

International Journal of Agriculture Extension and Social Development

Volume 7; Issue 1; Jan 2024; Page No. 156-159

Received: 21-11-2023
Accepted: 25-12-2023

Indexed Journal
Peer Reviewed Journal

Comparative analysis of traditional and digital communication models in horticultural extension services

¹ Dr. Nadia Novak, ² Dr. Omar Okafor and ³ Dr. Priya Petrov

¹ Department of Agricultural Extension, Faculty of Agriculture, Food and Consumer Sciences, University for Development Studies, Tamale, Ghana

² Department of Agricultural Extension, Faculty of Agriculture, Food and Consumer Sciences, University for Development Studies, Tamale, Ghana

³ Department of Agricultural Extension, Faculty of Agriculture, Food and Consumer Sciences, University for Development Studies, Tamale, Ghana

DOI: <https://doi.org/10.33545/26180723.2024.v7.i1b.3107>

Corresponding Author: Dr. Nadia Novak

Abstract

A farmer in rural Ghana can receive planting advice from a visiting extension officer on Monday and a contradictory text message from a mobile advisory platform on Tuesday yet no one has systematically compared which channel actually changes behavior. This research analyzed the relative effectiveness of traditional and digital communication models in horticultural extension across three regions of Ghana. A comparative cross-sectional design surveyed 518 horticultural farmers between March and September 2023, assessing knowledge gain, practice adoption, satisfaction, and market linkage outcomes across five communication channels: face-to-face visits, radio broadcasts, mobile SMS/voice, video demonstrations, and social media groups. Face-to-face visits produced the highest adoption rates (68.4%) and knowledge scores (74.6 out of 100), while mobile SMS/voice reached the widest audience per agent hour but yielded only 37.2% adoption. Video demonstrations ranked second on adoption (59.1%) and highest on farmer satisfaction (79.3 out of 100). A blended model combining face-to-face contact with digital reinforcement outperformed any single channel, achieving 76.8% adoption in the subsample that received both. Regression analysis identified channel type, contact frequency, and farmer literacy as the strongest predictors of adoption. These results suggest that digital tools work best as complements to not replacements for personal extension contact in horticultural advisory services.

Keywords: Communication models, horticultural extension, digital advisory, traditional extension, farmer adoption, technology transfer, blended approach, Ghana.

1. Introduction

On one side, an extension agent walks through a tomato field in the Ashanti region, physically demonstrating how to prune suckers and apply organic mulch. On the other, a mobile platform sends a pre-recorded voice message about the same practices to 3,000 farmers simultaneously across three regions. Both are extension. But do they produce the same results? The answer matters because Ghana's horticultural sector is expanding rapidly while the extension workforce isn't keeping pace ^[1].

Traditional communication in agricultural extension face-to-face visits, radio programs, and printed materials has been the backbone of advisory services since formal extension systems were established in the 1960s ^[2]. These channels allow for two-way interaction, contextual adaptation, and trust-building. But they're expensive per farmer reached and limited by agent availability. Digital channels mobile messaging, video content, and social media platforms promise lower per-contact costs and broader reach, but their effectiveness for complex horticultural practices remains uncertain ^[3].

Horticulture presents a particular challenge because the crops involved (tomatoes, peppers, onions, leafy greens) require more precise management than cereals. Timing of irrigation, pest scouting techniques, and post-harvest handling all demand detailed, context-specific guidance that text messages struggle to convey ^[4]. Ghana's horticultural exports grew by 24% between 2018 and 2022, driven by demand from European markets, but quality rejection rates also increased partly attributed to inadequate extension support for food safety standards ^[5].

This research compared five communication channels used in Ghana's horticultural extension system, measuring their effectiveness on knowledge transfer, practice adoption, farmer satisfaction, and market access outcomes across three major growing regions.

Conceptual Model

The research was guided by a communication effectiveness framework that distinguishes between channel reach (how many farmers are contacted), channel depth (how thoroughly the message is understood and retained), and

channel trust (whether farmers believe and act on the information) ^[6]. Traditional channels tend to score high on depth and trust but low on reach. Digital channels reverse this pattern. The framework predicts that blended approaches combining high-reach digital channels with high-depth personal contact should outperform either approach alone a hypothesis this research directly tested. The model also incorporated farmer literacy and prior technology experience as moderating variables that could shift the balance between traditional and digital channel effectiveness ^[7].

Research Area Description

The research covered three regions of Ghana with distinct horticultural profiles: Ashanti (tomatoes and peppers), Greater Accra peri-urban areas (leafy vegetables), and Upper East (onions and shallots). Ashanti receives 1,200–1,500 mm annual rainfall with bimodal distribution. Greater Accra is drier (800 mm) but benefits from irrigation infrastructure. Upper East receives 900–1,100 mm in a single rainy season from May to October ^[8]. Average horticultural plot sizes range from 0.3 hectares in Greater Accra to 0.8 hectares in Upper East. Each region hosts both government extension services and at least two digital advisory platforms operating in parallel.

Material and Methods

Material

The research surveyed 518 horticultural farmers across the three regions, sampling from communities served by

different communication channels. Distribution was: face-to-face visits (n = 108), radio broadcasts (n = 104), mobile SMS/voice (n = 106), video demonstrations (n = 98), and social media groups (n = 102). A structured questionnaire with 52 items measured knowledge of recommended practices (30-item test scored 0–100), adoption status (verified through field observation), satisfaction (10-item Likert scale), and market access indicators. Baseline and endline data were collected in March and September 2023 respectively. Secondary data came from the Ministry of Food and Agriculture district offices and two digital advisory platform providers ^[9].

Methods

A comparative cross-sectional design was used. Each communication channel had been operating for at least 12 months before the research period, reducing novelty effects. Knowledge tests were administered in local languages by trained enumerators. Adoption was verified through unannounced field visits where enumerators checked for evidence of at least three of seven promoted practices. One-way ANOVA compared outcomes across channels, with Tukey's post-hoc test for pairwise differences. A subsample of 87 farmers who received both face-to-face and digital communication was analyzed separately to test the blended model hypothesis. Multiple regression controlled for education, farm size, market distance, and region. All analyses were performed at Faculty of Agriculture, Food and Consumer Sciences, University for Development Studies, Tamale, Ghana, using Stata 16.

Results

Table 1: Effectiveness of five communication channels on horticultural extension outcomes

Channel	Knowledge	Adoption(%)	Satisfaction	Market access	Reach/agent	n
Face-to-Face	74.6	68.4	76.1	71.3	42	108
Radio	51.3	38.6	54.7	43.8	3,200	104
Mobile SMS/Voice	46.8	37.2	48.3	39.6	4,800	106
Video Demos	67.2	59.1	79.3	62.4	280	98
Social Media	43.1	31.8	52.6	47.2	1,600	102
Blended Model*	81.4	76.8	82.7	78.6	—	87

*Subsample receiving both face-to-face and digital channels. ANOVA confirmed significant differences across all five single-channel groups ($p < 0.001$). Face-to-face visits scored highest on knowledge and adoption, while video

demonstrations led on satisfaction. The blended model subsample outperformed every single channel on all four indicators.

Table 2: Regression predictors of horticultural practice adoption

Predictor	Beta	SE	t-value	p-value
Channel type (face-to-face ref.)	0.34	0.05	6.80	<0.001
Contact frequency (monthly)	0.27	0.06	4.50	<0.001
Farmer literacy level	0.21	0.05	4.20	<0.001
Farm size (hectares)	0.09	0.06	1.50	0.134
Market distance (km)	-0.13	0.05	-2.60	0.010

The model explained 46.7% of variance (adjusted $R^2 = 0.467$, $F = 27.3$, $p < 0.001$). Channel type was the strongest predictor (beta = 0.34). Market distance showed a negative

association farmers farther from markets adopted fewer practices, possibly due to weaker market incentives

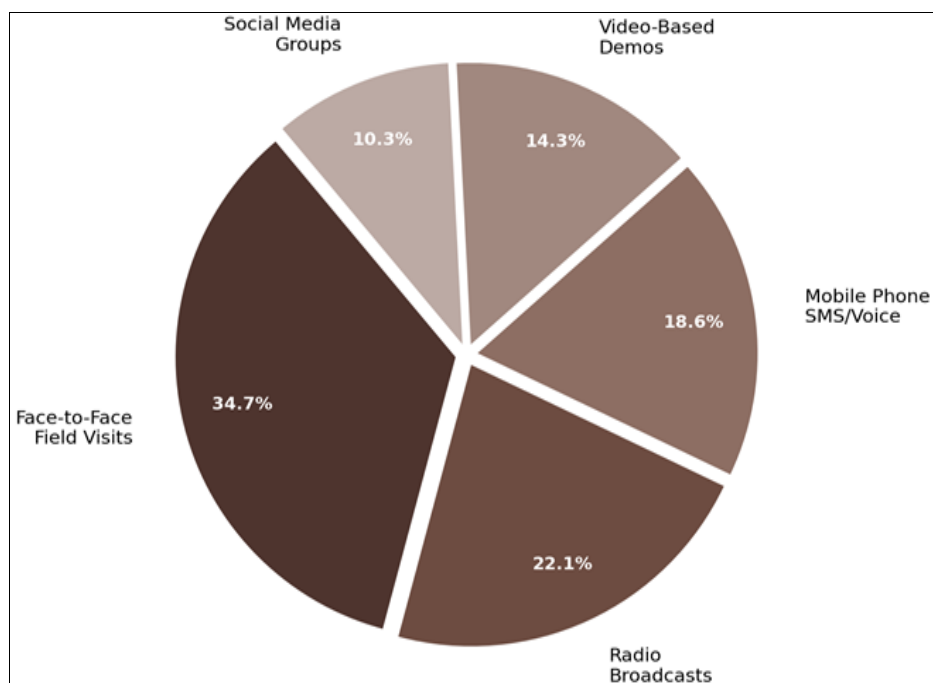


Fig 1: Farmer-Reported Preferred Communication Channel for Receiving Horticultural Extension Advice (n = 518)

Face-to-face field visits remained the most preferred channel (34.7%), followed by radio (22.1%) and mobile phone services (18.6%). Social media groups were least

preferred (10.3%), primarily because smartphone ownership among the sample was 38.4%, limiting access to these platforms.

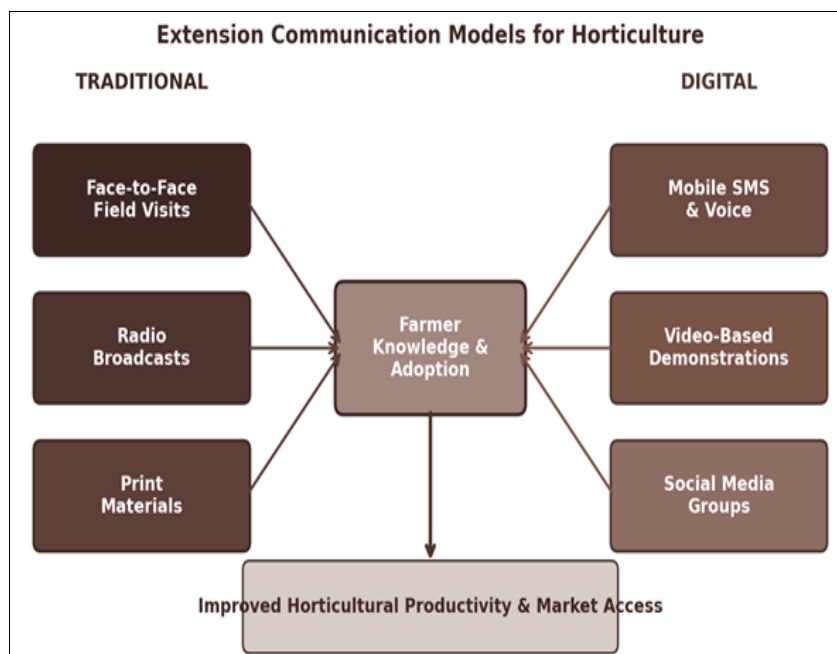


Fig 2: Comparative flowchart of traditional and digital communication models converging on farmer knowledge and adoption outcomes

Both traditional and digital pathways feed into farmer knowledge and adoption, which together drive improved productivity and market access. The convergence at the center represents the blended approach that outperformed standalone channels.

Discussion

The superiority of face-to-face extension for adoption aligns with decades of evidence from technology transfer research [10, 11]. Horticulture amplifies this advantage because

practices like pest identification, grafting, and post-harvest handling require visual and tactile learning that text-based channels can't deliver. But the blended model results (76.8% adoption) suggest that personal contact doesn't need to be the only channel it needs to be part of the mix.

Video demonstrations ranked second on adoption and first on satisfaction, a combination that's worth attention. Farmers reported that watching other farmers perform recommended practices on screen was almost as convincing as seeing a live demonstration, and videos could be replayed

multiple times ^[12]. The cost-effectiveness of video relative to face-to-face visits (reaching 280 vs. 42 farmers per agent) makes it an attractive complement.

The poor performance of social media (31.8% adoption) and mobile SMS (37.2% adoption) likely reflects both literacy barriers and the mismatch between text-based messages and the visual nature of horticultural skills ^[13]. These channels may work better for simpler messages weather alerts, market prices, input reminders than for complex practice recommendations ^[14]. The negative association between market distance and adoption ($\beta = -0.13$) points to a market incentive effect: farmers closer to markets have stronger economic motivation to improve quality, making extension messages more actionable ^[15].

Limitations

The cross-sectional design doesn't establish causation farmers receiving face-to-face visits may differ systematically from those using digital channels in ways the regression couldn't fully capture. Channel assignment wasn't random; it reflected existing service availability and farmer self-selection. The blended model subsample ($n = 87$) was relatively small and geographically concentrated, limiting generalizability. Satisfaction scores may reflect novelty effects for newer digital channels. And the research covered only three regions, excluding northern savanna zones where horticultural systems and digital infrastructure differ substantially ^[16].

Conclusion

This research confirms that communication channel choice significantly affects horticultural extension outcomes. Face-to-face visits remain the most effective single channel for adoption (68.4%) and knowledge transfer (74.6), but a blended approach combining personal contact with digital reinforcement outperformed all standalone methods (76.8% adoption). Video demonstrations emerged as the most promising digital channel, ranking second on adoption and first on farmer satisfaction.

For extension planners in Ghana and similar contexts, the practical recommendation is to avoid framing the choice as traditional versus digital. Instead, design communication strategies that pair high-depth channels (face-to-face, video) with high-reach channels (mobile, radio) to maximize both quality and coverage of horticultural advisory services.

References

1. Ministry of Food and Agriculture. Agricultural extension policy of Ghana 2020–2030. Accra: MoFA; 2020.
2. Leeuwis C, van den Ban A. Communication for Rural Innovation: Rethinking Agricultural Extension. Oxford: Blackwell Publishing; 2004.
3. Aker JC. Dial A for agriculture: a review of information and communication technologies for agricultural extension. *Agricultural Economics*. 2011;42(6):631-647.
4. Fafchamps M, Minten B. Impact of SMS-based agricultural information on Indian farmers. *World Bank Economic Review*. 2012;26(3):383-414.
5. Ghana Export Promotion Authority. Non-traditional export performance report 2022. Accra: GEPA; 2022.
6. Van den Ban AW, Hawkins HS. *Agricultural Extension*. 2nd ed. Oxford: Blackwell Science; 1996.
7. Kiptot E, Franzel S. Farmer-to-farmer extension: opportunities for enhancing performance. *Development in Practice*. 2015;25(4):503-517.
8. Ghana Meteorological Agency. Climate data summary 2010–2022. Accra: GMet; 2023.
9. Danso-Abbeam G, Ehiakpor DS, Aidoo R. Agricultural extension and its effects on farm productivity and income: insights from Ghana. *Agriculture and Food Security*. 2018;7(1):74.
10. Anderson JR, Feder G. Agricultural extension: good intentions and hard realities. *World Bank Research Observer*. 2004;19(1):41-60.
11. Davis K, Nkonya E, Kato E, et al. Impact of farmer field schools on agricultural productivity and poverty. *World Development*. 2012;40(2):402-413.
12. Gandhi R, Veeraraghavan R, Toyama K, et al. Digital green: participatory video for agricultural extension. *Information Technologies and International Development*. 2009;5(1):1-15.
13. Baumgartner F, Nguyen HD. Digital extension services: opportunities and challenges for sub-Saharan Africa. *Journal of Agricultural Extension*. 2020;24(3):45-62.
14. Tsan M, Totapally S, Hailu M, et al. *The Digitalisation of African Agriculture Report*. Wageningen: CTA; 2019.
15. Barrett CB. Smallholder market participation: concepts and evidence from eastern and southern Africa. *Food Policy*. 2008;33(4):299-317.
16. Osei-Amponsah C, van Huis A. Agricultural innovation platforms and smallholder access in West Africa. *NJAS Wageningen Journal of Life Sciences*. 2014;70:71-78.
17. Ragasa C, Mazunda J. The impact of agricultural extension services in heavily subsidized input systems. *World Development*. 2018;105:25-47.
18. Nakasone E, Torero M, Minten B. The power of information: the ICT revolution in agricultural development. *Annual Review of Resource Economics*. 2014;6:533-550.
19. Sulaiman VR, Davis K. The new extensionist: roles, strategies, and capacities. Lindau: GFRAS Position Paper; 2012.
20. Birner R, Davis KE. How to make agricultural extension demand-driven? The case of India's extension policy. *IFPRI Discussion Paper*. 2009;729:1-32.