Natural Resources for Human Health
eISSN: 2583-1194

Original Research

Received 22 May 2026
Revised 26 June 2026
Accepted 22 July 2026

Natural Resources for Human Health 2026, Vol. 6 (8s): 239–247

KEYWORDS:
credit access, chili farming, mobile phone, revenue, smallholder farmers.

The Role of Mobile Phone Use and Credit Access in Enhancing Chili Farmers' Income in Magelang Regency, Central Java, Indonesia

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ABSTRACT: This study aimed to evaluate the impact of mobile phone usage and access to credit on the revenue of chili farmers in India. The research was conducted in Magelang Regency, where 200 chili farmers were surveyed using structured questionnaires. The independent variables included age, gender, educational background, farming experience, land weight, seed number, fertilizer number, pesticide number (liter), pesticide number (kg), day female work (WH), day of male work (WH), mobile phone usage, credit access, total cost (IDR), chili production (kg), chili price (IDR/kg). The dependent variable was the revenue derived from the chili farming. Multiple linear regression analysis was employed to achieve the research objective. The results indicate that age, gender, educational background, farming experience, land weight, seed number, pesticide number (liter), day female work (WH), credit access, has no/significant effect on revenue. However fertilizer number, pesticide number (kg), day of male work (WH), mobile phone usagetotal cost (IDR), chili production (kg), chili price (IDR/kg) had a significant influence on revenue ($p < 0.05$). On average, the chili farmers in the study kept approximately 1722.05 kg of chili per one cultivated season (6 months), generating a one season revenue of IDR 61,513,500. The findings highlight that mobile phone usage have a significant positive and negative impact on chili farming revenue, but credit not have impact on revenue. Mobile phones enhance market access, facilitate communication, and improve farm management efficiency. This study suggests that expanding access to KUR and implementing digital literacy initiatives could further augment these positive effects.

1. INTRODUCTION

Chili is an important commodity in Indonesia [1]. This study aimed to investigate the impact of mobile phone use and credit access on chili farmers' income. Developing countries have used mobile phones to improve agricultural production and marketing [2], [3], [4], [5]. Mobile phones contribute to lowering production costs and increasing access to market information. Research conducted in Muzaffargarh district, Punjab, revealed that 87.20% of farmers use mobile phones to gain agricultural insights and market condition information [6]. Agricultural credit is crucial for modernizing farming activities and increasing agricultural sales. Digital finance significantly increases the adoption of sustainable agricultural practies by reducing financial barriers and inproving access to information [7], [8].

Credit plays a important role in agriculture by facilitating the purchase of inputs and supporting invesrment development [9], [10]. The Indonesian government's strategy for enhancing the macroeconomic sector includes implementing the Kredit Usaha Rakyat (KUR) program, which offers an annual interest rate of 3%–6%. Figure 1 illustrates the KUR statistical data from 2022 to 2024. Since 2022, there has been a significant increase in the KUR, suggesting that farmers have been able to access this program to strengthen their businesses. [11] indicated a positive link between the KUR and both technical efficiency and productivity. A previous study also observed a consistent annual increase in KUR numbers. As depicted in Figure 1, the KUR figures in Central Java Province have decreased from IDR 55.27 trillion in 2022 to IDR 41.92 trillion in 2024.

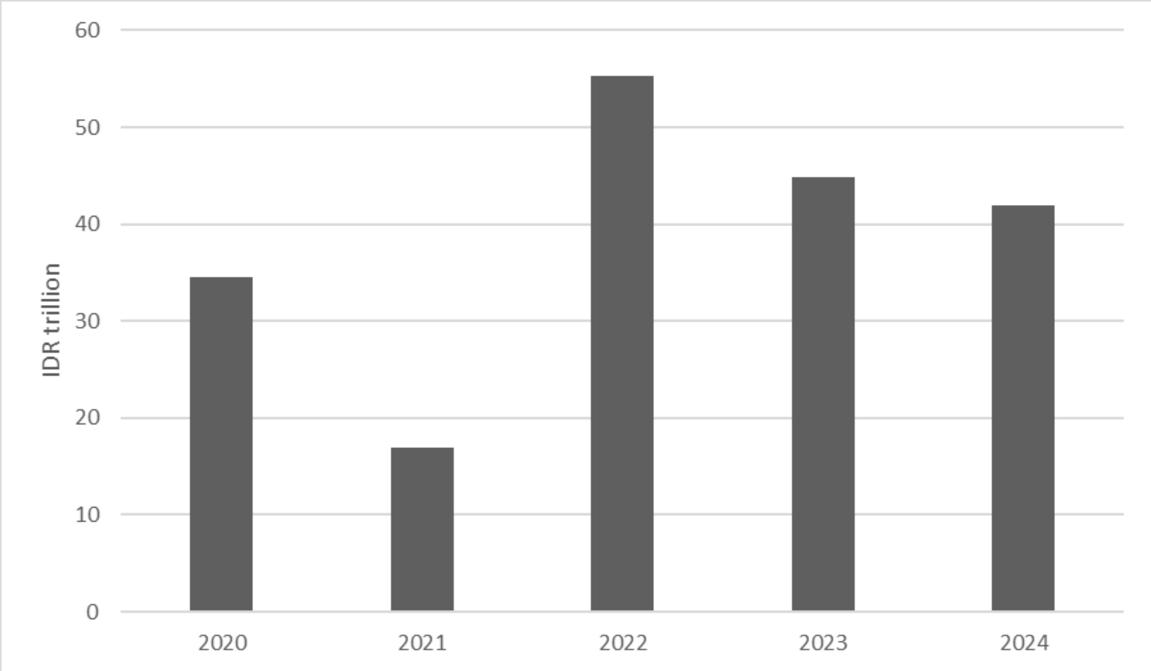

Figure 1. Kredit Usaha Rakyat (KUR) 2020-2024 in Central Java Province [12].

Several studies have examined the impact of agricultural credit on income, management strategies, and productivity [13], [14], [15], [16], [17], [18]. This study investigates the impact of mobile phone use and credit access on the income of chili farmers in Central Java, Indonesia. Indonesia's agricultural sector is a major contributor to food security and economic growth. In Central Java, Magelang Regency is a major center for chili production, a crucial subsector that supports the local economy. However, smallholder farmers often face obstacles such as limited market access, high farming costs, and inadequate financial assistance, limiting their overall potential.

The adoption of mobile phone technology in agriculture is crucial for modernizing agricultural practices and advancing rural development. Mobile phones are one of the information and communication technologies (ICT) that have facilitated communication between farmers and extension workers, thereby increasing access to agricultural information effectively and efficiently [19], [20], [21], [22]. Agricultural credit is crucial for increasing farm productivity. Research shows that access to credit enables farmers to invest in inputs and technology, thereby improving performance and yields [16], [23], [24]. The KUR program in Indonesia has played a significant role in providing loans to smallholder farmers. This program demonstrates the potential and positive impact of combining mobile phone use and credit access on farmer incomes, particularly in chili cultivation, but has not been extensively studied.

This study examines the impact of mobile phone use and credit access on the income of chili farmers in Magelang Regency. By analyzing this relationship, the research provides valuable insights into how digital technology and financial services can be combined to improve farmer productivity and income.

2. MATERIALS AND METHODS

2.1 Location Site

This research was conducted in Magelang Regency, Central Java, Indonesia. A sample of 200 chili farmers was selected using a stratified random sampling technique, categorized based on their farming scale (small, medium, and large), to ensure a representative sample.

2.2 Statistical Analysis

In this study, multiple linear regression data analysis was used to investigate the relationship between independent and dependent variables. Prior to conducting the regression analysis, normality tests and classical assumptions such as multicollinearity and heteroscedasticity were performed. The Kolmogorov-Smirnov test was used to assess normality.

Multicollinearity was assessed using the variance inflation factor (VIF), and heteroscedasticity was tested using a scatterplot test [25]. The regression formula is presented below, with the variables detailed in Table 1.

$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \beta_{12}X_{12} + \beta_{13}X_{13} + \beta_{14}X_{14} + \beta_{15}X_{15} + \beta_{16}X_{16} + \epsilon$

Where;

Y = Revenue from chili farming (IDR per month)

X_1 = Age of farmer (years)

X_2 = Gender (dummy variable: 0 = female, 1 = male)

X_3 = Education Background (categorical: 0 = no school, 1 = elementary, 2 = junior high school, 3 = senior high school, 4 = undergraduate/diploma)

X_4 = Farming Experience (years)

X_5 = Land weight (Ha)

X_6 = Seed number (heads)

X_7 = Pesticide number (liter)

X_8 = Pesticide number (kg)

X_{10} = Day of female work (WH)

X_{11} = Day of male work (WH)

X_{12} = Mobile phone (dummy variables 1= use 0= not use)

X_{13} = Credit access (dummy variables 1= have 0= not have)

X_{14} = Total cost (IDR)

X_{15} = Production (kg)

X_{16} = Chili Price (IDR/kg)

α = Contant

β = Regression coefficient

ϵ = Error

The results of the multiple linear regression analysis provide in-depth insights into the factors influencing duck farm income. The research hypotheses are formulated as follows: H0 = mobile phone use and access to KUR credit do not affect income, while H1 = mobile phone use and access to KUR credit do affect income. If the significance level is less than ($P < 0.05$), H0 is accepted, and H1 is rejected...

3. RESULTS AND DISCUSSION

3.1 Results

Table 1 outlines the characteristics of the respondents. This table shows that the average age of chili farmers in Magelang Regency is 51.37 years, indicating that the majority are still in their productive age. Farmers in this age group are generally more cautious in making production decisions, such as selecting inputs, determining cropping patterns, and managing risks. Based on gender, 90% of farmers are male, with an average working hours (WH) of 756.10 hours, while 10% are female, with an average working hours of 425.48 hours. This indicates that men predominantly engage in chili farming activities. Typically, men are more involved in the main fieldwork, whereas women focus on supporting tasks that require precision. This pattern of participation mirrors the traditional labor division in farming households, which aims for efficiency and effectiveness in achieving outcomes.

eISSN: 2583-1194

Table 1. Respondent characteristic of chili farming

No	Item	Number
1	Age (year)	51.37
2	Gender	
	Male (%)	90
	Female (%)	10
3	Educational background	
	Elementary school (%)	65.5
	Junior high school (%)	29.5
	Senior high school (%)	9
	Diploma/undergraduate (%)	5
4	Experience (year)	14.18
5	Land weight (ha)	0.31
6	Seed number (heads)	7162
7	Fertilizer number (kg)	1423
8	Pesticide number (liter)	1.61
9	Pesticide number (kg)	1.40
10	Number female work (WH)	425.48
11	Number male work (WH)	756.10
12	Mobile phone	
	Use (%)	96
	Not use (%)	4
13	Credit access	
	Have (%)	17.5
	Not have (%)	82.5
14	Total cost (IDR)	7,620,296
15	Total of production (kg)	1722.05
16	Chili price (IDR/kg)	35,650
17	Revenue (IDR)	61,513,500

- Exp: data analysis was conducted in 1 season (6 months)

Table 2. Factors influencing revenue

Item	Coefficients	Std error	Sig
Constant	-4.719E7	7.051E6	.000
Age (year)	93093.787	72580.514	.201
Gender	-2.206E6	2.189E6	.315
Educational background	517819.859	975542.778	.596
Experience (year)	-31713.284	79714.170	.691
Land weight (ha)	-125926.095	876516.219	.886
Seed number (heads)	-30.144	359.711	.933
Fertilizer number (kg)	2967.291	1082.589	.007
Pesticide number (liter)	-873554.045	636065.039	.171
Pesticide number (kg)	1.373E6	617576.368	.027
Number female work (WH)	-2798.204	5533.830	.614
Number male work (WH)	-3374.135	1465.563	.022
Mobile phone	690166.323	3.196E6	.029
Credit access	73171.995	1.676E6	.965
Total cost (IDR)	.822	.231	.000
Total of production (kg)	34353.832	1409.928	.000
Chili price (IDR/kg)	1363.268	105.777	.000
R Square	0.982		

As seen in table 2, there are 7 factors that significantly influence revenue, namely fertilizer number, pesticide number, day of male work, use of mobile phone, total cost, total chili production and chili price. seven factors significantly influenced farmers' revenue: the amount of fertilizer, amount of pesticide, number of male workdays, use of mobile phones, total production costs, total chili production, and chili price.

Table 3. Farmers use mobile phone

No	Item	Number	Percentage (%)
1	Use	192	96
2	Not Use	8	4

As presented in Table 3, 96% of chili farmers used mobile phones, and only 4% did not.

Table 4. Number of farmer have credit access

No	Item	Number	Percentage (%)
1	Have	35	17.5
2	Not have	165	82.5

3.2 Discussion

The education level of the chili farmers in the study area was relatively low. Most respondents (65.5%) completed only elementary school, followed by 29.5% who graduated from junior high school, 9% from senior high school, and 5% who attained higher education. This indicates that farmers' formal knowledge of modern agricultural technology is still limited; thus, learning and adoption of innovations often occur through field experience or farmer-to-farmer interactions.

The respondents had an average of 14.18 years of farming experience, indicating that the majority were quite seasoned in growing chili. This level of experience equips them with the ability to adapt to shifts in climate, market prices, and pest or disease outbreaks. Farmers with such expertise are generally more adept at managing production resources and selecting the best planting times, which enhances farming efficiency and minimizes potential production losses.

The typical size of cultivated land is 0.31 hectares, suggesting that the majority of farmers are smallholders. This scale of farming allows for more careful monitoring of crop conditions, especially during maintenance and pest control. On average, farmers pland 7.162 chili pepper seedlings per growing season and use 1.423 kg of fertilizer, 1.61 liters of liquid pesticides, and 1.40 kg of solid pesticides. These statistics indicate that the agricultural system used in chili farming is intensive, with large amounts of inputs used to support growth and yield. Intensive farming systems are designed to increase the productivity of limited land through regular fertilization, aggressive pest and disease control, and ongoing maintenance [26].

Regarding access to technology and capital, the majority of farmers (96%) integrate mobile phones into their farming practices, primarily to gather market price information. This use of communication technology demonstrates an adaptation to digital advancements that can improve the efficiency and effectiveness of farming. Despite high levels of technology adoption, only 17.5% of farmers receive credit from financial institutions, indicating low access to credit. This limited access to credit reflects farmers' caution regarding financial risks. Concerns about potential loan repayment difficulties due to price and crop uncertainty force most farmers to rely on their own capital resources. This situation restricts opportunities for income growth through intensified production, as small farmers often lack the financial means to invest in necessary inputs. Economically, the average production cost per planting season is Rp7,620,296, with an average yield of 1,722.05 kg and a selling price of Rp35,650 per kilogram, resulting in a gross income of around Rp61,513,500 per planting season. These findings suggest that chili farming holds promising economic potential, even without credit access.

The variable amount of fertilizer had a significant value (Sig) of 0.007, demonstrating that the use of fertilizer had a notable and positive impact on the income of chili farmers. This finding indicates that when fertilizer is applied in proportion and at the correct dosage, production yield increases. Fertilizer acts as a key input by supplying essential nutrients to the soil, enhancing soil structure, and promoting plant growth. Ultimately, increased productivity through the proper application of fertilizer will boost farmers' incomes. This result aligns with the findings of Subedi et al., 2023, which stated that increasing fertilizer use in chili farming activities resulted in increased harvest yields when combined with effective land management practices.

The solid pesticide quantity variable has a significance value of 0.027, indicating that solid pesticide use significantly impacts farmer income. Solid pesticides are crucial for controlling pests and diseases that can reduce crop yields. Proper pesticide use can maintain fruit quality, minimize crop failure, and increase market value. Chili plants are highly susceptible to pests and diseases, making pest control crucial. Intensive pest control through the use of pesticides has a positive influence on the efficiency of horticultural crop farming [28].

The number of male workdays significantly impacts income, with a significance level of 0.022 and a negative coefficient of -3,374.135. This negative coefficient indicates that an increase in male workdays can lead to a decrease in income unless offset by increased productivity. This is often the case for smallholder farmers, where excessive labor input does not result in significant yield increases. This highlights labor input inefficiency, where labor costs increase without a proportional increase in yields. Inefficient labor utilization will lead to low profit margins among small-scale chili farmers [29].

The variable for mobile phone usage shows a significant positive coefficient of 690,166,323 at a significance level of 0.029, indicating that it has a significant positive impact on farm income. Mobile phones provide farmers with quick and extensive access to information, particularly on market prices, weather conditions, and input availability. Communication technology also facilitates connections between farmers, traders, and consumers, expanding market access for agricultural products. The adoption of digital technology is one way farmers can adapt to changing market and information dynamics.

The factors of total production costs, total production, and chili prices significantly influence farmers' income. The significance value for total production costs is 0.031, with a positive coefficient of 0.82; for total production is 0.000 with a coefficient of 34,353.832; and for chili prices is 0.000 with a coefficient of 1,363.268. These findings indicate that when production costs increase along with increased yields and chili prices at favorable market levels, farmers' income can experience a substantial increase. High production costs often indicate high use of inputs such as fertilizers, pesticides, and labor, which can lead to greater productivity if managed properly. On the other hand, total production and chili prices are the main factors that determine farmers' income, as both have a direct impact on total income. High productivity allows farmers to maximize profits, especially when market prices are rising.

As shown in Table 3, the majority (96%) of chili farmers in Magelang Regency have utilized mobile phones in their farming activities, while only 4% do not. This indicates a very high level of adoption of communication technology in chili farming activities. Farmers can easily access information related to market prices, weather conditions, the availability of production facilities, and marketing opportunities for their crops using mobile phones. Furthermore, mobile phones facilitate communication between farmers and between farmers and collectors, thereby streamlining transactions and business decision-making processes. Access to fast and accurate information allows farmers to reduce the risk of losses due to delays in information related to dynamic market conditions and fluctuating chili prices.

Table 4 shows that only 17.5% of Chilean farmers have access to credit, while the remaining 82.5% do not. This indicates that most farmers carry out their agricultural activities without financial support from formal financial institutions. The low access to credit, especially among small-scale farmers, is due to difficulties in obtaining funds. Furthermore, farmers' limited access to credit is also influenced by concerns about the risk of defaulting on loans. The volatile fluctuations in chili pepper prices and uncertainty about harvest yields make farmers hesitant to take out loans, fearing that they will be unable to repay if their income decreases. Price and crop uncertainty are the main factors behind low farmer participation in agricultural credit programs [30]. As a result, most farmers tend to rely on their own capital or financial assistance from family members to maintain their farming activities.

4. CONCLUSION

The results of the study show that the use of mobile phones for chili farming increases revenue, but credit does not have a significant effect, the number of chili farmers who have credit is still small. Mobile phones are already commonly used to support chili businesses, but chili farmers still use only a few credit options.

ACKNOWLEDGEMENTS

The authors would like to thank the Research and Extension Service Office for funding this research

AUTHOR CONTRIBUTIONS

Agus Setiadi: Conceptualization, Investigation.

Dinda A. Sekarnurani: Methodology

Kartika Panji Kusuma: Data Curation

Migie Handayani: Formal Analysis.

Muthia Auralia: Supervision, Writing—Review & Editing.

CONFLICT OF INTEREST

All authors declare no conflict of interest

ETHICS STATEMENT

Not applicable in this study

DATA AVAILABILITY STATEMENT

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

[1] A. R. Bahtiar, A. J. Santoso, J. Juhariah, and P. Pranowo, "Deep Learning Detected Nutrient Deficiency in Chili Plant," institute of electrical electronics engineers, 2020, pp. 1–4. doi: 10.1109/icoict49345.2020.9166224.

[2] E. Misaki, M. Tedre, M. Apiola, and S. Gaiani, "Challenges facing sub-Saharan small-scale farmers in accessing farming information through mobile phones: A systematic literature review," *THE ELECTRONIC JOURNAL OF INFORMATION SYSTEMS IN DEVELOPING COUNTRIES*, vol. 84, no. 4, p. e12034, 2018, doi: 10.1002/isd2.12034.

[3] C. Anadozie, M. Fonkam, and J.-P. Cleron, "Assessing mobile phone use in farming: The case of Nigerian rural farmers," *African Journal of Science, Technology, Innovation and Development*, vol. 14, no. 2, pp. 418–427, 2021, doi: 10.1080/20421338.2020.1840052.

[4] E. Nakasone, B. Minten, and M. Torero, "The Power of Information: The ICT Revolution in Agricultural Development," *Annu. Rev. Resour. Economics*, vol. 6, no. 1, pp. 533–550, 2014, doi: 10.1146/annurev-resource-100913-012714.

[5] R. Fabregas, F. Schilbach, and M. Kremer, "Realizing the potential of digital development: The case of agricultural advice.," *Science (1979).*, vol. 366, no. 6471, 2019, doi: 10.1126/science.aay3038.

[6] N. A. Khan, A. A. Shah, G. Qijie, S. Ali, and B. Shahbaz, "Farmers' use of mobile phone for accessing agricultural information in Pakistan:," *Ciência Rural*, vol. 49, no. 10, 2019, doi: 10.1590/0103-8478cr20181016.

[7] P. Zhao, W. Cai, T. Liu, and W. Zhang, "The impact of digital finance use on sustainable agricultural practices adoption among smallholder farmers: an evidence from rural China.," *Environmental Science and Pollution Research*, vol. 29, no. 26, pp. 39281–39294, 2022, doi: 10.1007/s11356-022-18939-z.

[8] F. U. Khan, M. Nouman, L. Negrut, J. Abban, L. M. Cismas, and M. F. Siddiqi, "Constraints to agricultural finance in underdeveloped and developing countries: a systematic literature review," *Int. J. Agric. Sustain.*, vol. 22, no. 1, 2024, doi: 10.1080/14735903.2024.2329388.

[9] M. Muhammad Iqbal and K. Kalbe Abbas, "The Impact of Institutional Credit on Agricultural Production in Pakistan," *The Pakistan Development Review*, vol. 42, no. 4II, pp. 469–485, 2022, doi: 10.30541/v42i4iipp.469-485.

[10] E. Martey, P. M. Etwire, A. N. Wiredu, and J. K. M. Kuwornu, "The impact of credit on the technical efficiency of maize-producing households in Northern Ghana," *Agricultural Finance Review*, vol. 79, no. 3, pp. 304–322, 2019, doi: 10.1108/afr-05-2018-0041.

[11] S. I. Santoso, H. Setiyawan, P. Megayana, and A. Setiadi, "Impact of Mobile Phone Usage and Credit Access on the Revenue of Duck Farmers in Brebes, Indonesia," *Journal of Animal Health and Production*, vol. 13, no. 2, pp. 387–392, 2025, doi: 10.17582/journal.jahp/2025/13.2.387.392.

[12] Kementerian Koordinator Bidang Perekonomian Republik Indonesia, "Data Realisasi KUR 2020-2024 Jawa Tengah."

[13] S. Kipkogei, G. Mwalupaso, J. Tanui, J. Han, and R. Brenya, "The synergistic effects of microcredit access and agricultural technology adoption on maize farmer's income in Kenya," *PLoS One*, vol. 20, no. 1, p. e0316014, 2025, doi: 10.1371/journal.pone.0316014.

[14] N. A. Jimi, S. Kumbhakar, P. V Nikolov, and M. A. Malek, "The effects of access to credit on productivity: separating technological changes from changes in technical efficiency," *Journal of Productivity Analysis*, vol. 52, no. 1–3, pp. 37–55, 2019, doi: 10.1007/s11123-019-00555-8.

[15] I. S. Yadav and M. S. Rao, "Agricultural credit and productivity of crops in India: field evidence from small and marginal farmers across social groups," *J. Agribus. Dev. Emerg. Econ.*, vol. 14, no. 3, pp. 435–454, 2022, doi: 10.1108/jadee-05-2022-0092.

[16] C. Chaiya, S. E. Saqib, S. Sikandar, N. Ali, and P. Pinthong, "The Impact of Formal Agricultural Credit on Farm Productivity and Its Utilization in Khyber Pakhtunkhwa, Pakistan," *Sustainability*, vol. 15, no. 2, p. 1217, 2023, doi: 10.3390/su15021217.

[17] A. B. Assouto and D. J.-L. Houngbeme, "Access to credit and agricultural productivity: Evidence from maize producers in Benin," *Cogent Economics & Finance*, vol. 11, no. 1, 2023, doi: 10.1080/23322039.2023.2196856.

[18] A. Ogunleye, M. O. Akinloye, A. Kehinde, O. M. Ajayi, and C. A. Wongnaa, "Impacts of credit constraints on adoption of risk management strategies and income of maize farmers in Northern Nigeria," *Agricultural Finance Review*, vol. 84, no. 2/3, pp. 114–142, 2024, doi: 10.1108/afr-11-2023-0152.

[19] N. Khan *et al.*, "Analyzing mobile phone usage in agricultural modernization and rural development," *International Journal of Agricultural Extension*, vol. 8, no. 2, pp. 139–147, 2020, doi: 10.33687/ijae.008.02.3255.

[20] A. R *et al.*, "Impact of Mobile Technology on Extension Service Delivery in Remote Farming Communities: A Review," *J. Sci. Res. Rep.*, vol. 30, no. 3, pp. 1–13, 2024, doi: 10.9734/jsrr/2024/v30i31853.

[21] N. Khan, R. L. Ray, H. S. Kassem, and S. Zhang, "Mobile Internet Technology Adoption for Sustainable Agriculture: Evidence from Wheat Farmers," *Applied Sciences*, vol. 12, no. 10, p. 4902, 2022, doi: 10.3390/app12104902.

[22] N. K. Singh *et al.*, "Impact of Digital Technologies in Agricultural Extension," *Asian Journal of Agricultural Extension, Economics & Sociology*, vol. 41, no. 9, pp. 963–970, 2023, doi: 10.9734/ajaees/2023/v41i92127.

[23] A. Siaw *et al.*, "The ripple effect of credit accessibility on the technical efficiency of maize farmers in Ghana," *Agricultural Finance Review*, vol. 81, no. 2, pp. 189–203, 2020, doi: 10.1108/afr-05-2020-0068.

[24] A. A. Chandio, Y. Jiang, M. Mohsin, A. G. Pathan, M. A. Twumasi, and A. Rehman, "Determinants of demand for credit by smallholder farmers': a farm level analysis based on survey in Sindh, Pakistan," *Journal of Asian Business and Economic Studies*, vol. 28, no. 3, pp. 225–240, 2020, doi: 10.1108/jabes-01-2020-0004.

[25] D. N. Schreiber-Gregory, "Ridge Regression and multicollinearity: An in-depth review," *Model Assisted Statistics and Applications*, vol. 13, no. 4, pp. 359–365, 2018, doi: 10.3233/mas-180446.

[26] S. Kalogiannidis, F. Chatzitheodoridis, D. Kalfas, and O. Papaevangelou, "Role of Crop-Protection Technologies in Sustainable Agricultural Productivity and Management," *Land (Basel).*, vol. 11, no. 10, p. 1680, 2022, doi: 10.3390/land11101680.

[27] P. Subedi, P. Bhattarai, B. Lamichhane, A. Khanal, and J. Shrestha, "Effect of different levels of nitrogen and charcoal on growth and yield traits of chili (Capsicum annuum L.)," *Heliyon*, vol. 9, no. 2, p. e13353, 2023, doi: https://doi.org/10.1016/j.heliyon.2023.e13353.

[28] J. Byrne, R. Lillywhite, H. Creissen, F. Thorne, and L. Walsh, "Quantifying integrated pest management adoption in food horticulture," *Crop Protection*, vol. 191, p. 107165, 2025, doi: https://doi.org/10.1016/j.cropro.2025.107165.

[29] F. Wehfany, N. Timisela, and J. Luhukay, "Analisis Faktor Yang Mempengaruhi Pendapatan Usahatani Cabai Rawit (Capsicum frutescens L.)," *JURNAL AGRICA*, vol. 15, pp. 123–133, Oct. 2022, doi: 10.31289/agrica.v15i2.7314.

[30] A. Akinola *et al.*, "Impact of membership in agricultural cooperatives on yield of smallholder tomato farmers in Nigeria," *Environmental and Sustainability Indicators*, vol. 20, p. 100313, 2023, doi: https://doi.org/10.1016/j.indic.2023.100313.