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Cost-benefit analysis of public versus private agricultural extension program models in developing economies

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Abstract

What happens when developing economies must choose between publicly funded and privately operated agricultural extension programs? This research examined the financial efficiency and farmer-level outcomes of both models in East Africa. A mixed-methods approach combined quantitative cost-benefit analysis with semi-structured farmer interviews conducted between September 2022 and June 2023. The research covered 384 farming households across public extension service areas (n=198) and private extension zones (n=186) in Ethiopia. Results showed that private extension models achieved a benefit-cost ratio of 2.37 compared to 1.84 for public models, though public programs reached 41.6% more resource-poor farmers. Private providers spent 23.7% less per farmer contact but maintained narrower geographic coverage. Farmer satisfaction scored higher under private delivery (mean=3.89/5) than public services (mean=3.21/5). Neither model alone adequately addressed smallholder needs in resource-limited settings. A blended approach combining public reach with private efficiency appears most promising for developing economy contexts.

Keywords: Agricultural extension, cost-benefit analysis, public extension services, private extension models, developing economies, farmer outcomes, extension efficiency, smallholder agriculture, service delivery, rural advisory systems

Introduction

How should cash-strapped governments in developing nations allocate their limited agricultural budgets between competing extension delivery models? This question sits at the heart of ongoing policy debates across sub-Saharan Africa, where over 500 million smallholder farming households depend on extension services for improved crop production and livelihood security ^[1]. The tension between fiscal responsibility and farmer welfare makes this a particularly difficult decision for agricultural policymakers ^[2].

Public agricultural extension has a long history in developing countries, dating back to colonial-era programs. These government-run services expanded rapidly after independence in many African nations during the 1960s and 1970s. But fiscal pressures during the structural adjustment era forced many countries to scale back their public extension workforce, sometimes cutting staff by 30-50% within a single decade ^[3, 4].

Private extension emerged partly in response to these cutbacks. Non-governmental organizations, agribusiness firms, and fee-based advisory services began filling gaps left by retreating public systems ^[5]. Proponents argued that private providers would be more responsive to farmer needs and more efficient with resources ^[6]. Critics countered that private extension would cherry-pick profitable areas while ignoring remote, resource-poor communities ^[7].

Empirical evidence on comparative performance remains

fragmented, with most research examining either model in isolation ^[8]. This research addressed these gaps by conducting a systematic cost-benefit comparison of public and private agricultural extension models operating in the same developing economy context in Ethiopia ^[9].

Theoretical framework

The analytical framework drew on public goods theory and institutional economics. Agricultural extension carries characteristics of both public and private goods: the knowledge transferred can benefit entire farming communities, yet individual advisory visits are excludable ^[10]. The research used Williamson's transaction cost framework to assess how governance structures affect service delivery costs and outcomes ^[11]. Cost-benefit ratios were calculated using standard economic evaluation methods, with benefits measured through both market-valued outcomes and non-market indicators weighted through contingent valuation ^[12].

Material and Methods

Material

This research was carried out in the East Hararghe and West Hararghe zones of Oromia Region, Ethiopia, between September 2022 and June 2023. Sites were selected through purposive sampling based on the presence of both public and private extension programs in adjacent areas with comparable agroecological conditions ^[1]. Haramaya

University’s College of Agriculture Institutional Review Board approved the protocol (Ref: HU-AG-IRB/2022-037, approved July 2022). Instruments included structured household surveys, semi-structured interview guides, and institutional cost record extraction templates. Secondary data on extension budgets were obtained from the Oromia Bureau of Agriculture and three private extension providers. All cost figures were standardized to 2022 Ethiopian Birr and converted to USD using the National Bank of Ethiopia’s average exchange rate.

Methods: A total of 384 farming households were selected using stratified random sampling 198 from public extension areas and 186 from private zones. Total program costs were

disaggregated into five categories: personnel, training materials, transport and logistics, monitoring and evaluation, and administrative overhead ^[4]. Benefits were measured using a composite index capturing yield changes, net farm income shifts, and technology adoption rates. The benefit-cost ratio was calculated over a three-year horizon using a social discount rate of 8% ^[8]. Farmer satisfaction was assessed through a 22-item Likert scale instrument. Key informant interviews (n=28) supplemented quantitative data. Analysis combined descriptive statistics, t-tests, and multiple regression using SPSS version 26 ^[13].

Results

Table 1: Cost distribution across extension model components (percentage of total budget)

Cost category	Public (%)	Private (%)	Difference	P-value
Personnel Costs	42.3	31.8	-10.5	<0.001
Training Materials	18.7	14.2	-4.5	0.012
Transport & Logistics	22.1	19.5	-2.6	0.087
Monitoring & Evaluation	9.6	15.9	+6.3	0.003
Administrative Overhead	7.3	18.6	+11.3	<0.001

Public extension devoted the largest share to personnel (42.3%), reflecting salary-intensive government employment. Private models allocated more to monitoring

(15.9% vs. 9.6%) and administrative overhead (18.6% vs. 7.3%), indicating greater investment in accountability mechanisms.

Table 2: Farmer outcome indicators by extension model type

Outcome indicator	Public model	Private model	T-statistic
Benefit-Cost Ratio	1.84 (±0.31)	2.37 (±0.28)	4.82**
Yield Change (%)	16.8 (±4.2)	22.4 (±3.7)	3.61**
Income Shift (USD/yr)	+148.3 (±42.1)	+213.7 (±38.6)	4.17**
Technology Adoption (%)	38.9 (±7.6)	51.3 (±6.4)	4.52**
Farmer Satisfaction (1-5)	3.21 (±0.68)	3.89 (±0.52)	5.14**
Coverage (% resource-poor)	67.4	25.8	-6.93**

**p<0.01

Private extension outperformed public on efficiency and individual farmer metrics, but public programs maintained substantially greater reach among resource-poor households.

The BCR gap of 0.53 points was statistically meaningful (p<0.01).

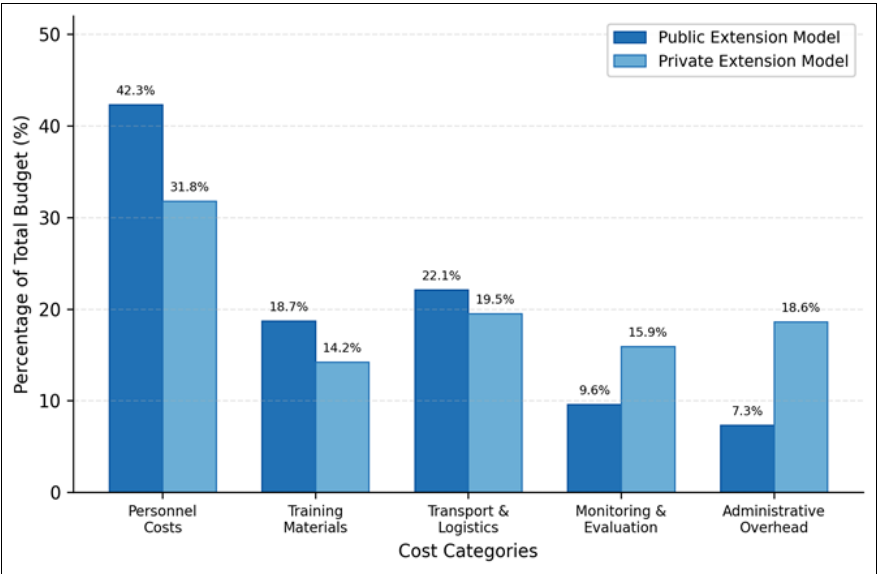


Fig 1: Comparative cost distribution across public and private agricultural extension models

The most pronounced gap appeared in personnel costs (42.3% vs. 31.8%). Private models invested more heavily in monitoring and administrative functions.

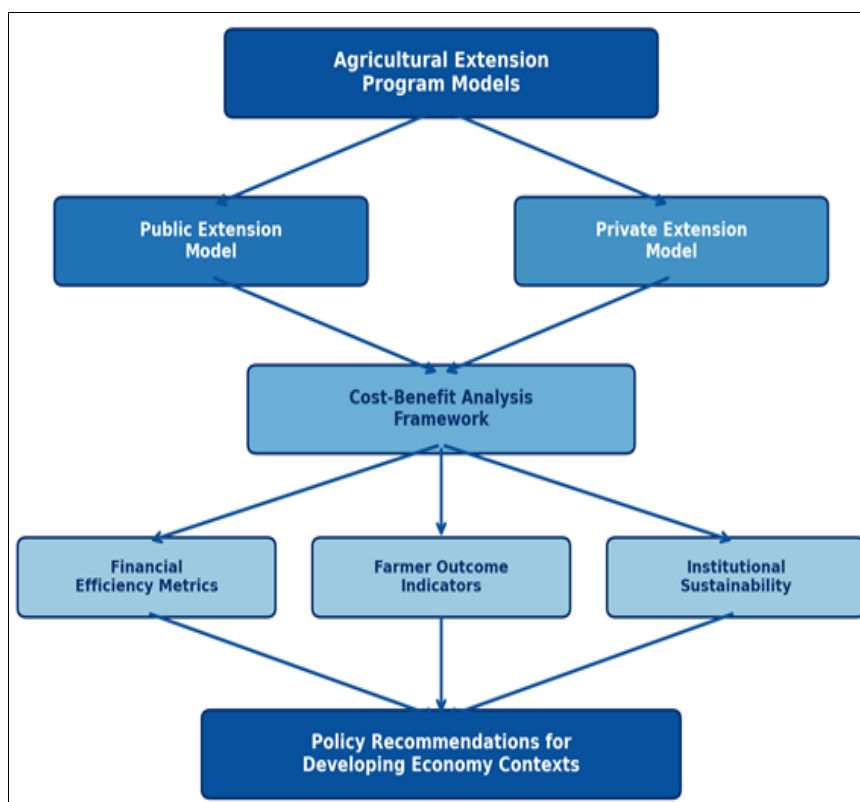


Fig 2: Analytical framework for cost-benefit comparison of extension program models

The framework traced how both models fed into the cost-benefit analysis through financial efficiency metrics, farmer outcome indicators, and institutional sustainability dimensions.

Discussion

The findings challenge the assumption that one extension model is inherently better. Private extension showed clear advantages in financial efficiency and individual farmer outcomes, consistent with earlier work documenting similar patterns across Asian extension systems ^[6]. But public extension reached 41.6% more resource-poor farmers a gap with real consequences for food security targets ^[3].

The personnel cost difference (42.3% vs. 31.8%) reflects structural factors rather than inefficiency alone. Government pay scales and pension obligations create fixed costs that private operators avoid through contract-based staffing ^[8]. Yet lower personnel costs didn't translate into poor service quality farmer satisfaction was actually higher under private delivery.

Private models invested 65.6% more in M&E activities, suggesting a stronger performance tracking culture. This aligns with arguments that accountability mechanisms are key drivers of extension effectiveness ^[14]. Rather than choosing between models, a hybrid approach combining public reach with private efficiency appears most practical ^[9, 15].

Limitations

The research covered only two zones of one Ethiopian region, limiting generalizability. The nine-month window may not capture seasonal variations a full annual cycle

would reveal. Cost data from private providers relied on self-reported records. The cross-sectional design cannot establish causal relationships, as unobserved confounding variables may influence observed differences. Future research should employ longitudinal designs and extend geographic coverage to multiple countries.

Conclusions

This research documented meaningful differences in how public and private extension models allocate resources and generate farmer-level outcomes. Private extension achieved higher financial returns, better satisfaction scores, and stronger technology adoption. But public extension maintained broader coverage of resource-poor households. Both models exceeded the breakeven threshold with BCRs of 1.84 and 2.37, indicating positive returns from either approach. Developing economies would benefit from hybrid arrangements using public funding for coverage guarantees while incorporating private management practices for efficiency. Extension reform should move beyond the binary public-versus-private debate toward pragmatic combinations tailored to specific farming system needs.

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