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Social media adoption by extension agents for farmer outreach: drivers, barriers, and effectiveness outcomes

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Abstract

Social media platforms have reshaped how information moves through nearly every sector of modern life, yet agricultural extension services across Southern Europe have been slow to integrate these tools into their advisory work. This research examined the factors driving or inhibiting social media adoption among extension agents in Portugal and measured the outreach effects when agents do incorporate digital platforms into their farmer communication. A survey of 142 extension agents across seven agricultural districts was combined with social media activity analysis and follow-up interviews with 86 farming households between February and October 2023. Only 38.7% of agents reported regular professional use of social media platforms. Perceived usefulness ($\beta=0.43$) and institutional support ($\beta=0.34$) emerged as the strongest adoption predictors, while agent age showed a moderate negative association ($r=-0.51$). Agents who actively used social media reached an average of 2.4 times more farming households than non-adopting peers. WhatsApp groups were the most widely used platform (67.3% of adopters), followed by Facebook pages (54.5%) and YouTube channels (21.8%). Farmers receiving extension information through social media reported 26.8% higher information timeliness satisfaction than those relying solely on face-to-face contact. The findings suggest that social media can meaningfully amplify extension reach but requires institutional backing and targeted training to overcome adoption resistance among older agents.

Keywords: Social media, extension agents, digital extension, farmer outreach, technology adoption, WhatsApp, agricultural communication, information dissemination, digital literacy, advisory services

Introduction

Between 2015 and 2023, smartphone ownership among Portuguese farmers rose from roughly 41% to over 78%, fundamentally changing how rural populations access and share information ^[1]. Extension services, however, have been markedly slower to adapt. While farmers scroll through weather forecasts, market prices, and crop management videos on their phones, most extension agents still rely on scheduled farm visits and printed bulletins as their primary communication channels ^[2].

This disconnect reflects a broader pattern across European agricultural advisory systems. Digital tools are widely available but unevenly adopted by the institutional structures responsible for knowledge transfer ^[3]. Some individual agents have embraced social media on their own initiative, creating WhatsApp advisory groups or posting technique videos on YouTube. But these remain isolated experiments rather than coordinated strategies, leaving the extension system as a whole underequipped for a digital farming population ^[4].

Understanding why some agents adopt social media while others resist it and whether adoption actually improves farmer outreach requires examining both individual and institutional factors. Technology acceptance research suggests that perceived usefulness and ease of use drive adoption decisions, but organizational context, management

support, and professional identity also play roles that generic technology models may underestimate ^[5, 6].

This research investigated the drivers and barriers of social media adoption among Portuguese extension agents and measured the outreach and satisfaction effects of digital platform use on farmer engagement with advisory services ^[7].

Material and Methods

Material

The research was conducted across seven agricultural districts in central and southern Portugal: Lisbon, Santarem, Leiria, Evora, Beja, Portalegre, and Faro. These districts span the country's major farming zones from intensive horticultural systems near Lisbon to extensive olive and cork oak landscapes in the Alentejo and irrigated citrus operations in the Algarve. Data were collected between February and October 2023. The University of Lisbon School of Agriculture Ethics Committee approved all protocols (Ref: ISA-EC/2023-032, January 2023). Survey instruments included a 36-item agent questionnaire covering technology use patterns, adoption drivers, barriers, and professional demographics, and a 22-item farmer questionnaire assessing information channel preferences and satisfaction ^[8].

Methods: A total of 142 extension agents completed the survey across the seven districts. Agents were classified as high adopters (regular professional social media use, $n=55$), moderate adopters (occasional use, $n=41$), or low/non-adopters (rare or no use, $n=46$). Social media activity was verified through platform analysis for consenting agents ($n=87$). Follow-up structured interviews with 86 farming households assessed information receipt patterns and satisfaction across communication channels. Adoption

predictors were modeled using hierarchical multiple regression with perceived usefulness, perceived ease of use, institutional support, self-efficacy, and demographic variables as predictors. Outreach effectiveness was compared across adopter categories using independent t-tests and ANOVA. Farmer satisfaction was assessed on a 5-point scale across five information quality dimensions [9, 10].

Results

Table 1: Predictors of social media adoption for professional extension use (hierarchical regression)

Predictor	B	SE	β	t	p	VIF
Perceived usefulness	0.41	0.07	0.43	5.86	<.001	1.28
Institutional support	0.31	0.06	0.34	5.17	<.001	1.19
Perceived ease of use	0.22	0.07	0.24	3.14	.002	1.34
Digital self-efficacy	0.17	0.06	0.19	2.83	.005	1.41
Agent age	-0.24	0.08	-0.22	-3.00	.003	1.16

Model: $R^2=0.534$, Adjusted $R^2=0.517$, $F(5,136)=31.18$, $p<.001$

Perceived usefulness was the strongest adoption driver, followed by institutional support. Agent age showed a negative relationship older agents were less likely to adopt

social media for professional use. The full model explained 53.4% of adoption variance.

Table 2: Outreach and farmer satisfaction outcomes by agent adoption category

Indicator	High adopters	Low/non-adopt	P-value
Farmers reached/month	147.3	61.8	<0.001
Information timeliness (1-5)	4.14	3.26	<0.001
Content relevance (1-5)	3.87	3.72	0.284
Interaction quality (1-5)	3.41	3.94	0.008
Geographic coverage (km ²)	342	186	<0.001

Social media adopters reached 2.4 times more farmers monthly and covered nearly twice the geographic area. However, farmers rated face-to-face interaction quality

higher than digital contact (3.94 vs. 3.41), indicating that social media extends but does not replace the depth of personal advisory relationships.

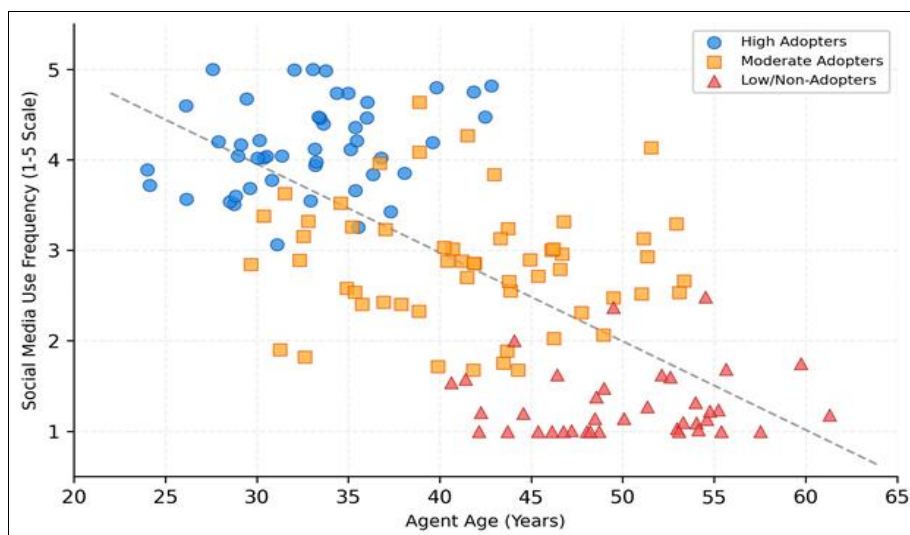


Fig 1: Relationship between agent age and social media use frequency across adoption categories

A clear age gradient separated adoption categories. High adopters clustered in the 25-40 age range, while low/non-adopters concentrated above age 45. The negative trend line ($r=-0.51$) confirms the age-adoption relationship. The pathway traces how perceived usefulness, ease of use, and institutional support feed adoption decisions, which

manifest through specific platform choices, expanding outreach and geographic reach.

Discussion: The 38.7% professional adoption rate among Portuguese extension agents is comparable to figures reported from other Southern European advisory systems but well below the 60-70% rates documented in some Asian

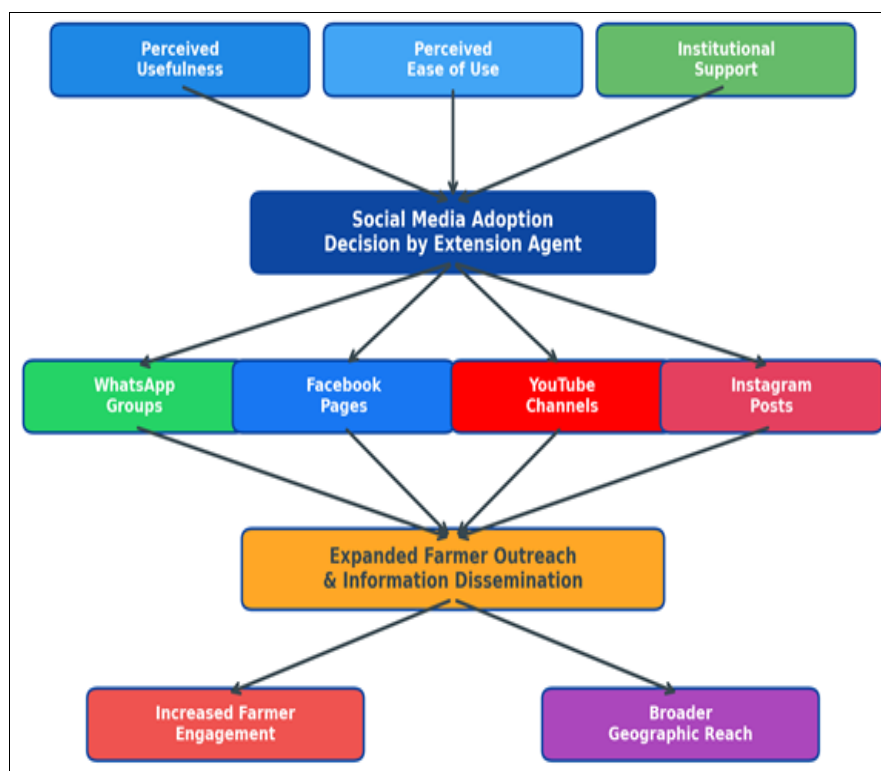


Fig 2: Social media adoption pathway from drivers through platform selection to farmer outreach outcomes

extension contexts where mobile-first strategies have been deliberately promoted^[11, 12]. The dominance of perceived usefulness as an adoption predictor aligns with decades of technology acceptance research, but the strong role of institutional support ($\beta=0.34$) highlights something specific to professional contexts: agents adopt tools that their organizations visibly endorse and resource^[5, 13].

The outreach multiplier effect 2.4 times more farmers reached by adopting agents represents a meaningful efficiency gain that extension systems operating under budget pressure cannot afford to ignore^[14]. But the finding that interaction quality scored higher for face-to-face contact introduces an important nuance. Social media excels at information broadcasting weather alerts, pest warnings, market updates but falls short when farmers need personalized problem-solving or nuanced technical advice^[15, 16].

The age effect warrants careful interpretation. Rather than viewing older agents as resistant, extension managers should recognize that agents trained in an era of farm-visit extension may lack both the technical skills and the professional framework to integrate digital tools into their practice^[17]. Targeted training that demonstrates practical relevance rather than generic digital literacy programs is more likely to shift adoption behavior among experienced agents^[18].

Policy implications

Portuguese agricultural policy should embed digital extension as a funded mandate rather than leaving social media adoption to individual initiative. This means allocating budget for platform management, content creation training, and data connectivity in rural advisory offices. Extension performance metrics should include digital outreach indicators alongside traditional visit counts. EU

Common Agricultural Policy advisory provisions should explicitly recognize digital channels as eligible extension activities to incentivize member state investment^[19, 20].

Future research directions

Three research priorities emerge from these findings. First, longitudinal tracking of how social media adoption evolves within extension organizations as younger agents enter the workforce. Second, randomized controlled trials comparing farmer outcomes between digitally enhanced and traditional-only extension delivery. Third, examination of information quality and misinformation risks when extension content circulates through informal social media sharing beyond the original intended audience^[21].

Conclusions

This research showed that social media adoption among Portuguese extension agents remains modest (38.7%) but produces clear outreach advantages when it occurs. Perceived usefulness and institutional support drive adoption more than individual technical skills, suggesting that organizational commitment matters more than agent training alone. Social media extends reach and improves information timeliness but does not match the interaction depth of face-to-face advisory contact. The practical recommendation is to position social media as a complement that handles information broadcasting efficiently, freeing agent time for the personalized advisory work where human contact remains irreplaceable.

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