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Young farmer innovation adoption and digital extension channel preferences: A pilot assessment in the Philippines

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Abstract

The Philippines loses an estimated 1.2 million agricultural workers per decade to urban migration, yet the young farmers who remain show markedly different innovation behaviors than their older counterparts. This pilot research assessed innovation adoption patterns and digital extension channel preferences among 96 young farmers (aged 18-35) compared to 87 older farmers (aged >35) across three provinces in the Calabarzon region from March to September 2022. Young farmers adopted precision farming apps (47.3%) and direct marketing (52.1%) at significantly higher rates than older farmers (12.7% and 24.6%, respectively). Social media groups (mean preference 4.6/5) and video tutorials (4.1/5) were the most preferred extension channels among young farmers. A positive correlation ($r = 0.61$, $p < 0.01$) was found between digital literacy and overall innovation adoption. Logistic regression showed that digital literacy and social media engagement were the strongest predictors of innovation adoption among young farmers. The findings support redesigning extension delivery around digital channels to retain and empower the next generation of Filipino farmers.

Keywords: Young farmers, innovation adoption, digital extension, social media, precision farming, Philippines, extension channels, digital literacy, farmer retention, agricultural innovation

1. Introduction

Every year, the average age of Filipino farmers climbs a little higher. The Philippine Statistics Authority estimates that the median age of farm operators reached 57 in 2020, up from 51 a decade earlier ^[1]. This aging trend threatens long-term food security and rural economic viability. And yet, a minority of young people are choosing to stay in agriculture—often bringing digital skills, market awareness, and a willingness to experiment that set them apart from the previous generation ^[2, 3].

Extension services in the Philippines have been slow to adapt to this shift. Most advisory delivery still relies on face-to-face farm visits and farmer field schools designed around older farmers' schedules and learning preferences ^[4]. Younger farmers, raised with smartphones and social media, often bypass formal extension channels entirely, turning instead to YouTube tutorials, Facebook farming groups, and peer-to-peer messaging for advice ^[5]. Whether these digital channels are effective substitutes for, or complements to, traditional extension remains an open question.

This pilot research assessed how innovation adoption and extension channel preferences differed between young and older farmers in the Calabarzon region of the Philippines. The objectives were: (a) to compare adoption rates for five agricultural innovations between age groups, (b) to measure young farmers' preferences across five extension channels, and (c) to identify the farmer-level factors most predictive of innovation adoption among young farmers ^[6, 7].

Theoretical framework

The research drew on Rogers' Diffusion of Innovations theory, with particular attention to the innovator and early adopter categories that young farmers disproportionately occupy ^[8]. Rogers identifies relative advantage, compatibility, complexity, trialability, and observability as the five attributes shaping adoption decisions. Digital extension channels may accelerate diffusion by enhancing observability (through video content) and reducing perceived complexity (through interactive platforms). The framework was supplemented by the Unified Theory of

Acceptance and Use of Technology (UTAUT), which models technology adoption as a function of performance expectancy, effort expectancy, social influence, and facilitating conditions ^[9].

Pilot research

This investigation was designed as a pilot to test measurement instruments and preliminary hypotheses before a planned multi-region assessment across Luzon and Visayas. The combined sample of 183 farmers (96 young, 87 older) was sufficient for the planned comparative and regression analyses while remaining feasible within a single research team's capacity ^[10]. Findings from this phase informed revisions to the digital literacy scale and helped calibrate the innovation adoption checklist for local farming systems. The pilot also assessed response rates and survey completion times for the target population.

Material and methods

Material

A cross-sectional survey was administered to 183 farmers across Laguna, Batangas, and Quezon provinces from March to September 2022. Young farmers (≤ 35 years, $n =$

96) and older farmers (>35 years, $n = 87$) were recruited through municipal agriculture offices and farmer organization registries. The questionnaire measured adoption of five innovations (precision farming apps, drip irrigation, organic certification, direct marketing, solar drying), extension channel preference and usage (5-point scale), a 10-item digital literacy index (Cronbach's $\alpha = 0.82$), and demographic variables. Ethical approval was obtained from the University of the Philippines Los Baños Research Ethics Board (Protocol UPLB-REB/2022-014, dated February 7, 2022) ^[11].

Methods

Chi-square tests compared adoption rates between age groups for each innovation. Independent t-tests compared channel preference scores. Pearson correlation measured the association between digital literacy and overall innovation adoption. Binary logistic regression modeled any-innovation adoption among young farmers as a function of digital literacy, social media engagement, education, farm size, and household income. Data were analyzed using SPSS version 26 ^[12].

Results

Table 1: Innovation adoption rates by age group ($n = 183$)

Innovation	Young ≤ 35 ($n=96$)	Older >35 ($n=87$)	χ^2	p-value	Phi
Precision farming apps	47.3%	12.7%	24.81	$<0.001^{**}$	0.37
Drip irrigation	34.8%	28.3%	0.87	0.351	0.07
Organic certification	28.6%	21.4%	1.22	0.269	0.08
Direct marketing	52.1%	24.6%	14.28	$<0.001^{**}$	0.28
Solar drying	31.4%	27.8%	0.28	0.597	0.04

$^{**}p<0.01$. Young farmers significantly outpaced older farmers on digital-dependent innovations (apps, direct marketing) but showed similar rates for infrastructure-based innovations (drip irrigation, solar drying)

Table 2: Logistic regression predictors of any-innovation adoption among young farmers ($n = 96$)

Predictor	B	S.E.	Wald	Sig.	Exp(B)	95% CI
Digital literacy index	0.843	0.214	15.51	$<0.001^{**}$	2.32	1.53-3.52
Social media engagement	0.612	0.198	9.56	0.002^{**}	1.84	1.25-2.72
Education (years)	0.174	0.089	3.82	0.051	1.19	1.00-1.42
Farm size (ha)	0.098	0.112	0.77	0.381	1.10	0.88-1.38
Household income	0.231	0.104	4.93	0.026^*	1.26	1.03-1.54

$^*p<0.05$; $^{**}p<0.01$. Nagelkerke $R^2 = 0.418$. Digital literacy was the strongest predictor, followed by social media engagement

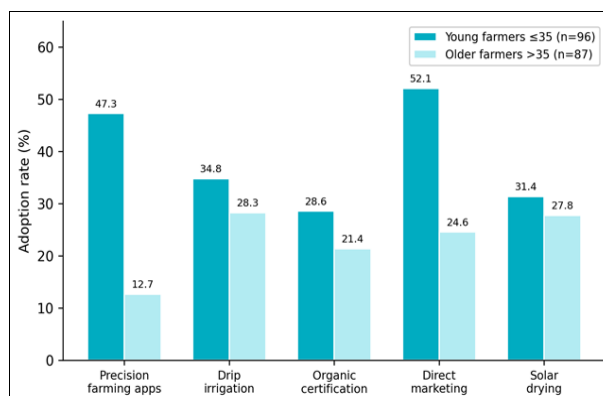


Fig 1: Innovation adoption rates among young farmers (≤ 35) and older farmers (>35) across five agricultural innovations

The largest age-group gaps appeared in digitally-mediated innovations-precision farming apps and direct marketing-

where young farmers led by 35 and 28 percentage points respectively.

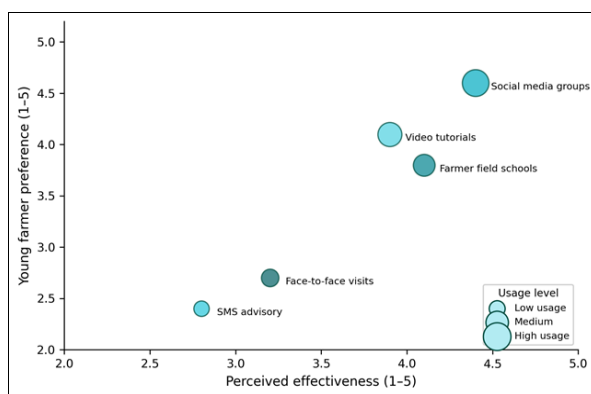


Fig 2: Young farmer extension channel preferences plotted against perceived effectiveness, with bubble size indicating usage level

Social media groups scored highest on both preference and usage, while traditional face-to-face visits and SMS advisory fell in the lower-left quadrant. Video tutorials

occupied an intermediate position with high preference but moderate current usage.

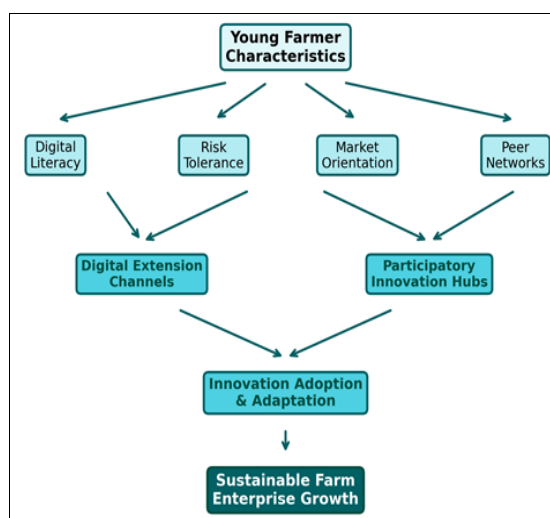


Fig 3: Proposed pathway from young farmer characteristics through digital extension channels and innovation hubs to sustainable farm enterprise growth

Four young farmer characteristics—digital literacy, risk tolerance, market orientation, and peer networks—feed into digital extension channels and participatory innovation hubs, which jointly drive innovation adoption and farm enterprise growth.

Comprehensive interpretation

Young farmers' innovation advantage was concentrated in digital and market-oriented innovations rather than infrastructure-based ones, suggesting that their edge comes from information access and market connectivity rather than capital investment capacity.

Discussion

The sharp age-group gap in precision farming app adoption (47.3% vs. 12.7%) mirrors patterns observed in similar assessments in India and Kenya, where smartphone-based tools are adopted almost exclusively by younger cohorts^[13, 14]. The near-parity on drip irrigation and solar drying suggests that when innovations require physical infrastructure and capital rather than digital skills, age becomes less relevant. This distinction matters for extension

design: digital innovations may need different delivery channels than hardware-based ones.

The strong preference for social media groups among young farmers challenges the conventional extension model built around scheduled visits and group meetings. Young farmers in this sample were already learning from Facebook groups and YouTube channels before any formal extension contact occurred^[15]. Rather than competing with these channels, extension services could integrate them—posting verified agronomic content on platforms where young farmers already congregate. The logistic regression results reinforce this point: digital literacy and social media engagement, not education or farm size, were the strongest adoption predictors^[16, 17]. Extension agencies that invest in digital content creation and platform-based advisory are likely to reach young farmers more effectively than those relying solely on traditional methods.

Limitations

This pilot was restricted to three provinces in the Calabarzon region, limiting generalizability to other Philippine agricultural zones with different crop profiles and

connectivity conditions. The sample of 183 farmers, while adequate for the planned analyses, does not support subgroup analyses by province or crop type. The cross-sectional design cannot establish whether digital literacy causes innovation adoption or whether innovative farmers seek out digital tools. Self-reported adoption and preference data may be subject to recall and social desirability biases. A larger multi-region longitudinal follow-up is planned ^[18].

Conclusion

This pilot research shows that young Filipino farmers adopt agricultural innovations at significantly higher rates than older farmers, particularly for digitally-mediated and market-oriented innovations. Social media groups and video tutorials were the most preferred and used extension channels among young farmers, while traditional face-to-face delivery ranked lowest. Digital literacy was the single strongest predictor of innovation adoption, underscoring the importance of building digital skills alongside agronomic knowledge.

Extension agencies in the Philippines should invest in digital content strategies that meet young farmers on the platforms they already use. Integrating verified agricultural advice into social media groups, developing short-form video tutorials, and training extension agents in digital communication could help retain young people in agriculture by making the profession feel modern and connected rather than traditional and isolated ^[19, 20].

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Contributions not qualifying for authorship

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