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Mentorship programs for early-career extension professionals in remote and underserved areas

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Abstract

Across Latin America, nearly 43% of newly hired extension agents posted to remote areas resign within 30 months. This research assessed mentorship programs targeting early-career extension professionals in remote communities across Costa Rica, Panama, and Honduras. A longitudinal cohort tracked 214 agents over 36 months (January 2020 to December 2022), comparing 118 mentored against 96 non-mentored controls through quarterly surveys, retention records, and competence assessments. After 36 months, mentored agents showed 74.3% retention versus 48.7% for controls (chi-square = 16.24, $p < 0.001$). Mentored agents scored higher on competence ($M = 5.9$ vs. 4.3 , $p < 0.001$) and community trust ($M = 6.2$ vs. 4.7 , $p < 0.001$). Virtual mentoring was more accessible but less effective for practical skills than field visits. The research proposes a three-pillar mentorship architecture combining virtual, field-based, and peer support elements.

Keywords: Mentorship, early-career professionals, remote areas, extension agents, staff retention, competence development, rural advisory services, Central America, workforce sustainability, professional support

Introduction

When Costa Rica established its first organized agricultural extension service in 1956, agents lived within farming communities, building relationships through daily presence ^[1]. That model has disappeared, replaced by centrally managed posting systems assigning newly graduated professionals to remote districts where they have no prior connections or organizational support ^[2]. Remote areas present unique challenges: geographic isolation limits supervisor access and peer interaction ^[3], infrastructure deficits make travel demanding, cultural barriers complicate relationship-building ^[4], and the psychosocial toll of isolation contributes to burnout and early resignation ^[5]. Mentorship has been proposed as a buffer mechanism, providing personalized guidance and emotional support from experienced colleagues ^[6], yet evidence on its effectiveness in remote extension postings remains sparse ^[7].

This research assessed mentorship program outcomes for early-career extension professionals in remote areas across three Central American countries, examining retention trajectories, competence development, and the differential effectiveness of virtual, field-based, and peer mentoring components.

Ethical Considerations

All participants provided written informed consent. The protocol was approved by the Universidad de Costa Rica Bioethics Committee (Protocol VI-2019-0386, approved November 2019). Participants were informed that group assignment did not reflect performance evaluation.

Quarterly surveys included optional withdrawal clauses. Retention data were obtained from anonymized administrative records with institutional permission.

Materials and Methods

Materials

The research was conducted across remote agricultural districts in Costa Rica (Limon and Guanacaste provinces), Panama (Darien and Bocas del Toro provinces), and Honduras (Gracias a Dios and Olancho departments) from January 2020 to December 2022. The institutional base was the Department of Rural Development, Universidad de Costa Rica, San Jose. Research materials included quarterly structured surveys measuring job satisfaction, isolation perception, mentoring quality, and professional confidence (42 items, Cronbach alpha = 0.86). Competence assessments covered six domains: technical knowledge, communication skills, community engagement, problem-solving, report writing, and program planning. Administrative retention records were obtained from each country's extension service directorate.

Methods

A longitudinal cohort design compared 118 mentored agents against 96 non-mentored controls over 36 months. Mentored agents were enrolled in structured programs featuring monthly virtual mentoring sessions, quarterly mentor field visits, and biannual regional peer cohort meetings. Assignment to mentorship was based on program availability in each district rather than randomization. Quantitative analysis included chi-square tests for retention

comparisons, independent t-tests for competence and satisfaction differences, repeated measures ANOVA for trajectory analysis across time points, and Cox proportional hazards regression for time-to-resignation modeling. Qualitative data from 34 semi-structured exit and continuation interviews were analyzed thematically [8].

Instrument Development

The competence assessment instrument was developed through a three-stage process. First, 14 experienced

extension supervisors from the three countries identified competency domains through a modified Delphi process. Second, items were generated for each domain and reviewed by a panel of five extension education specialists. Third, the instrument was pilot-tested with 28 extension agents in non-study districts. Confirmatory factor analysis supported the six-factor structure (CFI = 0.93, RMSEA = 0.048). Inter-rater reliability for observed competence ratings was acceptable (ICC = 0.81).

Results

Table 1: Baseline characteristics of mentored and non-mentored cohorts

Characteristic	Mentored (n=118)	Non-mentored (n=96)	p-value
Mean age (years)	26.4 (3.1)	25.9 (2.8)	0.231
Female (%)	41.5	38.5	0.649
Prior rural experience (%)	22.9	20.8	0.718
Distance to nearest town (km)	47.3 (21.6)	44.8 (19.3)	0.387
Baseline competence score	2.1 (0.6)	2.0 (0.5)	0.194
Baseline job satisfaction	4.6 (0.9)	4.5 (1.0)	0.440

The two cohorts did not differ significantly on any baseline characteristic, supporting comparability despite non-random assignment. Mean age was approximately 26 years, about

40% were female, and fewer than one-quarter had prior rural work experience.

Table 2: Retention and competence outcomes at 36 months by mentorship status

Outcome measure	Mentored	Non-mentored	Test statistic
Retained at 36 months (%)	74.3	48.7	$\chi^2=16.24$, $p<0.001$
Competence score (1-7)	5.9 (0.7)	4.3 (0.9)	$t=14.31$, $p<0.001$
Community trust index (1-7)	6.2 (0.6)	4.7 (1.1)	$t=11.87$, $p<0.001$
Job satisfaction (1-7)	5.8 (0.8)	4.1 (1.2)	$t=11.63$, $p<0.001$
Isolation perception (1-7, lower=better)	2.8 (1.0)	4.9 (1.3)	$t=12.74$, $p<0.001$

Mentored agents outperformed non-mentored controls on every outcome measure. The retention gap was 25.6 percentage points at 36 months. Competence scores

diverged substantially (5.9 vs. 4.3), and mentored agents reported significantly lower isolation perception (2.8 vs. 4.9).

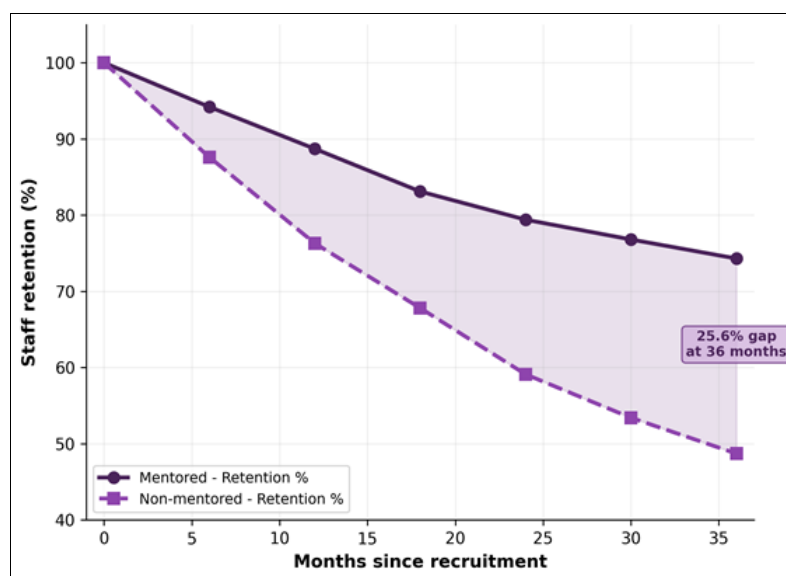


Fig 1: Staff retention trajectories over 36 months by mentorship status (n = 214)

Retention curves diverged sharply between months 6 and 18, with the gap stabilizing thereafter. The shaded area between curves represents the cumulative retention difference attributable to mentorship participation. Cox

regression indicated that non-mentored agents had a hazard ratio of 2.47 (95% CI: 1.63-3.74) for resignation compared to mentored agents.

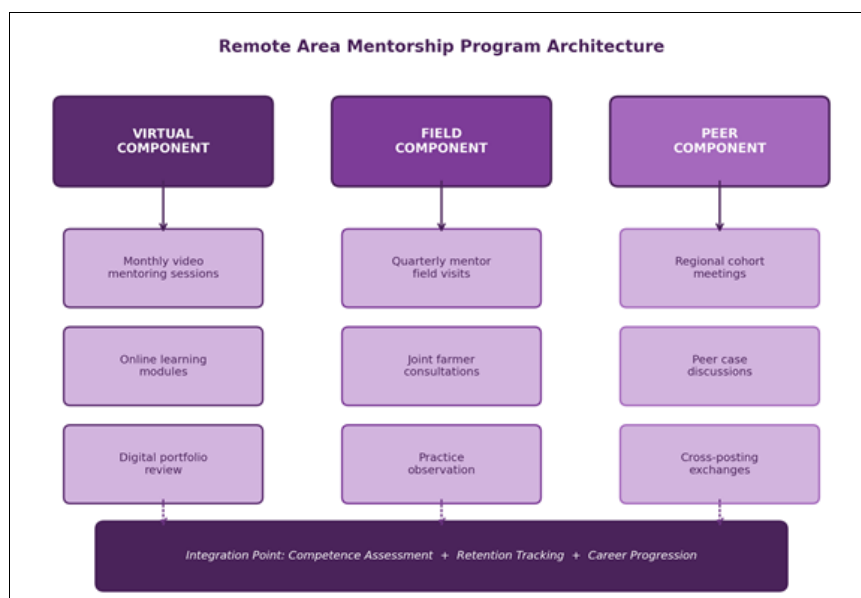


Fig 2: Three-pillar mentorship architecture for remote area extension professionals

The architecture integrates virtual, field-based, and peer components. Virtual mentoring provided accessibility; field visits were most valued for contextual competence; peer meetings addressed isolation through horizontal support networks.

Comprehensive Interpretation

The data show that structured mentorship mitigates the specific disadvantages of remote postings. The strongest effects appeared in isolation perception and community trust, which are difficult to develop through formal training alone. Mentors who had themselves served in remote areas were rated most highly, suggesting experiential matching matters more than seniority in mentor selection.

Discussion

The 25.6 percentage point retention gap represents a substantial organizational return. Calculating against average recruitment costs reported by Central American extension services ^[9], preventing one resignation saves approximately \$8,400 USD, generating positive returns even with modest numbers. These findings align with remote healthcare retention research, where mentorship consistently shows measurable effects ^[10].

Virtual mentoring was accessible but insufficient alone for building field competence. Agents consistently rated quarterly mentor field visits as most impactful, particularly when mentors demonstrated techniques in real community settings ^[11]. This suggests that remote-area mentorship programs cannot rely exclusively on technology-mediated contact; physical presence, even if infrequent, carries disproportionate weight in skill transfer.

Limitations

Non-random assignment to mentorship groups introduces selection bias despite comparable baseline characteristics. The three-country scope limits generalizability to other Latin American or global contexts. Competence assessments relied partly on self-report, which may inflate scores among mentored agents aware of program expectations. The

COVID-19 pandemic disrupted field visit schedules during 2020, potentially attenuating observed effects of the field-based component.

Conclusion

This research demonstrated that structured mentorship programs significantly improved retention, competence, job satisfaction, and community trust among early-career extension agents in remote Central American settings. The three-pillar architecture combining virtual, field-based, and peer support showed that each component contributed differently to professional development, with field visits providing the strongest impact on practical skills. Extension agencies investing in remote area staffing should treat mentorship not as an optional addition but as a core element of deployment strategy, built into budgets and timelines from the point of initial posting.

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