Factors Influencing Farmers' Adoption of Digital Extension Services in Kibanggay, Lantapan, Bukidnon, Philippines

Cherry Mae B. Guay, Jennifer C. Esteban, Maryjoy S. Bacus, Anecil S. Quijano-Pagutayao

Davao Oriental State University-Cateel Campus, Cateel Davao Oriental, 8205, Manupali Agri-Development Corporation, Valencia City Bukidnon, Central Mindanao University, Musuan, Maramag, Bukidnon

DOI: https://dx.doi.org/10.47772/IJRISS.2025.905000278

Received: 04 May 2025; Accepted: 09 May 2025; Published: 11 June 2025

ABSTRACT

Digital technologies are becoming widely used in all countries yet the adoption among farmers remains limited hindering the improvement in agricultural productivity and sustainability. This study implores to investigate the factors that influence the adoption of digital extension services among farmers in Kibanggay, Lantapan, Bukidnon, Philippines. It utilized descriptive-correlational design, data were collected through surveys assessing the respondent on influencing factors such technological, socio-economic, institutional and behavioral. The results indicate that behavioral and psychological factors along with technological readiness and institutional support, significantly affect adoption levels. The study concludes that enhancing farmers engagement and support mechanisms is vital for improving the uptake of digital extension services.

Keywords: digital extension services, technology, farmers, technological factors, socio-economic factors

INTRODUCTION

Agricultural extension services have their pivotal role in bridging the gap of information and practices that would be transferred to the farmers to increase farm productivity and, at the same time, reduce operational costs (Mapiye et al., 2020). In Malawi, the study conducted by Chidimbah Munthali et al. Al et al. (2025) reveal that digital farm technologies have been introduced to farmers, yet they are still low in agricultural production. According to Meemken and Bellemare (2020), smallholder farmers often have low productivity and face different agricultural market issues like a lack of information on the time needed, inaccessible technologies, and unavailable financial services. Digital extension services boost agricultural productivity, which contributes to food security in the world. With the help of digital extension services, we can provide better recommendations for farmers' practices and decision-making (Gow et al. 2020; Klerkx, Jakku, and Labarthe 2022; McCampbell et al. 2021). The study conducted in the Philippines shows that one of the concerns hindering digital extension services to the farmers is the farmers' attitudes, subjective norms, and the update toward digital services (Le Thi Hoa Sen et al., 2024). There are many studies that digital extension services offer a lot of opportunities in the agricultural sectors, which is more cost-effective (Naika et al., 2021) supported by Fabregas (2022). Thus, this study aims to measure the level of factors that influence the adoption of digital extension services of farmers in Kibanggay, Lantapan, Bukidnon, Philippines

LITERATURE REVIEW

Digital extension services play significant role in agricultural extension in a way of providing farmers with accessible, timely and relevant information. According to Naika et.al (2021) these services support farmers by improving productivity, enabling public-private partnerships, and expanding access to digital advisory platforms. The integration of digital tools—such as mobile apps, web platforms, and ICT technologies—enhances transparency, accessibility, and decision-making in farming systems (FAO, 2021a). Kansiime et al. (2022) highlight the cost-effectiveness of digital tools in promoting new technologies in remote areas. Aker

(2011) notes that advanced technologies like improved seeds and fertilizers can increase yields, but information gaps often hinder their adoption. ICT-based services aim to bridge these gaps using widespread mobile networks, offering services through voice, text, internet, and mobile money platforms. Singh et al. (2023) emphasize that digital tools have transformed how farmers receive information quickly and efficiently. Meanwhile, Rajkhowa and Qaim argue that digital extension must be tailored to farmers' needs to increase adoption rates effectively.

Hypotheses

HO_1: There is no significant difference in technological, socio-economic, Institutional and Policy Support, Behavioral and Psychological Factors analyzed according to demographic profile.

HO_2: there is no significant relationship between technological, socio-economic Institutional and Policy Support, Behavioral and Psychological Factors and adoption extension services of farmers in Kibanggay, Lantapan, Bukidnon.

METHODOLOGY

The study utilized descriptive-correlation design to examine the relationship between different factors of digital extension services. The research was conducted in Kibanggay, Lantapan Bukidnoon, Phillippines selected according to relevance and accessibility of the researchers to the respondents. Respondents were registered farmers in the Department of Agriculture. And utilized purposive sampling, ensured that all eligible farmers were included based on the criteria on the selection processed. Data collection was done through self-administered survey questionnaires, adapted and modified from Bontsa et al. (2023), covering technological, socio-economic, institutional, behavioral factors, and adoption levels has the reliability test of .83 to .87. The statistical tools used were mean, standard deviation and pearson r. Mean were used to assess the level of influencing factors and pearson r which determine the relationship between the influencing factors and the adoption of digital extension services. The study were conducted thru kobotoolbox which the respondents utilized cellphone to answer the questions.

RESULTS AND DISCUSSION

The study assessed the four major factors influencing the adoption of digital extension service among farmers in Kibanggay, Bukidnoon and found that all factors were rated high in terms of their influence. Technological factors have mean average of 3.88 means that technology greatly help in the adoption of the digital services. Venkatesh et al. (2003); it shows that the successful adoption of technological extension services by the farmers depends on the facility condition of the farmers that affects their willingness to adopt the said technology. Furthermore, digital technologies offer good opportunities to the farmers, such as an increase in production and even in market access; however, there are risks that can be faced by the farmers if the said technology is not supported properly, especially to the rural population, according to Briones et al. (2023). Another factor was socio-economic factor has mean average of 3.95, therefore it indicates that income, educational level perceives socio-economic factors to significantly influence the adoption of digital extension services. The findings of the study are supported by Makwin et al. (2024) emphasis on the fact that education and farming experience are determinants in the use of information and communication technologies in accessing agricultural information.

Institutional and policy support has average score of 3.77 this means that government policies, extension services, and institutional support systems were positively associated with farmers' use of digital platforms, emphasizing the role of structured programs and resources. The Food and Agriculture Organization emphasized that strengthening digital agricultural extension and advisory requires collaborative effort among key actors to bridge supply and demand gaps (FAO, 2023). Behavioral and Psychological Factors (Mean = 3.78, High): Farmers' motivation, openness to technology, and confidence in digital tools strongly affected adoption decisions. The theory of planned behavior has been applied to understand farmers adoption decisions (Ajzen, 1991). It is shown that social-psychological constructs significantly influence farmer's intentions to adopt new agricultural technologies (Sun et al., 2022).

Table 1: Level of Factor influencing the adoption of digital extension services.

Factors	Mean	Std. Deviation	Interpretation
Technological factor	3.88	0.95	High
Socio-economic factor	3.95	0.93	High
Institutional and policy support	3.77	1.02	High
Behavioral and psychological factor	3.77	0.94	High

In the correlation result, technological factor, socio-economic factor, institutional and policy support, behavioral and psychological shows strong, positive and statistically significant relationship with the adoption of digital extension services. This indicate that improvement in any of the factors significantly enhance the digital serviced adoption among farmers.

Table 2: Pearson Coefficient Result on factors influencing adoption of digital extension services.

Indicators	Pearson correlation
Technological Factors	.794**
Socio-Economic Factors	.713**
Institutional And Policy Support	.800**
Behavioral And Psychological Factors	.800**

CONCLUSION

This study concludes that farmers in Kibanggay, Lantapan, Bukidnon exhibit a high level of adoption of digital extension services, driven by technological readiness, socio-economic factors, institutional support, and behavioral and psychological openness. These findings underscore that adoption is not solely about access to technology, but also about the farmers' ability, motivation, and environment that supports digital innovation. Ultimately, improving these factors can enhance agricultural productivity, streamline farming practices, and empower rural communities toward more sustainable and informed farming systems.

Practical Implication

The findings of the study highlight that adoption of digital extension services among farmers is shaped by interrelated factors. To strengthen the adoption of digital extension services. This is practical strategies in improving digital infrastructure, strengthen digital literacy program, strengthen institutional and financial support and established monitoring and evaluation

REFERENCES

1. Abdulai, A.-R., KC, K. B., & Fraser, E. (2023). What factors influence the likelihood of rural farmer participation in digital agricultural services? Experience from smallholder digitalization in Northern Ghana. Progress in Development Studies. https://doi.org/10.1177/00307270221144641SAGE Journals
2. Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T
3. Aker, J.C. (2011). Dial “A” for agriculture: a review of information and communication technologies for agricultural extension in developing countries. https://doi.org/10.1111/j.1574-0862.2011.00545
4. Bontsa, N. V., Mushunje, A., & Ngarava, S. (2023). Factors Influencing the Perceptions of Smallholder Farmers towards Adoption of Digital Technologies in Eastern Cape Province, South Africa. Agriculture, 13(8), 1471. https://doi.org/10.3390/agriculture1308147
5. Briones, R. M., Galang, I. M. R., & Latigar, J. S. (2023). Transforming Philippine Agri-Food Systems with Digital Technology: Extent, Prospects, and Inclusiveness. Philippine Institute for Development

Studies. https://doi.org/10.62986/dp2023.29
6. Briones, R. M., Galang, I. M. R., & Latigar, J. S. (2023). Transforming Philippine agri-food systems with digital technology: Extent, prospects, and inclusiveness. Philippine Institute for Development Studies. https://doi.org/10.62986/dp2023.29Cooperative Development Authority+2
7. Chidimbah Munthali, G. N., Puming, H., Banda, L. O., & Ngulube, P. S. (2025). Diversities of conservation agriculture technologies being adopted by rural farmers in sub-Saharan Africa region: A case study from Vibangalala extension planning area, Mzimba District, Malawi. Frontiers in Sustainable Food Systems, 9, 1529846. https://doi.org/10.3389/fsufs.2025.1529846
8. DOI: 10.9734/AJAEES/2023/v41i92127
9. Fabregas, R. (2022). Digital Agricultural Extension for Development (pp. 187–219). Springer eBooks. https://doi.org/10.1007/978-3-030-86065-3_8
10. FAO. (2021a). Empowering smallholder farmers to access digital agricultural extension and advisory services: Food and Agriculture Organization of the United Nations
11. FAO. (2023). Strengthening digital agricultural extension and advisory services in smallholder farming. Rome. https://doi.org/10.4060/cc6267en
12. FAO. (2023). Strengthening digital agricultural extension and advisory services in smallholder farming. Rome. https://doi.org/10.4060/cc6267en
13. Gow et al. 2020; Klerkx, Jakku, and Labarthe 2022; McCampbell et al. 2021 **Analysis of the factors influencing the adoption of digital extension services: evidence from the RiceAdvice application in Nigeria** https://doi.org/10.1080/1389224X.2023.2222109
14. Idris, N. D. M., et al. (2024). Factors affecting behavioral intentions of farmers in Southeast Asia to technology adoption: A systematic review analysis. Journal of Cleaner Production, 39094416. https://doi.org/10.1016/j.jclepro.2024.139416PubMed
15. Kansiime, M. K., Mugambi, I., Rware, H., Alokit, C., Aliamo, C., Zhang, F., Romney, D. (2022). Challenges and Capacity Gaps in Smallholder Access to Digital Extension and Advisory Services in Kenya and Uganda. Frontiers of Agricultural Science and Engineering 9(4), 642-654. Doi: https://doi.org/10.15302/J-FASE-2021423
16. Le Thi Hoa Sen, Phanith Chou, Flordeliz B. Dacuyan, Ylva Nyberg, Johanna Wetterlind 2024 Barriers and enablers of digital extension services' adoption among smallholder farmers: the case of Cambodia, the Philippines and Vietnam. https://doi.org/10.1080/14735903.2024.2368351
17. Makwin, M. F., Bako, S. A., Selzing, P. M., & Dalla, A. A. (2024). Socio-Economic Factors Influencing the Use of Information and Communication Technology for Accessing Agricultural Information among Cowpea Farmers in Alkaleri Local Government Area of Bauchi State, Nigeria. Journal of Applied Sciences and Environmental Management, 28(5). https://www.ajol.info/index.php/jasem/article/view/270867African Journals Online
18. Mapiye, O., Makombe, G., Molotsi, A., Dzama, K., & Mapiye, C. (2020). Towards a Revolutionized Agricultural Extension System for the Sustainability of Smallholder Livestock Production in Developing Countries: The Potential Role of ICTs. Sustainability, 13(11), 5868. https://doi.org/10.3390/su13115868
19. McFadden, J., Casalini, F., & Antón, J. (2022). Policies to bolster trust in agricultural digitalisation: Issues note (OECD Food, Agriculture and Fisheries Papers, No. 175). OECD Publishing. https://doi.org/10.1787/5a89a749-enOECD+1OECD+1
20. Meemken, E., & Bellemare, M. F. (2020). Smallholder farmers and contract farming in developing countries. Proceedings of the National Academy of Sciences, 117(1), 259-264. https://doi.org/10.1073/pnas.1909501116
21. Mishra, R., et al. (2024). Technology in farming: Unleashing farmers' behavioral intention for the adoption of agriculture 5.0. Computers in Human Behavior, 39172798. https://doi.org/10.1016/j.chb.2024.107598
22. Mohammed, N. (2024). Socio-Economic Variables Influencing the Use of Information and Communication Technologies (ICTs) in Agricultural Extension Service Delivery Among Farmers in Yobe State, Nigeria. Asian Journal of Research in Agriculture and Forestry, 10(2), 102–118. https://doi.org/10.9734/ajraf/2024/v10i2290journalajraf.com
23. Naika, M. B. N., Kudari, M., Devi, M. S., Sadhu, D. S., & Sunagar, S. (2021). Chapter 8 - Digital extension service: quick way to deliver agricultural information to the farmers. In C. M. Galanakis

(Ed.), Food Technology Disruptions (pp. 285-323). Galanakis: Academic Press.

24. Naika, M. B., Kudari, M., Devi, M. S., Sadhu, D. S., & Sunagar, S. (2020). Digital extension service: Quick way to deliver agricultural information to the farmers. Food Technology Disruptions, 285-323. https://doi.org/10.1016/B978-0-12-821470-1.00006-9

25. Oliveira, T. M., et al. (2023). Analysis of the factors influencing the adoption of digital extension technologies by farmers. The Journal of Agricultural Education and Extension, 29(3), 1–15. https://doi.org/10.1080/1389224X.2023.2222109
26. Singh, N. K., et al. (2023). Impact of digital technologies in agricultural extension. Asian Journal of Agriculture Extension, Economics & Sociology, 41(9), 963-970.
27. Sun, Y., et al. (2022). Drivers of farmers' intention to use the digital agricultural management system: Integrating theory of planned behavior and behavioral economics. Frontiers in Psychology, 13, 901169. https://doi.org/10.3389/fpsyg.2022.901169
28. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.
29. Zhang, Y., Li, Y., Chen, H., & Wang, X. (2024). Digital extension and farmers' adoption of climate adaptation technology: An empirical analysis of Chinahttps://doi.org/10.1016/j.landusepol.2024.107220