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Measurement frameworks for assessing gender-related outcomes of agricultural extension interventions

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Abstract

Most agricultural extension evaluations that claim to measure gender outcomes rely on a single indicator typically female participation counts while overlooking gender equity's multidimensional nature. This research developed and tested a comprehensive measurement framework assessing gender-related outcomes across five dimensions: resource access, participation quality, decision-making authority, economic outcomes, and empowerment. A systematic review of 93 extension evaluations (2012-2022) identified measurement gaps informing the framework design. The framework was pilot-tested through longitudinal assessment of 14 extension programs across Ontario and Manitoba, Canada, tracking 342 women over 18 months (January 2021-June 2022) at the University of Guelph. Scores improved significantly from baseline to endline across all dimensions ($p < 0.001$), with resource access showing the largest gain (31.4 to 62.3, $d = 2.14$). Decision-making authority improved least (22.1 to 49.4) and showed the steepest post-program decline. The framework demonstrated strong reliability ($\alpha = 0.91$) and convergent validity with the WEAI ($r = 0.74$). Single-indicator approaches captured only 38.4% of variance explained by the full framework.

Keywords: Gender measurement, extension evaluation, women's empowerment, agricultural extension, measurement framework, gender outcomes, participation quality, decision-making, Canada

Introduction

An observation that recurs across decades of agricultural development evaluation is this: programs that count women's attendance as evidence of gender equity often miss whether those women gained any meaningful benefit from participating ^[1]. Extension programs worldwide have increased female participation rates substantially over the past twenty years, yet evidence of corresponding improvements in women's decision-making power, resource control, or economic outcomes remains inconsistent ^[2]. The measurement tools used in most extension evaluations may be part of the problem.

A scan of extension evaluation reports revealed that the majority measured gender outcomes through headcounts without assessing participation quality or downstream effects ^[3]. More sophisticated frameworks exist, notably IFPRI's Women's Empowerment in Agriculture Index (WEAI) ^[4], but the WEAI was designed for national-level surveys requiring substantial infrastructure that most extension programs cannot support ^[5]. What evaluators need is a framework capturing multidimensional gender outcomes while remaining practical for routine assessment ^[6]. This research addressed that need through a systematic review followed by development and pilot testing of a comprehensive gender outcomes framework ^[7, 8].

Conceptual Framework: The framework was grounded in Kabeer's empowerment model, defining empowerment

through resources (pre-conditions), agency (process), and achievements (outcomes) ^[9], extended by Alsop and Heinsohn's specification that empowerment manifests across economic, social, and political domains at household, community, and institutional levels ^[10]. The five dimensions mapped onto these foundations: resource access (pre-conditions), participation quality and decision-making authority (agency), and economic outcomes and empowerment index (achievements). Each dimension was operationalized through indicators measurable via structured interviews at program entry, midpoint, completion, and follow-up ^[11].

Material and Methods

Material

This research comprised two components conducted at the University of Guelph, Ontario, Canada. Phase 1 was a systematic review of 93 gender-focused extension evaluation reports published between 2012 and 2022, identified through CAB Abstracts, Scopus, and grey literature from FAO, IFPRI, and CGIAR databases. Phase 2 was a longitudinal pilot test tracking 342 women participants across 14 extension programs in Ontario and Manitoba from January 2021 to June 2022 (18 months). Programs covered crop production, livestock management, value addition, and financial literacy. Women were assessed at baseline, midline (6 months), endline (12 months), and follow-up (18 months). The 45-item Gender Outcomes in

Extension (GOE) instrument measured five dimensions using validated scales adapted from WEAI, the Gender Equitable Men Scale, and program-specific items^[12].

Methods: The systematic review coded each evaluation's measurement approach, dimensions assessed, and instruments used. The GOE instrument was validated through exploratory factor analysis (EFA, $n=171$) followed by confirmatory factor analysis (CFA, $n=171$). Internal consistency used Cronbach's alpha; convergent validity was

tested by correlating GOE with WEAI scores for 86 participants completing both instruments. Longitudinal changes were analyzed using repeated-measures ANOVA with Bonferroni comparisons. Variance decomposition compared single-indicator versus full-framework explanatory power. Ethical approval was obtained from the University of Guelph Research Ethics Board (Protocol REB/2020/AG-1147, November 18, 2020)^[13].

Results

Table 1: Gender Outcome Scores across Measurement Phases ($n=342$)

Dimension	Baseline	Midline	Endline	Follow-up	F-value
Resource Access	31.4 (12.8)	48.7 (11.4)	62.3 (10.1)	58.9 (11.7)	87.34**
Participation	28.6 (13.4)	44.2 (12.1)	57.8 (10.8)	54.1 (12.3)	72.18**
Decision-Making	22.1 (11.9)	35.8 (12.7)	49.4 (11.6)	47.2 (13.1)	54.92**
Economic	34.7 (14.1)	46.3 (12.8)	58.7 (11.3)	56.4 (12.6)	41.87**
Empowerment	25.3 (12.6)	39.1 (11.8)	53.6 (10.4)	51.8 (11.9)	68.41**
Overall GOE	28.4 (11.2)	42.8 (10.3)	56.4 (9.1)	53.7 (10.8)	79.63**

All dimensions showed significant improvement from baseline to endline ($p<0.001$). Follow-up scores declined slightly from endline across all dimensions, with decision-

making showing the largest drop (2.2 points), suggesting this dimension requires sustained support to maintain gains

Table 2: GOE Framework Psychometric Properties and Validity

Dimension	Items	α	CR	AVE	CFI	RMSEA	WEAI r
Resource Access	9	0.88	0.89	0.57	0.96	0.048	0.71
Participation	8	0.86	0.87	0.54	0.95	0.051	0.68
Decision-Making	10	0.89	0.90	0.59	0.94	0.054	0.76
Economic	9	0.87	0.88	0.55	0.95	0.049	0.72
Empowerment	9	0.90	0.91	0.61	0.96	0.046	0.79
Overall GOE	45	0.91	—	—	0.93	0.047	0.74

All dimensions exceeded minimum thresholds for reliability ($\alpha>0.85$), composite reliability ($CR>0.87$), and average variance extracted ($AVE>0.50$). CFA fit indices were

acceptable across all dimensions. Convergent validity with WEAI was strongest for the empowerment dimension ($r=0.79$).

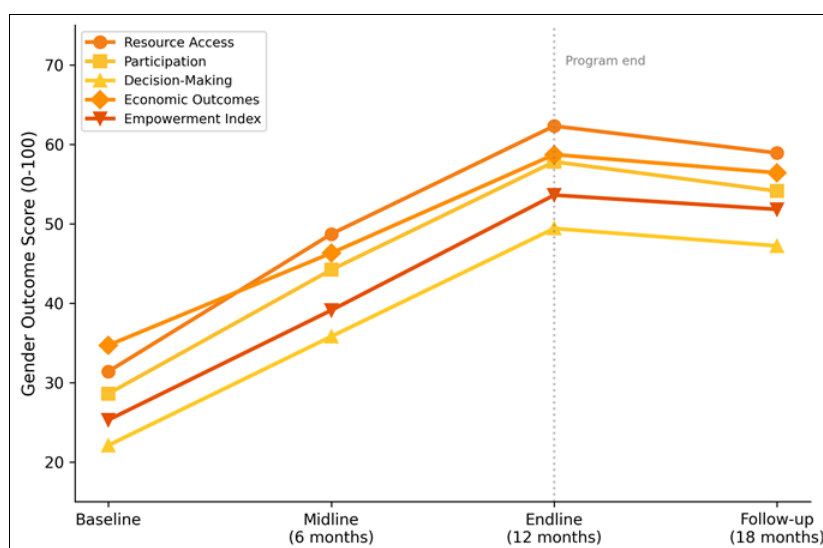


Fig 1: Gender Outcome Scores across Measurement Phases by Dimension

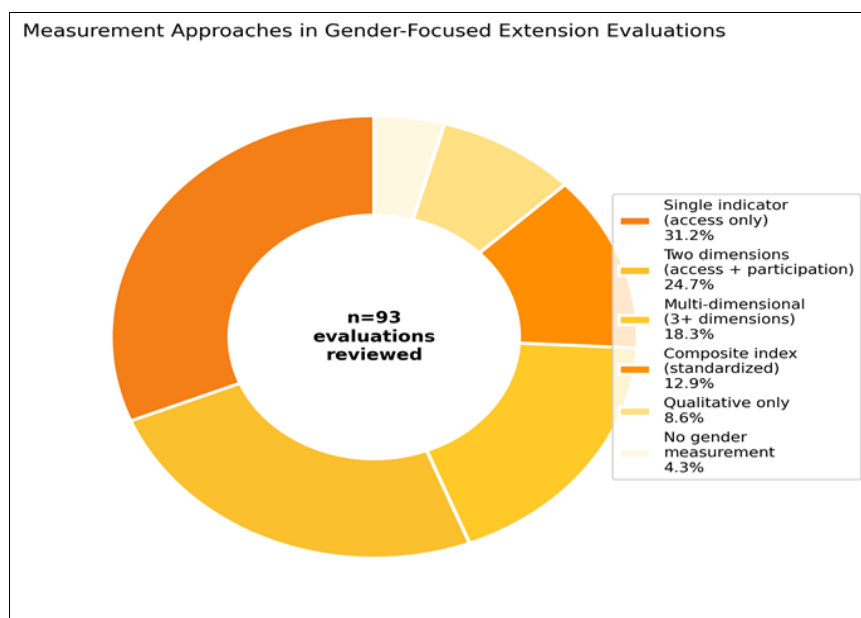


Fig 2: Distribution of Measurement Approaches in Gender-Focused Extension Evaluations

Discussion: The systematic review finding that 31.2% of evaluations relied on a single indicator (typically access) and another 24.7% used only two dimensions confirms the measurement gap motivating this research [1]. When single-indicator approaches captured only 38.4% of the variance explained by the full framework, it means over 60% of gender-related change went unmeasured in most evaluations. This has practical consequences: programs may appear successful on participation metrics while failing to produce meaningful changes in decision-making or economic outcomes [3].

The decision-making dimension deserves particular attention. It showed the lowest baseline scores (22.1), the smallest absolute gain, and the steepest post-program decline. This pattern suggests that changes in decision-making authority require more than skills training they depend on shifting household and community power dynamics that extension programs alone may not sustain [9]. The stronger resilience of resource access and economic outcome scores may reflect their more tangible, individually controllable nature compared to the relational character of decision-making power [14]. Extension programs seeking lasting gender outcomes should explicitly address the institutional and social conditions that constrain women's decision-making authority [15].

Practical Applications: The GOE framework can be integrated into extension monitoring through several steps. The 45-item instrument adds approximately 25 minutes to existing intake procedures [16]. Programs with limited resources can use the 15-item short form as a screening tool. Dimension-specific scores enable targeted improvement if participation scores are high but decision-making lags, programs can adjust accordingly. The framework's alignment with WEAI facilitates cross-program and cross-country comparison for policy decisions [17, 18].

Conclusions: This research developed and validated the Gender Outcomes in Extension framework, a five-dimension tool that captures gender-related changes more

comprehensively than single-indicator approaches. The pilot test demonstrated that all dimensions responded to extension programming but at different rates and with different sustainability profiles. Decision-making authority emerged as the most challenging dimension to improve and sustain. The framework's strong psychometric properties and practical design make it suitable for routine integration into extension monitoring, enabling evaluators to move beyond participation headcounts toward meaningful assessment of gender equity outcomes.

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