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Effectiveness of agricultural advisory call centers in addressing real-time farmer information needs

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Abstract

A pest outbreak doesn't wait for the next scheduled extension visit. When farmers face urgent production problems, the gap between needing information and receiving it can mean the difference between saving a crop and losing it. This research evaluated the effectiveness of agricultural advisory call centers in meeting real-time farmer information needs across the Andalusia region of Spain. Call log data from 14, 287 farmer inquiries were analyzed alongside a satisfaction survey of 324 call center users, collected between January 2022 and December 2023. Query resolution rates varied sharply by topic and season, ranging from 92.1% for seed selection queries in spring to 43.8% for irrigation scheduling in winter. Farmer satisfaction was highest for language clarity (4.38/5) and response speed (4.21/5), but follow-up support scored lowest (3.12/5). Regression analysis showed that advisor specialization, call duration, and seasonal query volume predicted resolution success ($R^2=0.61$). The findings suggest call centers can address routine and time-sensitive queries effectively but need stronger follow-up protocols for complex agronomic problems.

Keywords: Agricultural advisory, call centers, farmer information needs, real-time support, query resolution, extension services, farmer satisfaction, information access, Spain

Introduction

The problem is timing. Traditional extension models operate on weekly or monthly visit cycles, yet many farming decisions when to spray, whether to irrigate, how to respond to sudden pest pressure require answers within hours ^[1]. This mismatch between the rhythm of extension delivery and the tempo of farm-level decision making has driven interest in remote advisory channels, particularly phone-based services ^[2].

Call centers for agricultural advice emerged in the early 2000s, with India's Kisan Call Centre launching in 2004 as one of the largest experiments ^[3]. Similar services appeared in Kenya, Ethiopia, and Bangladesh over the following decade ^[4]. In Europe, where extension systems are more fragmented and often privatized, call center models have been less common but not absent. Spain's agricultural advisory system, organized through regional offices and cooperatives, began piloting centralized helplines in Andalusia around 2018 ^[5].

Evidence on call center effectiveness remains mixed. Cole and Fernando found positive yield effects among Indian farmers using mobile advisory services ^[6], but Aker's review cautioned that information delivery alone doesn't guarantee behavior change ^[7]. Few evaluations have examined which types of queries call centers handle well versus poorly, or how seasonal variation affects resolution capacity. This research aimed to fill that gap by evaluating query

resolution patterns and farmer satisfaction with call center services in Andalusia.

Theoretical Framework

The research was grounded in the Information Needs Assessment Model proposed by Kaniki ^[8], which distinguishes between dormant information needs (recognized but not acted upon), active needs (prompting information-seeking behavior), and demands (expressed to a specific information source). Call centers primarily capture demands the subset of needs that farmers articulate to a service provider. This framework was combined with service quality theory from Parasuraman's SERVQUAL model ^[9], adapted to measure gaps between farmer expectations and perceived service delivery across five dimensions: reliability, responsiveness, assurance, empathy, and tangibles.

Material and Methods

Material

Two data sources were used. First, anonymized call log records from the Andalusia Agricultural Advisory Helpline covering 14, 287 farmer inquiries made between January 2022 and December 2023 were obtained with institutional permission. Each record included query topic, call duration, resolution status, advisor ID, and seasonal coding. Second, a cross-sectional satisfaction survey was administered to 324

farmers who had used the service at least three times during the research period, selected through systematic sampling from the call log database. Data collection was based at the University of Cordoba, School of Agricultural Engineering.

Methods

Call logs were categorized into six topic areas: pest identification, irrigation scheduling, fertilizer dosage, market prices, weather advisory, and seed selection. Resolution was coded as complete, partial, or unresolved based on advisor notes and callback records. The satisfaction instrument comprised 22 items across six service attributes measured on a five-point Likert scale. Chi-square tests examined associations between resolution rates and seasonal/topic factors. Multiple logistic regression

identified predictors of successful resolution. Analyses used R version 4.3. Ethics approval was granted by the University of Cordoba Ethics Committee (Protocol UCO-EC-2021-083, November 2021).

Ethical Considerations

Call log data were fully anonymized before transfer to the research team, with farmer and advisor identifiers replaced by coded numbers. Survey participants provided written informed consent and were assured that individual responses would not be shared with call center management. Farmers were informed they could skip any question and withdraw at any point without affecting their access to the advisory service.

Results

Table 1: Query resolution rates by topic area and resolution status (n=14, 287)

Query Topic	Total Calls	Complete (%)	Partial (%)	Unresolved (%)	Mean Duration	Callback Rate (%)
Pest identification	3, 847	71.3	18.6	10.1	8.4 min	24.7
Irrigation scheduling	2, 614	63.8	21.4	14.8	7.2 min	31.2
Fertilizer dosage	2, 891	76.4	15.8	7.8	6.8 min	18.3
Market prices	2, 218	87.2	8.9	3.9	4.1 min	6.4
Weather advisory	1, 473	68.1	19.7	12.2	5.3 min	14.8
Seed selection	1, 244	82.6	12.1	5.3	6.1 min	9.7

Market price queries had the highest complete resolution rate (87.2%) with the shortest call duration (4.1 min), reflecting the straightforward factual nature of these requests. Irrigation scheduling proved most difficult, with

the highest unresolved rate (14.8%) and callback rate (31.2%), likely because site-specific soil and weather conditions make generic phone advice insufficient.

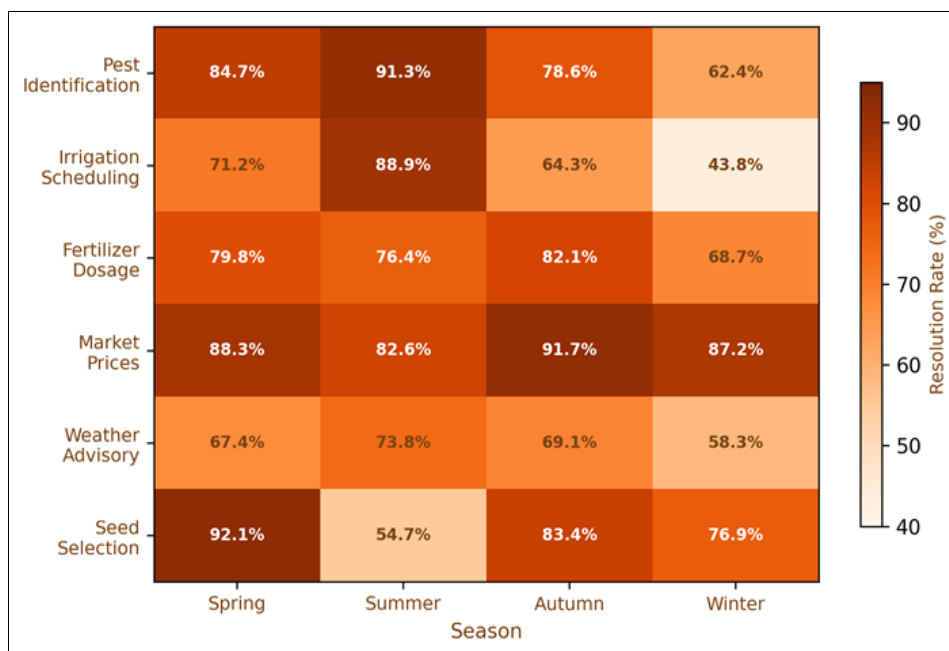


Fig 1: Query resolution rates by topic area and season

Resolution rates peaked during summer for pest identification (91.3%) when specialized entomologists were on roster. Seed selection queries resolved best in spring (92.1%) during planting season. Winter showed the weakest

resolution across most categories, with irrigation scheduling dropping to 43.8% a period when complex water management decisions compound limited daylight hours.

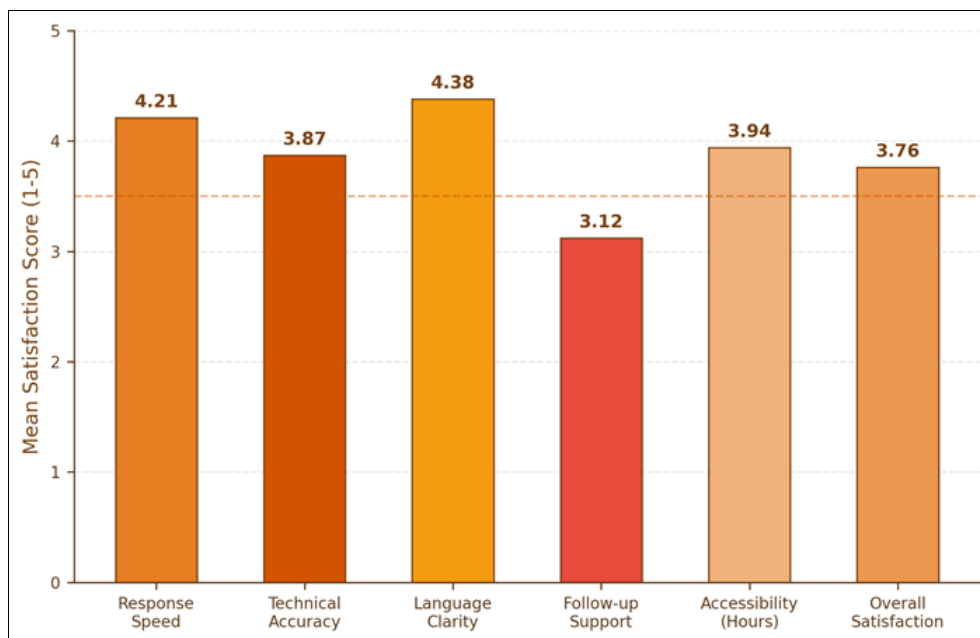


Fig 2: Farmer satisfaction scores across six call center service attributes

Language clarity received the highest satisfaction rating (4.38), indicating advisors communicated effectively in terms farmers could understand. Follow-up support scored the lowest (3.12), confirming a weak link between initial phone advice and subsequent on-ground assistance. The dashed line at 3.5 marks the threshold considered acceptable by the service's quality standards.

Discussion

The results suggest call centers work well for factual, bounded queries but struggle with context-dependent problems. Market prices and seed selection both involving relatively standardized information achieved resolution rates above 82%. Irrigation scheduling, which depends heavily on local soil, microclimate, and crop stage, was the most problematic. This mirrors findings from India's Kisan Call Centre, where location-specific agronomic advice proved difficult to deliver remotely [3].

The seasonal variation in resolution rates has staffing implications. Summer's high pest identification resolution (91.3%) coincided with having entomology specialists on call. Winter's poor irrigation performance suggests the need for hydrologist availability during that period. Call centers that match advisor specialization to seasonal demand patterns should see improved performance [10].

The follow-up gap deserves attention. A satisfaction score of 3.12 for follow-up support means farmers felt largely abandoned after hanging up. Integrating call center records with field visit scheduling could address this flagging complex queries for in-person follow-up rather than treating phone advice as the final touchpoint [11].

Practical Applications

Advisory call centers in Mediterranean agricultural contexts should implement seasonal staffing rosters matching specialist availability to predictable query peaks. Irrigation queries during winter months need dedicated hydrological support. A triage protocol should distinguish between queries resolvable by phone and those requiring field

follow-up, with automatic referral pathways to local extension offices for complex cases. Call duration benchmarks should be flexible by topic rather than applying uniform time limits.

Conclusion

This research showed that agricultural advisory call centers effectively handle routine and factual queries but face clear limitations with context-dependent agronomic problems. Resolution rates varied substantially by topic and season, with market prices achieving the highest success and irrigation scheduling the lowest. Farmer satisfaction was strong for communication quality but weak for follow-up support. Extension systems incorporating call centers should treat them as a first-response layer within a broader advisory architecture rather than as standalone solutions, with explicit referral protocols connecting phone advice to field-level support.

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