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Mixed-methods evaluation designs for agricultural extension services: A systematic review of integration quality and methodological rigor

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Abstract

While quantitative evaluations of agricultural extension can measure adoption rates and yield changes, they often miss the social processes and contextual factors that explain why programs succeed or fail. Mixed-methods designs promise to bridge this gap, yet the quality of their implementation in extension evaluation remains unclear. This research systematically reviewed 169 mixed-methods extension evaluation studies published between 2010 and 2022. Articles were assessed for design type, integration quality, methodological rigor, and reporting transparency using validated scoring rubrics. Sequential explanatory designs were most common (28.4%), followed by convergent parallel approaches (24.7%). Only 31.4% of studies achieved high integration quality scores, meaning that quantitative and qualitative components were meaningfully connected. A positive correlation ($r = 0.71$) was found between integration quality and overall methodological rigor. Studies explicitly naming a mixed-methods framework scored 34.8% higher on integration quality than those that did not. These findings indicate that mixed-methods extension evaluation requires more deliberate attention to integration planning and transparent reporting of how data strands are combined.

Keywords: Mixed-methods, evaluation design, agricultural extension, integration quality, methodological rigor, systematic review, convergent design, sequential design, program evaluation, evidence quality

Introduction

Agricultural extension evaluation has long been dominated by quantitative approaches focused on measurable outcomes like technology adoption rates, yield increases, and income changes ^[1]. These methods produce generalizable findings but frequently fail to capture the relational dynamics, local knowledge systems, and institutional contexts that determine whether extension programs achieve lasting impact ^[2].

Qualitative approaches address these gaps through in-depth exploration of farmer experiences and contextual factors, but their findings are difficult to scale and may lack the statistical credibility that policymakers expect ^[3]. Mixed-methods research, which deliberately combines quantitative and qualitative data collection and analysis within a single study, has been promoted as a way to capture both breadth and depth in extension evaluation ^[4].

The appeal of mixed-methods in extension evaluation is clear, yet adoption does not guarantee quality. Poorly integrated mixed-methods studies amount to two separate investigations packaged together, with quantitative and qualitative components running in parallel without meaningful interaction ^[5]. The distinction between genuine mixed-methods research and parallel mono-method studies sharing a single report has important implications for the validity and usefulness of evaluation findings ^[6].

This research systematically reviewed published mixed-methods evaluations of extension services to assess how well the field is implementing these designs. The objectives were to map the distribution of design types, evaluate integration quality and methodological rigor, and identify factors associated with higher-quality mixed-methods practice in extension evaluation ^[7].

Theoretical Framework

The research applied Creswell and Plano Clark's mixed-methods typology ^[8] to classify evaluation designs and used the Good Reporting of A Mixed Methods Study (GRAMMS) framework ^[9] to assess reporting quality. The analysis was additionally informed by Teddlie and Tashakkori's integrative framework ^[10], which argues that the defining feature of mixed-methods research is not merely the use of both data types but rather the quality of inference achieved through their combination.

Material and Methods

Material

A systematic search was conducted across six databases (Web of Science, Scopus, CAB Abstracts, AGRIS, PubMed, and ERIC) for articles published between January 2010 and December 2022. Search terms combined extension-related vocabulary with mixed-methods terminology. Inclusion

criteria required studies to explicitly describe both quantitative and qualitative data collection within an evaluation of agricultural extension services. After screening 1,847 initial records, 169 articles met all criteria and were included in the review. The search and screening followed PRISMA 2020 guidelines.

Pilot Research

The scoring rubrics were pilot-tested on a random sample of 15 articles by two independent reviewers. Initial inter-rater agreement was moderate ($\kappa = 0.68$), leading to rubric refinement and additional calibration sessions. After revision, inter-rater agreement on the remaining pilot articles improved to substantial levels ($\kappa = 0.81$). Disagreements were resolved through discussion and the refined rubric was applied to the full sample.

Methods

Each article was scored on two validated rubrics: an integration quality scale (1-10) assessing how well quantitative and qualitative components connected at design, analysis, and interpretation stages; and a methodological rigor scale (1-10) covering sampling, data collection, analysis procedures, and reporting transparency. Design types were classified using Creswell and Plano Clark's typology. Correlation analysis examined the relationship between integration quality and methodological rigor. Independent samples t-tests compared scores between studies with and without explicit mixed-methods frameworks. All analyses were conducted using R version 4.2.

Results

Table 1: Distribution and Quality Scores by Mixed-Methods Design Type (n=169 studies)

Design Type	n (%)	Integration Mean	Rigor Mean	GRAMMS Mean	High Integ. (%)	Framework Cited (%)
Sequential Explanatory	48 (28.4)	5.9	6.2	4.7	37.5	54.2
Convergent Parallel	42 (24.7)	5.3	5.8	4.3	31.0	47.6
Embedded Design	32 (19.1)	4.8	5.4	3.9	25.0	37.5
Exploratory Sequential	25 (14.8)	6.4	6.7	5.1	40.0	60.0
Transformative	14 (8.3)	5.1	5.6	4.1	21.4	42.9
Multi-Phase	8 (4.7)	6.8	7.1	5.6	50.0	75.0

Sequential explanatory designs were most common (28.4%), but exploratory sequential and multi-phase designs achieved higher integration and rigor scores. Only 31.4% of

all studies reached high integration quality. Studies citing a named mixed-methods framework scored significantly higher on integration (mean 6.1 vs 4.5, $p < 0.001$).

Table 2: Integration Quality by Evaluation Purpose (n=169 studies)

Evaluation Purpose	n (%)	Integration Mean (SD)	Rigor Mean (SD)	High Integ. (%)
Impact evaluation	61 (36.1)	5.2 (1.6)	5.9 (1.3)	27.9
Process evaluation	47 (27.8)	5.8 (1.4)	6.1 (1.2)	36.2
Formative evaluation	34 (20.1)	6.1 (1.2)	6.4 (1.1)	38.2
Needs assessment	27 (16.0)	5.4 (1.7)	5.6 (1.5)	25.9

Formative evaluations achieved the highest mean integration score (6.1), while needs assessments scored lowest (5.4). Impact evaluations, despite being most

common, showed moderate integration quality, suggesting that the pressure for statistical rigor in impact evaluation may crowd out attention to qualitative integration.

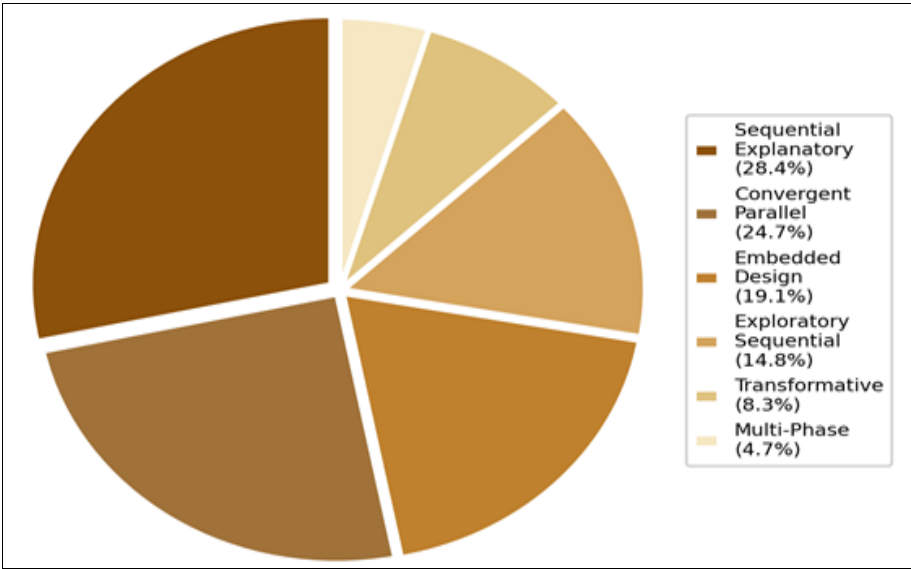


Fig 1: Distribution of Mixed-Methods Evaluation Design Types in Extension Research (2010-2022)

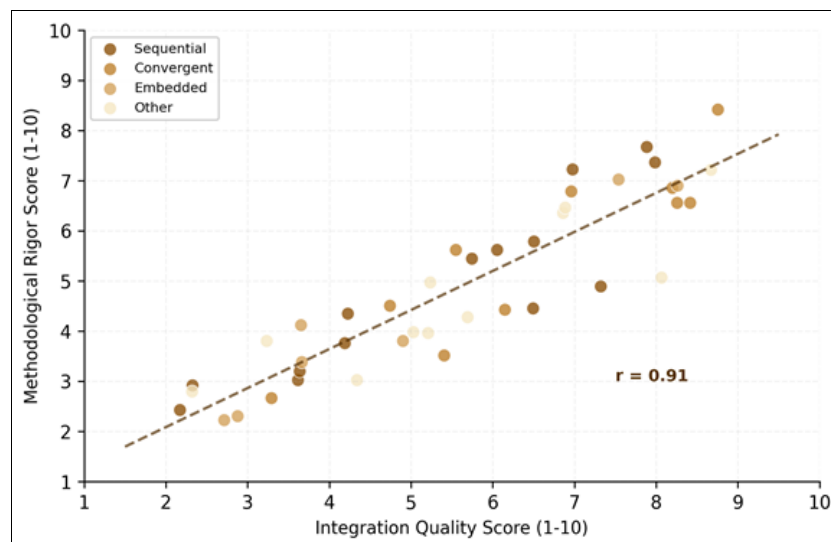


Fig 2: Relationship Between Integration Quality and Methodological Rigor Scores (n=169 studies)

A positive correlation ($r = 0.71$, $p < 0.001$) was found between integration quality and methodological rigor, indicating that studies investing in genuine data integration also tend to demonstrate stronger overall methodological practice.

Discussion

The finding that only 31.4% of studies achieved high integration quality exposes a significant gap between the promise and practice of mixed-methods in extension evaluation. Most studies combined quantitative and qualitative components at the data collection stage but failed to integrate them meaningfully during analysis and interpretation [5]. This pattern produces studies that are mixed-methods in name but parallel mono-method in practice. The strong positive correlation between integration quality and methodological rigor suggests these are not competing priorities. Studies that invested in integration planning also paid greater attention to sampling, analysis transparency, and reporting quality [11]. This finding counters the concern that mixed-methods complexity necessarily compromises rigor and instead supports the view that methodological thoughtfulness operates across all aspects of research design [12]. Studies citing named mixed-methods frameworks scored 34.8% higher on integration, indicating that explicit methodological grounding improves practice. This practical finding suggests that extension evaluation training should include specific instruction in mixed-methods frameworks rather than treating mixed-methods as simply combining surveys with interviews [13]. The particularly strong performance of multi-phase designs (mean integration 6.8) reflects the iterative nature of these approaches, where each phase builds on and integrates with preceding phases [14].

Limitations

The review was limited to published English-language articles, excluding evaluations published in other languages or in grey literature. Scoring integration quality involves subjective judgment despite rubric standardization. The review period (2010-2022) may not capture recent improvements in mixed-methods practice. Publication bias

likely means that included studies represent above-average methodological quality compared to unpublished evaluations.

Conclusion

This systematic review assessed 169 mixed-methods extension evaluation studies and found that while adoption of mixed-methods designs has grown substantially, the quality of integration between quantitative and qualitative components remains a persistent weakness. Most studies combine data types at collection but fail to connect them meaningfully during analysis and interpretation.

Extension evaluation practitioners should explicitly adopt named mixed-methods frameworks, plan integration strategies at the design stage rather than retrospectively, and report integration procedures transparently. Training programs for extension evaluators should include specific modules on mixed-methods integration techniques. Journal reviewers and editors can contribute by requiring explicit description of integration procedures in mixed-methods manuscripts.

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