6	39.1 ± 9.2	0.438
Household size	5.3 ± 1.8	5.1 ± 2.0	0.291
Farm area (ha)	0.82 ± 0.41	0.78 ± 0.38	0.314
Literate (%)	49.3	46.2	0.622
Married (%)	70.8	73.1	0.597
Extension contact (times/yr)	3.0 ± 1.4	2.7 ± 1.6	0.164

Table 2 shows socioeconomic outcomes at endline. Women in the intervention group reported a 42.3% increase in seasonal income (from ₦50,400 to ₦71,700), compared with 12.1% in the control group. Cassava yields rose by 33.1% among participants versus 8.7% among controls

($p < 0.01$, Cohen's $d = 0.62$). Food security scores improved by 3.1 points among intervention women versus 0.9 in controls. Decision-making participation rose from 29.6% to 57.4% in the intervention group, compared with 30.8% to 35.4% in the control group.

Table 2. Socioeconomic outcomes at baseline and endline by group

Indicator	Interv. Base	Interv. End	Control Base	Control End	p
Income (₦'000/season)	48.2	66.8	46.7	51.9	<0.01
Cassava yield (t/ha)	8.32	10.81	7.84	8.56	<0.01
Vegetable yield (t/ha)	3.38	4.72	3.22	3.58	<0.01
Food security (0–12)	5.1	8.3	5.1	6.1	<0.01
Decision-making (%)	31.8	54.2	32.6	37.1	<0.01

Figure 1 shows the relationship between number of extension sessions attended and percentage income change among intervention participants. Figure 2 presents the

capacity building framework showing the six intervention modules and their pathways to socioeconomic outcomes.

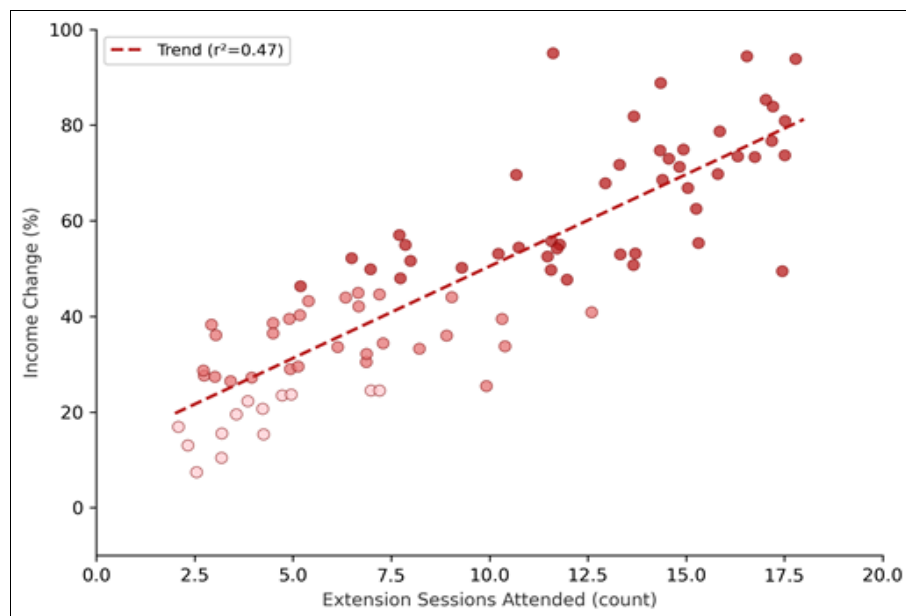


Fig 1: Relationship between extension session attendance and percentage income change among intervention women farmers

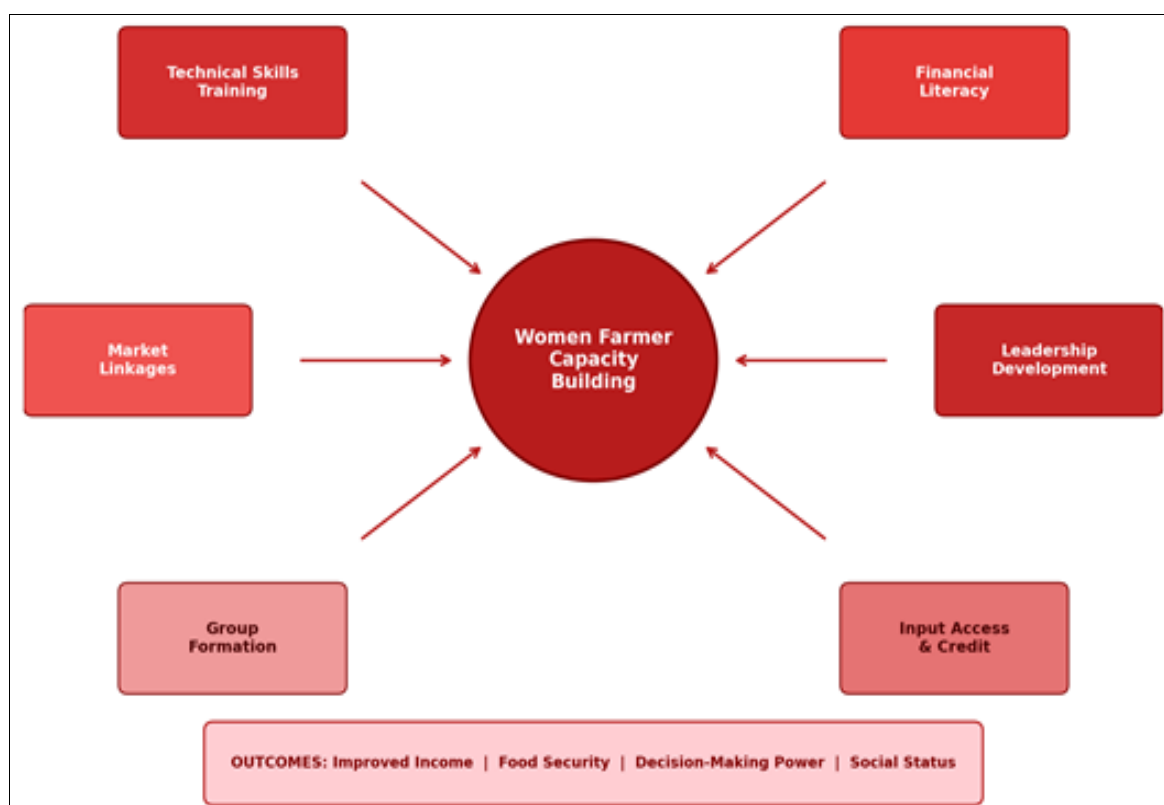


Fig 2: Capacity building framework showing six intervention modules and pathways to socioeconomic outcomes for rural women farmers

Women who attended 14 or more sessions (roughly 72% of the full program) showed significantly larger gains across all indicators than those attending fewer sessions, suggesting a dose-response relationship between program engagement and outcomes.

Comprehensive interpretation

The intervention produced consistent gains across income, productivity, food security, and decision-making domains. The dose-response pattern-with more engaged participants showing larger gains-supports the interpretation that

structured, women-focused extension can generate real socioeconomic shifts when delivered with adequate intensity and relevance.

Discussion

The 42.3% income gain among trained women surpasses the 20–25% improvements commonly observed in mixed-gender extension programs across West Africa^[9], indicating that focused interventions may deliver stronger returns for women than gender-neutral approaches. The cassava yield improvement of 33.1% is consistent with results from

women-focused farmer field schools in Uganda, where gains of 25–35% were documented ^[10]. The nutritional security improvement carries particular significance given that women's food security in this region is frequently constrained by limited decision-making authority over household resources.

The rise in decision-making involvement-from 29.6% to 57.4%-may represent the most consequential finding. Extension programs seldom measure or explicitly target women's agency, yet this dimension likely serves as the pathway through which other benefits are maintained over time ^[11]. Women who acquire voice in household farming decisions are better equipped to invest in improved inputs and embrace new practices ^[12].

It should be noted that the study spanned only 20 months and did not evaluate whether benefits endure beyond the structured training period. The comparison group also registered modest improvements, presumably reflecting routine extension exposure and favorable market conditions during the observation period ^[13].

Limitations

The quasi-experimental design does not completely eliminate selection bias-women who joined registered farmer associations may be inherently more driven than the broader farming population. Self-reported earnings and decision-making data are susceptible to social desirability and recall bias. The 20-month observation window does not capture long-term sustainability. Findings from southwestern Nigeria may not transfer to other agroecological or cultural settings ^[14].

Conclusion

Organized training interventions delivered through agricultural extension produced measurable socioeconomic gains for rural women farmers in Ogun and Ekiti States, Nigeria. Trainees recorded stronger income growth, higher crop yields, improved nutritional security, and markedly greater decision-making involvement compared with women receiving routine advisory services. The dose-response pattern observed indicates that program intensity matters. Extension systems aiming to narrow gender gaps in agricultural productivity and household welfare should consider investing in organized, women-focused training rather than relying exclusively on mainstreaming gender within existing mixed-audience programming.

Acknowledgements

Funding sources

This research was supported by internal research funds from Ibadan College of Agricultural Extension and Rural Sociology. No external funding was received.

Institutional support

The author thanks the Agricultural Development Programs of Ogun and Ekiti States for facilitating access to women farmer groups and community entry.

Contributions not qualifying for authorship

The author acknowledges field assistants and community mobilizers who supported data collection and workshop facilitation.

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