AGRISOCIONOMICS
Jurnal Sosial Ekonomi dan Kebijakan Pertanian
ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

DEMOGRAPHIC TARGETING OF USERS IN MOBILE APPLICATIONS FOR LIVESTOCK DIGITAL MARKETING AMONG SMALLHOLDER CATTLE FARMERS

Agung Triatmojo*, Mujtahidah Anggriani Ummul Muzayyanah, Suci Paramitasari Syahlani, and Budi Guntoro
Department of Livestock Socio-economics, Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia

*Correspondence Email: agungtriatmojo@ugm.ac.id

Submitted 13 May 2024; Approved 28 May 2024

ABSTRACT

Several livestock diseases leading to high mortality rates among animals have raised concerns about a potential food crisis in Indonesia. To prevent further spread of these diseases, access to livestock sheds has been restricted. This situation has highlighted the importance of developing alternative marketing channels to facilitate livestock trade. The present study investigates the demographic factors that influence farmers' interest in adopting mobile applications for digital livestock marketing in the Special Region of Yogyakarta. The data for this research was collected from a stratified random sample of 968 respondents across four regions. Prior to the interviews, farmers were provided with an introduction and given the opportunity to experience the mobile applications firsthand. The data analysis employed descriptive statistics, non-parametric analysis, and a logistic regression model. The results indicated a significant ($p < 0.05$) association between variables such as the farmer's age, educational level, women's decision-making power, farming revenue, cattle ownership, farming experience, and interest in using mobile applications for livestock digital marketing. However, no distinction in adoption interest was observed between farmers who were members of agricultural groups and those who were not. These findings have significant methodological implications, as they require independent interviewing among member farmer groups. This study suggests that developers of mobile applications for livestock digital marketing should consider the lack of digital literacy among farmers as a crucial factor influencing their interest in adopting new technologies. Addressing the digital literacy gap could increase the adoption and effective use of these applications within the farming community.

Keywords: *cattle farmer, digital marketing, demographic, farmer group, FMD*

BACKGROUND

The outbreak of mouth and nail disease (FMD) is a disease outbreak that has become a significant concern in the Indonesian livestock industry. The Ministry of Agriculture stated in Ministerial Decree No. 260/1986 that Indonesia was free from the pandemic of foot-and-mouth disease (FMD). This was reinforced by the World Organization for Animal Health's (OIE) recognition of Indonesia in resolution No. XI of 1990 (Basuki et al., 2020). However, the Ministry of Agriculture stated that FMD cases re-endemic after the disease was found in the Gresik area, East Java on April 28, 2022. Based on data from the Indonesian Ministry of Agriculture, DIY Province ranks eighth in the total sick livestock with a total of 13,069 heads. DIY Province also ranks third in the total livestock

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

that died due to FMD outbreaks with a total of 470 heads. Foot-and-mouth disease (FMD) can be transmitted quickly between one livestock and another. FMD transmission can occur directly and indirectly (Sansamur et al., 2020). Direct transmission can occur when healthy livestock come into direct contact with livestock that have been exposed to FMD. Indirect transmission can occur due to contact with a person, contaminated materials or tools such as contact with cage personnel, vehicles, animal feed that can spread the virus to healthy livestock (Zainuddin, 2022).

The presence of digital platforms like mobile applications, which are accessible to both farmers and buyers, is crucial in preventing the spread of diseases in livestock. Mobile applications, designed to be run on smartphones and tablets, have been particularly beneficial in developing countries like India, Kenya, Uganda, South Africa, and Tanzania, where they have contributed to enhanced agricultural productivity (Costopoulou et al., 2016; Qiang et al., 2012). Baumuller (Baumüller, 2015) emphasized that these apps hold the potential to effectively support and reach rural smallholders. Among the various agricultural applications, providing valuable information has been deemed the most significant due to the information disparities prevalent in rural markets of developing nations (Aker, 2010; Qiang et al., 2012). According to Qiang et al. (2012), the use of mobile applications has helped smallholders increase their income by reducing transaction and distribution costs related to output sales and input supplies. Noteworthy examples of successful mobile apps include Esoko and Cocoa Link, which addressed information asymmetry issues for Ghanaian farmers (Aker et al., 2016), as well as Modisar, which improved livestock production in Botswana (Chukwunonso & Tukur, 2012).

Nevertheless, in developing country like Indonesia, more than 90% of the population is involved in cattle farming (Widiati, 2015). These smallholders often rely on subsistence farming and struggle with outdated technology, resulting in low productivity (Baumüller, 2015). The primary obstacles they encounter include limited access to agricultural information regarding modern technologies and practices, difficulties in reaching markets, restricted financial services access, and inadequate extension services. Research has demonstrated that the use of mobile applications in agriculture can help smallholders overcome these hurdles by providing access to agricultural information, financial services, improved market access, and enhanced visibility in the supply chain (Baumüller, 2015; Qiang et al., 2012).

The introduction of digital marketing applications is anticipated to boost the sales of agricultural products and associated products, with projections indicating a potential increase in sales targets ranging from 30% to 40% compared to current levels. Furthermore, digital marketing strategies are reported to have a substantial positive impact, contributing to a 42.8% rise in the income of agricultural communities (Krisnawati et al., 2019). Research reports from MercyCorps and Rabobank indicate the presence of 55 different agricultural digital technologies in Indonesia (Makini et al., 2020). However, on average, the adoption and utilization of these digital solutions within the agricultural sector remain in their nascent stages. The reports further reveal that 60% of the available agricultural digital technologies cater to providing digital information, such as market data or price updates. Another significant portion, accounting for 40%, focuses on facilitating market access for agricultural products. Approximately one-third of these technologies target supply chain management and data handling processes (Kim et al., 2020).

Mobile phones, a seemingly simple information and communication technology, hold immense potential for supporting agricultural activities and enhancing farm produce marketing.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

Farmers who possess, utilise, and leverage mobile phones effectively can gain access to a wealth of valuable information, such as extension services, market insights, and other resources that can ultimately boost their productivity (Issahaku et al., 2018). However, despite the availability of this technology, the general trend among farmers has been an underutilization of digital solutions, particularly those facilitated through internet connectivity. Only a small portion of farmers currently employ their mobile devices to actively seek agricultural information, while the majority primarily relies on these devices for routine communication and entertainment purposes. A study by Yuantari et al. (2016) further highlights that farmers' knowledge levels regarding technology, including the marketing of agricultural products, remain suboptimal. The use of simple technologies like mobile phones for farming activities has not been optimised to its full potential (Feryanto & Rosiana, 2021). This scenario underscores the need for targeted efforts to bridge the digital divide and enhance digital literacy among the farming community. By equipping farmers with the necessary skills and knowledge, they can harness the power of mobile devices and leverage digital solutions to access vital information, streamline marketing processes, and ultimately enhance their agricultural productivity and profitability (Munawaroh, 2022).

Although previous studies (Krisnawati et al., 2019) have shown that mobile applications are potentially effective in supporting livestock digital marketing, there is still a lack of research on how demographic factors impact the adoption of these applications among smallholder cattle farmers. Earlier investigations have examined the consumer satisfaction on the application of digital marketing to livestock commodities (Rahmasari et al., 2022). However, there is a dearth of information on how user demographics, including age, gender, education, and socioeconomic status, influence the intention to before they will use of these tools. It is crucial to analyse the demographic characteristics of users in order to understand their preferences and the likelihood of them adopting mobile livestock marketing applications. This analysis helps identify specific user segments and develop targeted strategies to effectively engage smallholder cattle farmers.

The rapid growth of mobile phones in Indonesia has resulted in a rising number of apps that can enhance agricultural productivity. Certain applications are currently in the developmental phase, but others have already been implemented as functional web-based versions. There is currently limited research on farmers' use of mobile applications, with the majority of studies concentrating on general mobile phone usage (Asa & Uwem, 2017; Jaji et al., 2018) rather than mobile application usage. These studies do not distinguish between mobile phone usage and mobile phone applications. Atibioke et al. (2012) noted that many mobile applications struggle to succeed as their developers have difficulty identifying the precise user requirements. This study aims to address this gap by analysing the sociodemographic factors that influence the adoption of livestock mobile applications. The findings of this study provide valuable insights to developers and other stakeholders, enabling them to comprehend the obstacles encountered by farmers and identify the necessary enhancements to promote the use of mobile applications among farmers.

RESEARCH METHODS

This research was conducted in the Special Region of Yogyakarta. The method used in this research consists of two stages, including pre-survey and survey. The pre-survey stage was carried out to determine the research locations that would be used as respondents and interviewed for primary

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

data collection. The research locations consisted of 4 regions in Yogyakarta, namely Gunung Kidul, Kulon Progo, Bantul, and Sleman Regency. The study's districts were specifically focused on beef cattle production. This indicates that these regions are known for their significant involvement in raising and managing beef cattle, making them relevant and representative for research on livestock-related topics. Primary data is data obtained by field surveys using all original data collection methods. The primary data for this study consists of data obtained directly from questionnaires concerning the socio-demographic characteristics of farmers and their technological interest in adopting mobile applications.

A stratified random sample of 968 respondents was used to collect the data. The survey was carried out from September to October 2022. This study focused on cattle farmers who have at least one mobile phone in their household with internet connectivity. Prior to their interviews, farmers were provided with instructions and directed to educate themselves with mobile applications, one by one, without any interruption from peer farmers. The data was analysed using STATA software analysis, employing descriptive statistics, a non-parametric analysis, and a logistic regression model. The logistic regression model utilized in this study is as follows:

$$Y_i = Log\left(\frac{p}{p-1}\right)$$

$$Yi = \beta_0 + \beta_1\, age + \beta_2\, education + \beta_3\, woman's\ decision + \beta_4\, farming\ income + \beta_5\, farmer's\ group + \beta_6\, farming\ experience + \beta_7\, herd\ size$$

Information:
Y_i : Interest in adopting mobile apps
Y: 1, Yes
Y: 0, No
I : Respondents i (1,2,3.... N)
Log : Logistic equation
P : Probability in adopting mobile apps
p-1 : Probability to not adopting mobile apps
β_0 : Constant
β_{1-7} : Regresion coefisient
X_{1-7} : Independent variables

Tabel 1. Variable Operational Definitions

Variable		Scale	Operational Definitions
X_1	Age	Ratio	The chronological age of participants in the study, measured in years at the time of data collection and determined by respondents' self-reporting
X_2	Education	Ratio	Education level of respondents is defined as the highest level of formal education attained by participants at the time of the survey. The scale ranges from 0 to 21, where 0 represents individuals who have not enrolled in formal education, and 16 represents those who have completed a university degree or equivalent tertiary education
X_3	Woman's decision	Nominal	1: Yes 0: No

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

X_4	Farming income	Ratio	The total average monetary earnings in a year were derived solely from beef cattle farming and its associated products. Income will be reported in the local currency (Indonesian Rupiah, or IDR). Respondents are asked to provide an estimate of their annual income from beef cattle farming, supported by relevant financial records or documentation where available
X_5	Farmer's group	Nominal	1: Member 0: Non-member
X_6	Farming experience	Rasio	the cumulative duration of active engagement in livetsock farming activities, from the initial initiation of farm-related tasks to the time of data collection for the survey
X_7	Herd size	Ratio	The total number of cattle owned or managed by the respondent is quantified by converting it into Tropical Livestock Units (TLU). A tropical livestock unit is a standardised measure that considers the size and weight of different types of livestock, adjusted for the tropical environment. The conversion to TLU facilitates comparisons across different types of livestock and regions
Dependent variable			
Y	Interest in adopting mobile apps	Nominal	1: Yes 0: No

RESULT AND DISCUSSION

Socio-economic Profile of Farmers Interest in Adopting Mobile Applications

According to the data presented in Table 2, individuals belonging to the active age group exhibit a higher level of engagement with agricultural activities. The study was participated in proportionally by farmer respondents of both productive and non-productive ages. The participants surveyed who are involved in agricultural activities fall between the ages of 18 and 60. It is observed that individuals belonging to younger age groups indicate a higher propensity for adopting enhanced technology practices (Atibioke et al., 2012). 65% of young farmers were interested in using mobile apps, whereas only 36% of older farmers were interested. A tendency of younger cattle farmers to adopt mobile applications for digital marketing can be linked to their advanced technological literacy and familiarity with digital platforms, which has been cultivated through early exposure to mobile devices and the internet (Chuang et al., 2020). However, elderly farmers frequently show hesitancy in embracing these technologies because of deeply ingrained conventional methods, low proficiency in digital abilities, and possible concerns about the intricacies involved in using new electronic interfaces (Miine et al., 2023).

The data on respondents' education levels, as presented in Table 2, reveals that while 95% of the participating farmers have completed tertiary education, nearly half have only attained primary school education. A significant majority (70%) of respondents with primary school education expressed a lack of interest in utilizing mobile applications. In contrast, over 60% of individuals with a high school education or its equivalent expressed a desire to adopt mobile applications. Previous studies have consistently highlighted the crucial role of farmers' knowledge and understanding in their decision to adopt innovations. Atibioke et al. (2012) stated that farmers' knowledge played a significant role in their decision to adopt innovations, while Meijer et al. (2015) and Rosário et al.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

(2022) identified farmers' knowledge and understanding as critical determinants in their decision to adopt innovative practices and technologies. Furthermore, Diaz et al. (2021) found a positive correlation between farmers' knowledge of mobile applications and their willingness to adopt these tools for marketing and agricultural purposes. As shown in Table 2, more than half of respondents (55%) from households with more than two members expressed a propensity to utilise mobile applications. Terras & Ramsay (2016) supports this conclusion, noting that parental technology use is strongly linked to that of their child, as children often assist in developing digital literacy and adoption (Rompaey et al., 2002).

Table 2. Farmer's Characteristic in Interest in Adopting Mobile Applications

Variables	Freq.	%	Freq. Interest in Adopting		Non-parametric Tests
			Yes	No	
All respondents			489	479	
Age (years)					Fisher's Exact^2= **163.89****
18– 60 (productive)	477	49	312	165	
> 60 (un-productive)	491	51	177	314	
Education (years)					
Primary school (1 – 6 years)	386	39	117	269	Pearson X^2=**130.83****
High school (7 – 12 years)	528	55	330	198	
Tertiary (> 13 years)	54	6	42	12	
Household size (persons)					
1 – 2	206	21	68	138	Pearson X^2=**38.13****
3 – 4	487	50	264	223	
> 4	275	29	157	118	
Women's decision					Fisher's Exact^2=**5.63***
Yes	739	76	389	350	
No	229	24	100	129	
Farming income (IDR average per year)					
Lower-middle (below Rp 12 mio)	457	47	193	264	Pearson X^2=243.02
Middle (Rp 12 mio to Rp 24 mio)	304	31	145	159	
Upper-middle (Above Rp 24 mio)	207	22	151	56	
Farmer group					Fisher's Exact^2= **5.56***
Yes	564	58	303	261	
No	404	42	186	218	
Farming System					
Breeding	149	15	74	75	Pearson X^2= 0.89
Rearing	142	15	67	75	
Fattening	677	70	489	329	
Farming experience (years)					
1 – 10	358	37	206	152	Pearson X^2= **98.21****
11 – 20	218	23	128	90	
>20	392	40	155	227	
Herd size (Tropical Livestock Unit)					
1 – 3	938	96	470	468	Pearson X^2= 41.53
4 – 6	26	3	15	11	
>6	4	1	4	0	

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

Notes: *, ** The mean difference is significant at the 0.05 and 0.01 level

A substantial 76% of agricultural decisions are jointly discussed with spousal partners, underscoring the collaborative nature of farming households, as evidenced by studies such as Malabayabas & Mishra (2022). Furthermore, research by Mponela et al. (2021) highlights the pivotal role of marriage in generating family labor, enabling the participation of women and children in various aspects of livestock production, processing, marketing, farming practices, and the adoption of agricultural technologies. On the contrary, farmers with varying income levels, farming systems, and herd sizes showed no significant differences in their interest in adopting mobile apps for livestock digital marketing. This demographic factor is intricately linked with business characteristics, particularly in scenarios where small-scale production may not be optimally marketed through digital platforms, thus favoring direct sales to brokers instead (Triatmojo et al., 2024).

A notable proportion of respondents, encompassing nearly half of both those affiliated with farmers' groups and those operating independently, exhibited a distinct lack of interest in adopting mobile applications. This lack of interest can be attributed to various factors, including limited awareness, perceived complexity, and uncertainties surrounding the tangible benefits of these applications, as farmer group will facilitate to maketing their livestock (Abdul-Rahaman & Abdulai, 2020). Finally, farmers with fewer years of experience (Table 2) in the agricultural sector have exhibited a higher propensity towards adopting mobile applications, a trend that can be attributed to the correlation between lower farming experience and a younger age demographic (Diaz et al., 2021). Additionally, noted that younger farmers, often associated with less farming experience, were more likely to adopt precision agricultural technologies due to their higher levels of education and exposure to digital tools. Consequently, the relationship between farming experience and age emerges as a significant factor in shaping the adoption of mobile applications in the agricultural sector.

Determinants Factor of Interest in Adopting Mobile Applications

This section presents the estimation results on the demographic factors affecting interest in adopting mobile applications for livestock digital marketing by cattle farmers. The result of the logistic regression model is summarized in Table 3. The results suggest that age, education, a woman’s decision, farming revenue, farming experience, and cattle ownership significantly affect a farmer’s interest in using a livestock digital marketing mobile application. The coefficient for age is negative means that farmers with older ages are more likely to have less interest in adopting mobile applications to market their livestock. These farmers are typical to sell their animals directly into their shed or in a livestock market (Triatmojo et al., 2024). Diaz et al. (2021) noted that younger farmers were significantly more inclined to adopt precision agricultural technologies, including mobile apps, attributable to their higher educational levels and exposure to digital tools. Furthermore, age is a strong determinant of mobile phone adoption (Poushter, 2016), with younger farmers being more likely to use mobile services to access market information and conduct transactions. Similarly, Conci et al. (2009) observed lower adoption rates for technology among older farmers, citing limited digital literacy and resistance to change as potential barriers. Collectively, these studies illuminate the generational divide in the adoption of mobile applications and digital technologies in the agricultural sector, underscoring the need for targeted interventions to address the unique challenges faced by older farmers.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

Table 3. Demographic Determinants of Farmers Interest of Mobile Application Adoption

Variabel	**β**	**S.E.**	**Sig.**	**Exp$^{\beta}$**
Constant	0.20	0.50	0.69	1.22
Age	-0.03	0.01	**0.00****	0.96
Education	0.12	0.02	**0.00****	1.13
Woman's decision	0.43	0.17	**0.00****	1.54
Farming income	1.8052E^{-7}	5.6772E^{-8}	**0.00****	1.01
Farmer's group	0.19	0.15	0.21	1.21
Farming experience	0.16	0.08	**0.04***	1.17
Herd size	-0.01	0.01	**0.04***	0.99
Model X^2	5.76			
-2 Log likelihood	1148.57			
Overall case correctly predicted 67.10%				

Notes: *, ** The mean difference is significant at the 0.05 and 0.01 level.

The positive coefficient associated with the education variable indicates that farmers with higher levels of educational attainment have a greater interest in using livestock digital marketing platforms to sell their animals. This inclination may stem from these farmers' familiarity with mobile phone usage for buyer communication, suggesting a predisposition to embrace new technological advancements within this group. Consequently, individuals with advanced education levels are more likely to seamlessly integrate the use of digital marketing tools into their existing practices, thereby facilitating the adoption process. Lower educational attainment has been identified as a significant impediment to the adoption of mobile applications for livestock digital marketing among farmers, as evidenced by studies such as Meijer et al. (2015), where farmers with limited formal education exhibited lower uptake of such technologies due to challenges in comprehending and navigating digital interfaces. Conversely, research by Diaz et al. (2021) found that farmers with higher levels of education were more receptive to adopting mobile applications for agricultural marketing, attributing this trend to their enhanced digital literacy, openness to innovation, and ability to perceive the potential benefits of these technologies.

Furthermore, household farmers who engage their spouses in agricultural business decisions exhibit a heightened interest in adopting mobile applications, as collaborative decision-making processes foster an environment conducive to exploring innovative technologies. This phenomenon is particularly prominent when women contribute their perspectives to their partners, as studies by Malabayabas & Mishra (2022) have demonstrated that women's involvement in agricultural decision-making enhances the adoption of improved practices and technologies. Furthermore, research by (Mponela et al., 2021) highlights the pivotal role of women in generating family labor and driving the adoption of agricultural innovations within farming households. Consequently, the active involvement of spouses, particularly women, in agricultural decision-making processes emerges as a

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

significant factor influencing the interest and uptake of mobile applications among household farmers.

On the one hand, high farming revenue reflects cattle ownership. Farmers who have a higher income from their cattle business can use the mobile application. These farmers would enlarge their market through technology, resulting in higher cattle sales. In contrast, the more cattle a farmer raises, the less interest there is in adopting mobile applications. These farmers are more likely to explore new information and information sources that may be important to efficiently manage farm risk (Mittal & Mehar, 2016).

A positive correlation between farmer experience and interest in adopting technology. It is believed that more experienced farmers raise cattle with more consideration for new technology. On one hand, they try to keep their behaviour and beliefs, and on the other side, farmers try several methods to increase their productivity. The regression results suggest that farmers with relatively short time in cattle management rely less on Information and Communication Technologies (ICTs) and less on exploring other information sources like modern ICTs for new information content (Abebe & Mammo Cherinet, 2019).

The finding has significant methodological implications, as they require independent surveying among member farmer groups. These findings underscore the necessity of employing independent surveying methodologies among members of farmer groups to capture the intricacies of technology adoption decisions. The findings indicate that affiliation with farmer groups does not exert a significant influence on the interest to adopt mobile applications, suggesting that the primary function of these groups may be centered around marketing cattle, thus diminishing the perceived need for digital tools. Notably, the employment of independent surveys in this study ensured that respondents' perspectives were not unduly swayed by peer dynamics within their respective farmer groups. Consequently, the data collected reflects the individual farmers' genuine inclinations and motivations, unencumbered by potential group-level biases or pressures. This methodological approach fortifies the validity and reliability of the insights gained, providing an authentic representation of the factors shaping technology adoption decisions among smallholder cattle farmers, independent of their group affiliations.

CONCLUSION AND SUGGESTION

The research findings revealed a statistically significant ($p < 0.05$) association between several factors, including the farmer's age, educational attainment, decision-making authority of women, farming income, cattle ownership, and farming experience, and their interest in utilizing mobile applications for digital marketing of livestock products. However, there was no discernible difference in adoption interest between farmers who were members of agricultural groups and those who were not. This study highlights the importance of considering the digital literacy levels of farmers when developing mobile applications for livestock digital marketing. The lack of digital skills and knowledge among the farming community can substantially influence their willingness to adopt and effectively utilize new technological solutions. Application developers should prioritize user-friendly designs, intuitive interfaces, and comprehensive training programs to bridge the digital literacy gap and foster greater adoption rates among farmers.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

Furthermore, the study underscores the need for a nuanced approach that accounts for the diverse characteristics of the target audience. Factors such as age, education, gender dynamics, economic status, asset ownership, and prior experience in the agricultural domain can shape farmers' attitudes towards adopting mobile technologies. By tailoring the application's features, functionalities, and promotional strategies to address these specific considerations, developers can enhance the relevance, usability, and appeal of their solutions, ultimately driving greater acceptance and integration of digital marketing platforms within the livestock sector. It should be highlighted that the finding has significant methodological implications, as it requires independent surveying among member farmer groups.

REFERENCES

Abdul-Rahaman, A., & Abdulai, A. 2020. Farmer groups, collective marketing and smallholder farm performance in rural Ghana. Journal of Agribusiness in Developing and Emerging Economies, 10(5): 511–527. https://doi.org/10.1108/JADEE-07-2019-0095

Abebe, A., & Mammo Cherinet, Y. 2019. Factors Affecting the Use of Information and Communication Technologies for Cereal Marketing in Ethiopia. Journal of Agricultural & Food Information, 20(1): 59–70. https://doi.org/10.1080/10496505.2018.1438290

Aker, J. C. 2010. Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger. American Economic Journal: Applied Economics, 2(3): 46–59. https://doi.org/10.1257/app.2.3.46

Aker, J. C., Ghosh, I., & Burrell, J. 2016. The promise (and pitfalls) of ICT for agriculture initiatives. Agricultural Economics, 47(S1): 35–48. https://doi.org/10.1111/agec.12301

Asa, A. U., & Uwem, A. C. 2017. Utilization of Mobile Phones for Agricultural Purposes by Farmers in Itu Area, Nigeria. European Scientific Journal, ESJ, 13(19): 395. https://doi.org/10.19044/esj.2017.v13n19p395

Atibioke, O. A., Ogunlade, I., Abiodun, A. A., Ogundele, B. A., Omodara, M. A., & Ade, A. R. 2012. Effects of Farmers' Demographic Factors on the Adoption of Grain Storage Technologies Developed by Nigerian Stored Products Research Institute (NSPRI): A case study of selected villages in Ilorin West LGA of Kwara State (Vol. 2, Issue 6). www.iiste.org

Basuki, R. S., Isnaini, M. F., Rozi, Poermadjaja, B., & Saptarini. 2020. Penyidikan Kasus Penyakit pada Sapi Suspect PMK di Kabupaten Pamekasan tahun 2019. Penyidikan Penyakit Hewan, 115–122.

Baumüller, H. 2015. Agricultural Innovation and Service Delivery through Mobile Phones Analyses in Kenya.

Chuang, J.-H., Wang, J.-H., & Liang, C. 2020. Implementation of Internet of Things depends on intention: young farmers' willingness to accept innovative technology. International Food and Agribusiness Management Review, 23(2): 253–266. https://doi.org/10.22434/IFAMR2019.0121

Chukwunonso, F., & Tukur, A. 2012. Problems and prospects of adopting ICT in agriculture: some comments. African Journal of Agricultural Research and Development, 5(3): 39–47.

Conci, M., Pianesi, F., & Zancanaro, M. 2009. Useful, Social and Enjoyable: Mobile Phone Adoption by Older People (pp. 63–76). https://doi.org/10.1007/978-3-642-03655-2_7

Costopoulou, C., Ntaliani, M., & Karetsos, S. 2016. Studying Mobile Apps for Agriculture. Journal of Mobile Computing & Application, 3(6): 44–49. https://doi.org/10.9790/0050-03064449

Diaz, A. C., Sasaki, N., Tsusaka, T. W., & Szabo, S. 2021. Factors affecting farmers' willingness to adopt a mobile app in the marketing of bamboo products. Resources, Conservation & Recycling Advances, 11: 200056. https://doi.org/10.1016/j.rcradv.2021.200056

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

Feryanto, F., & Rosiana, N. 2021. Penggunaan Telepon Seluler untuk Pemasaran Serta Dampaknya Terhadap Kesejahteraan Petani. Jurnal AGRISEP: Kajian Masalah Sosial Ekonomi Pertanian Dan Agribisnis, 20(01): 25–40. https://doi.org/10.31186/jagrisep.20.01.25-40

Issahaku, H., Abu, B. M., & Nkegbe, P. K. 2018. Does the Use of Mobile Phones by Smallholder Maize Farmers Affect Productivity in Ghana? Journal of African Business, 19(3): 302–322. https://doi.org/10.1080/15228916.2017.1416215

Jaji, M. F. O., Abanigbe, S. A., & Abass, B. O. 2018. Mobile Phone as an extension tool among female agricultural practitioners in Lagos State Nigeria. Journal of Agricultural Extension, 21(3): 66. https://doi.org/10.4314/jae.v21i3.7

Kim, J., Shah, P., Gaskell, J. C., Prasann, A., & Luthra, A. 2020. Scaling Up Disruptive Agricultural Technologies in Africa. World Bank, Washington, DC. https://doi.org/10.1596/978-1-4648-1522-5

Krisnawati, I., Ubaidi, I. A., Rais, H., & Batu, R. L. 2019. Strategi Digital Marketing dalam Perdagangan Hasil Tani untuk Meningkatkan Pendapatan Kabupaten Karawang. Jurnal Ilmiah Ekonomi Global Masa Kini, 10(2): 70–75. https://doi.org/10.36982/jiegmk.v10i2.838

Makini, F., Mose, L., Kamau, G., Mulinge, W., Salasya, B., Akuku, B., & Makelo, M. 2020. The Status of ICT Infrastructure, Innovative Environment and ICT4AG Services in Agriculture. Food and Nutrition in Kenya, 5(11): 75.

Malabayabas, M. L., & Mishra, A. K. 2022. Assessing inverse relationship in joint farm decision-making households: An empirical evidence from Eastern India. Frontiers in Sustainable Food Systems, 6. https://doi.org/10.3389/fsufs.2022.1000156

Meijer, S. S., Catacutan, D., Ajayi, O. C., Sileshi, G. W., & Nieuwenhuis, M. 2015. The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations among smallholder farmers in sub-Saharan Africa. International Journal of Agricultural Sustainability, 13(1): 40–54. https://doi.org/10.1080/14735903.2014.912493

Miine, L. K., Akorsu, A. D., Boampong, O., & Bukari, S. 2023. Drivers and intensity of adoption of digital agricultural services by smallholder farmers in Ghana. Heliyon, 9(12): e23023. https://doi.org/10.1016/j.heliyon.2023.e23023

Mittal, S., & Mehar, M. 2016. Socio-economic Factors Affecting Adoption of Modern Information and Communication Technology by Farmers in India: Analysis Using Multivariate Probit Model. The Journal of Agricultural Education and Extension, 22(2): 199–212. https://doi.org/10.1080/1389224X.2014.997255

Mponela, P., Villamor, G. B., Snapp, S., Tamene, L., Le, Q. B., & Borgemeister, C. 2021. The role of women empowerment and labour dependency on adoption of integrated soil fertility management in Malawi. Soil Use and Management, 37(2): 390–402. https://doi.org/10.1111/sum.12627

Poushter, J. 2016. Smartphone Ownership and Internet Usage Continues to Climb in Emerging Economies. Pew Research Center.

Qiang, C. Z., Chew Kuek, S., Dymond, A., & Esselaar, S. 2012. Mobile Applications for Agriculture and Rural Development.

Rahmasari, L. F., Faturokhman, M., & Kurniawan, F. A. 2022. Analisis Kepuasan Konsumen pada Penerapan Pemasaran Digital untuk Komoditas Peternakan. Jurnal Sains Terapan, 12(1): 54–65. https://doi.org/10.29244/jstsv.12.1.54-65

Rompaey, V. Van, Roe, K., & Struys, K. 2002. Children's Influence on Internet Access at Home: Adoption and use in the family context. Information, Communication & Society, 5(2): 189–206. https://doi.org/10.1080/13691180210130770

Rosário, J., Madureira, L., Marques, C., & Silva, R. 2022. Understanding Farmers' Adoption of Sustainable Agriculture Innovations: A Systematic Literature Review. Agronomy, 12(11), 2879. https://doi.org/10.3390/agronomy12112879

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Special Edition: 602-613, June 2024

Sansamur, C., Arjkumpa, O., Charoenpanyanet, A., & Punyapornwithaya, V. 2020. Determination of Risk Factors Associated with Foot and Mouth Disease Outbreaks in Dairy Farms in Chiang Mai Province, Northern Thailand. Animals, 10(3): 512. https://doi.org/10.3390/ani10030512

Terras, M. M., & Ramsay, J. 2016. Family Digital Literacy Practices and Children's Mobile Phone Use. Frontiers in Psychology, 7. https://doi.org/10.3389/fpsyg.2016.01957

Triatmojo, A., Qui, N. H., Sayed, Y. B. El, Muzayyanah, M. A. U., Syahlani, S. P., & Guntoro, B. 2024.Technological Acceptance of Cattle Farmers in Mobile Applications for Livestock Di gital Marketing. Bulletin of Animal Science, 48(2): 153–161. https://doi.org/10.21059/buletinpeternak.v48i2.92075

Widiati, R. 2015. Developing Beef Cattle Industry at Smallholders to Support Beef Self-Sufficiency. Indonesian Bulletin of Animal and Veterinary Sciences, 24(4). https://doi.org/10.14334/wartazoa.v24i4.1090

Yuantari, M. C., Kurniadi, A., & Ngatindriatun. 2016. Pemanfaatan Teknologi Informasi untuk Meningkatkan Pemasaran Hasil Pertanian di Desa Curut Kecamatan Penawangan Kabupaten Grobogan Jawa Tengah. Techno.COM, 15(1).

Zainuddin. 2022. Kesiagaan Darurat Veteriner Indonesia Seri Penyakit Mulut Dan Kuku. Minister of Agriculture of Indonesia.