



Willingness to Adopt E-Commerce by Farmers in Naic, Cavite, as a Means for Sales during the COVID-19 Pandemic [†]

Dave Joseph S. Oblena  and Gerieka R. Anapi *

Department of Food Science and Nutrition, College of Home Economics, University of the Philippines Diliman, Quezon City 1101, Philippines

* Correspondence: granapi1@up.edu.ph

[†] Presented at the 4th International Electronic Conference on Foods, 15–30 October 2023; Available online: <https://foods2023.sciforum.net/>.

Abstract: Various strategies to contain the spread of COVID-19, including trade restrictions and lockdowns, challenged the movement of produce from farm-to-fork. Business closures reduced demand for produce, which affects Filipino farmers. As an alternative, e-commerce surged as a safer way to shop for produce. This study aimed to assess the willingness of Filipino farmers to adopt e-commerce using an extended Technology Acceptance Model (TAM) to measure their perceived innovativeness (PI), perceived usefulness (PU), perceived ease of use (PEOU), perceived cost (PC), information awareness (IA), and social influence (SI). Using Spearman's rho, it was found that PI ($p = 0.001$), PU ($p < 0.001$), IA ($p < 0.001$), SI ($p < 0.001$), and monthly internet data allocation ($p = 0.001$) were all correlated to farmers' willingness to adopt (WTA) e-commerce.

Keywords: e-commerce; food security; willingness to adopt; COVID-19 pandemic; agriculture



Citation: Oblena, D.J.S.; Anapi, G.R. Willingness to Adopt E-Commerce by Farmers in Naic, Cavite, as a Means for Sales during the COVID-19 Pandemic. *Biol. Life Sci. Forum* **2023**, *26*, 41. <https://doi.org/10.3390/Foods2023-15021>

Academic Editor: Anet Režek Jambrak

Published: 13 October 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

COVID-19 made a huge impact on social interactions, and in the Philippines, at least 10 quarantine rules were implemented [1]. Food and agriculture-related activities were not barred, but the market demand for food lowered due to loss of income and access to traditional food distribution sites [2]. The consistent closing of food establishments and businesses led to more bottlenecks, even if purchasing power was retained. Households have limited options for obtaining food since businesses and establishments that used to buy, process, and sell fresh produce consistently closed throughout the lockdown periods. Of the MSMEs that comprise 99% of businesses in the Philippines, 6% ended up not opening from August to September 2020, affecting 65% of the Philippine workforce [3].

The pandemic exacerbated many of the country's problems regarding food security and food waste. From 2.1 million to 3.4 million families reported having gone hungry at least once from April to June 2021 [4]. Due to job lay-offs, households struggle to save and buy food; of the little that is kept, it is used to buy barely nutritious foods [5]. To add, (super)typhoons added to the agricultural losses the country was already facing [6,7]. Due to difficulty finding produce buyers, farmers end up selling their harvest for cheap, if not disposing of or donating these goods [8].

Despite all this, there was still hope. The internet became a common tool for communication, interaction, and coping while households stayed at home. A 2021 study by VISA found that one in two Filipinos shopped online for the first time in 2020 amid the pandemic. Long-time online shoppers also preferred cashless payments [9] for both convenience and safety reasons. MSEs and the informal sector were also found to have a growing interest in Information and Communication Technology (ICT). This is due to its potential for growing productivity in businesses as it is known to be core to a country's economic development [10]. More online platforms have opened since the pandemic, and

agriculture is not behind thanks to initiatives involving the Department of Agriculture that aimed to bridge the gap between producers and consumers [11]. Websites and mobile apps usage became more apparent for obtaining groceries and purchasing meals. Public and private entities have been encouraging the population to shift to e-commerce and digital purchasing in restoring the food supply chain in the country. This trend in increasing e-commerce use has attracted studies on the general accessibility and ease of use of such platforms. Thus, this study aimed to assess the willingness to adopt (WTA) of farmers using e-commerce, which can overcome sales challenges due to COVID-19 restrictions. The results of this study provided a better understanding of the problems and inefficiencies in sales of produce due to COVID-19, and the factors that affect the adoption of e-commerce by Filipino farmers.

2. Materials and Methods

2.1. Study Site

Palangue Agrarian Reform Cooperative (PARC), a cooperative under the Department of Science and Technology program for plant iron-fortified rice located in Naic, Cavite, the Philippines, was the chosen study site [12]. PARC offered to sell their produce for less to improve food security across Luzon [13]. PARC is also involved in converting unused urban land to farmlands for income divided among its members [14]. Naic, Cavite, shares a similar harvest output as other agricultural centers of the Philippines, which makes PARC a good source of information that may be relevant to other areas.

2.2. Questionnaire

A two-part survey and interview were prepared for this research. The survey questions contained demographic and socio-economic information about the farmers' livelihoods and general technological use. This includes the number of gadgets used, internet connection types and speed, reasons for using their devices and the internet, and any prior e-commerce use. The core of this research can also be found in the survey section, which used a five-point Likert scale for perceived innovativeness (PI), perceived usefulness (PU), perceived ease of use (PEOU), perceived cost (PC), information awareness (IA), social influence (SI), and willingness to adopt (WTA). These constructs were based on Diaz et al.'s (2021) study on farmers adopting the use of mobile apps used for marketing bamboo products [15]. Diaz et al.'s (2021) extension of the Technology Acceptance Model (TAM) aimed to better encapsulate several factors that could affect the adoption of e-commerce [15]. A short interview immediately followed the survey, where respondents were free to answer the questions as they saw fit. These questions were designed to give better context to their answers in the earlier Likert-scale portion of the survey. These interview questions focused on pre- and current pandemic farming experiences and any e-commerce feedback if the farmers had prior experience using such platforms.

The survey interview was prepared in both English and Filipino for better respondent understanding. A quick briefing on e-commerce was also prepared in case any respondents were unaware of what e-commerce was. A pretest using the survey interview was conducted with two farmers from provinces outside of Cavite and different from each other. Improvements in the translations and approaches were made from the pre-test experiences. A third-party that worked closely with PARC and in the general area led the coordination with the cooperative officers and general data collection. This took three days, from morning to afternoon, to accomplish.

2.3. Data Analysis

Spearman's rho was used to find any correlation between WTA and both the demographic data results and the six constructs that make up the extended Technology Acceptance Model, namely perceived innovativeness (PI), perceived usefulness (PU), perceived ease of use (PEOU), perceived cost (PC), information awareness (IA), and social influence (SI).

3. Results and Discussion

Demographic and Socioeconomic

The majority of respondents were middle-aged, males, married, and finished either elementary or high school (Table 1). In the household, most families included up to six members with up to two dependent children, and they expected an average monthly income of at most PHP 20,000. These farmers planted 19 different crops, with 29 and 11 farmers planting rice and fruits, respectively. Most preferred planting vegetables and one farmer cited the Rice Tariffication Law as their reason for avoiding planting rice. Another five farmers mentioned the plans of President Ferdinand E. Marcos, Jr. to lower the price of rice grains per kilogram to PHP 20; if this were to come true, the farmers would avoid planting rice due to its low income. Most of the farmer respondents (87.5%) mentioned not using any e-commerce platforms. Of the 56 who had not used them, 47 were not actively looking to move to e-commerce platforms for selling their harvest.

Table 1. Correlation of willingness to adopt (WTA) vs. the six extended TAM constructs and non-multiple choice demographics using Spearman's rho.

Variable	Correlation Coefficient	<i>p</i> -Value
Age	0.054	0.673
Gender	−0.189	0.136
Marital status	0.121	0.342
Highest educational attainment	0.166	0.190
Household members	−0.420	0.743
Dependent children	0.115	0.367
Average monthly income	0.207	0.101
Own the land used	−0.062	0.628
Total size of land (binned)	0.050	0.696
Monthly data allocated	0.401 **	0.001
Perceived Innovativeness (PI)	0.390 **	0.001
Perceived Usefulness (PU)	0.679 **	0.000
Perceived Ease of Use (PEOU)	−0.092	0.472
Perceived Cost (PC)	0.193	0.127
Information Awareness (IA)	0.711 **	0.000
Social Influence (SI)	0.571 **	0.000

** = Correlation significant at 0.01 level (2-tailed).

Every farmer lived in a household with a technological device, of which most had at least one mobile phone. Most used social media and general communication with other family members and farmers, with several of them having used some form of online financial transaction app like GCash, Shopee, or Lazada. Only eight farmers had ever used e-commerce to sell their produce on any e-commerce platform. Most farmers spent around three hours using the internet, while thirty farmers reported that all the household devices they owned were personal devices. Only 6 farmers had no internet connection at home (wired/mobile), but 55 of 64 farmers with an internet connection (plans) had unlimited data plans or purchased at least 15 GBs of data monthly. Capped internet plan users reported re-subscribing to pre-paid internet promos once their monthly allocation was used up. Only one of the six non-internet subscribers was thinking of obtaining a personal internet connection in the future. The farmers' households in Naic were likely to have devices and internet connections ready for use. Of the 64 internet users, only 34 used the internet related to farming.

Of the demographic data obtained, only monthly data allocated showed a correlation ($p = 0.001$) with the willingness to adopt (WTA) e-commerce (Table 1). Data allocation can be interpreted as general internet use, which, with five other attributes, is significant in adopting four e-commerce activities: online shopping, online banking, online investing, and electronic payment [16]. This falls in line with the 85% of respondents having at least 15 GB of monthly data or unlimited data plans.

Perceived innovativeness (PI), with a low p -value of 0.001, described as using novel ideas, correlates with WTA e-commerce. PI is defined by Agarwal and Prasad (1998) as “the willingness of an individual to try out any new information technology” and is related to risk-taking behavior due to uncertain implications of new technology [17]. A more recent study by Alalwan et al. (2018) verified the linking of PI to IT adoption, showing a huge impact on adopting mobile internet [18]. As obtained from the respondents, most farmers had access to the internet based on their device ownership and internet connection type, speed, and allocation. This shows that, even if only their household members use the internet, the farmers can be successfully influenced to use the internet and possibly e-commerce in the future.

Fagan et al. (2012) quoted Davis, the creator of the TAM, in defining perceived usefulness (PU) as “the degree to which a person believes that using a particular system would enhance his or her job performance [19].” PU is limited to the actual use and not its moderation in information technology use, the latter being PI’s domain. With a high PU correlation for adopting e-commerce ($p < 0.000$), the farmers knew the extent of the effects of using e-commerce and, therefore, were open to using such a technology (Table 1). Second, perceived ease of use (PEOU), as mentioned by Fagan et al. (2012), is the “significant antecedent of PU since information technology applications that are easy to use are also more likely to be perceived as useful [19].” However, the data collected in this study show that PEOU was not correlated to WTA e-commerce ($p = 0.472$) by the farmers. This can be inferred from the other data collected: while technology is accessible to them, only about half of the respondents reporting using the internet. Despite seeing e-commerce as something useful, the respondents also believed that learning how to use new platforms is difficult. In their study, Gefen and Straub (2000) mentioned that PEOU directly affects IT adoption only if the main task to which the technology is related to is an integral aspect of IT adoption [20]. In this case, e-commerce may not be perceived as easy to use by farmers because their primary task, which is selling their harvest, is not inherently dependent on digital interactions. Instead, farmers may prefer other methods for selling their produce that do not rely on the internet.

Perceived cost (PC) refers to the price associated with the internet that is required for e-commerce use, from opening any portals to interacting and paying via the internet. PC is not correlated with WTA ($p = 0.127$), and this makes sense due to the limited budget of farmers and the quality of internet that is available in the Philippines. Quimba and Calizo, Jr. (2019) reported that a reduction in the cost of and an improvement in the quality of internet services in the Philippines are essential when discussing adopting e-commerce [21]. In the same report, the Philippines was specifically named by the ASEAN as needing to improve its internet services in terms of speed, quality, and cost to adopt e-commerce much faster. Five years since the ASEAN order, the Philippines has not yet made internet services more accessible if most farmers in Naic still believe that the cost of buying pre-paid internet or setting up a home internet connection is still a big factor in adopting e-commerce.

Information awareness (IA) is the constant updating of information about the farmers’ general surroundings. Diaz et al. (2021) reported that in Maasin, Iloilo, farmers have been constantly checked up on by the Department of Natural Resources (DENR) and the Department of Science and Technology—Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) since the 1990s [15]. Much of the information given to these farmers involved environmental conservation and improvements, and farmers have been receptive to such information in maintaining their area of livelihood. These farmers showed a correlation to adopting the bamboo marketing app to help them with selling their bamboo products [15]. Similarly, the farmers of the Palangue Agrarian Reform Cooperative (PARC) are constantly in touch with government programs as they have been active in testing government-initiated technology, such as iron-fortified rice and in improving their land use with repurposing unused urban spaces [12,14]. It is therefore expected that these farmers, who are informed constantly by the government and other agencies, would have a correlation with their adoption of e-commerce ($p < 0.000$).

Consequently, social influence (SI) heavily affects others in terms of trying something new or staying with the status quo. As Yang et al. (2009) reported, social influences, behavioral beliefs, and personal traits mold how their respondents adopted and used mobile payment services [22]. Seeing other people doing anything when others, especially groups of people, do the same action becomes a signal or invitation to do the same. This was seen in this study ($p < 0.000$) after the farmers were asked whether their family, other farmers, and harvest sales experts would affect their choice to try and integrate e-commerce into their farming practices.

To add context to the questionnaire, interview answers were collected from the respondents. In total, 34.2% of farmers had no major problems prior to the pandemic in terms of their farming. Others faced issues like low selling prices, lack of sales, the oversupply of crops, and haggling of consumers. Two respondents mentioned that they were not farmers prior to the pandemic, and one respondent was not able to be interviewed at all. Of the 36 who had pre-existing problems, 25 (69.44%) reported no worsening of problems encountered in farming. Five farmers reported receiving fewer sales, three with over-haggling buyers, and two selling their crops for cheaper. New issues included lockdown-related challenges, price increases for (farming) materials, and sales-related problems.

Eighteen farmers said that as a result of the study, they did not experience any improvements in their living conditions. Only nine farmers mentioned that all their problems had disappeared since the pandemic started. On the other hand, nineteen farmers had better sales experiences. There was increased demand due to lockdown restrictions. Buyers came directly to them, bypassing middlemen. Some sales in Naic also improved due to some northern Luzon regions being affected by harsh typhoons. Based on only 11 narratives, most uses of e-commerce helped increase the farmers' market reach. Seven reports mentioned that they earned the same or increased their income. There was also one report of eye strain due to their prolonged use of gadgets.

Farmers were also asked regarding external assistance from the government. Most mentioned needing financial help, especially for loans and (farming) materials. It is important to also highlight that one farmer is requesting that middlemen activities are regulated to help them earn more. The Rice Tariffication Law was also mentioned to be improved because farmers in Naic are currently not earning much from selling rice, despite it being a staple crop. One farmer also requested marketing, climate change, and comprehensive land use training. Half of the respondents saw the need for an internet connection for e-commerce as a problem, due to issues like slow internet speeds and increased expenses, and lack of use of the internet outside of e-commerce. The other half do not mind the upkeep of having an internet connection because they think it is affordable, the internet has more uses outside of e-commerce, or that obtaining an internet (home or mobile) connection is accessible.

The majority of the farmers mentioned that using e-commerce is not prevalent because they do not have access to the internet nor an internet-compatible device, leading to unwillingness to use e-commerce. Interestingly, the demographic shows otherwise. Instead, these farmers may be referring to not knowing how to use such devices, which falls more in line with the internet use survey. Moreover, the reason as to why e-commerce is not a norm in Naic (36.51% or 23 farmers) is that farmers mention that they find it easier to sell their produce to ready buyers who go directly to them and buy all their harvest regardless of quality. This makes selling easier and faster without much change to their farming habits. This reason is followed by being too busy already with farming and then by financial constraints.

Twelve farmers had used e-commerce platforms, regardless of whether they were buyers or sellers. Facebook is the preferred platform due to its large network, speed, and reliability. One farmer also mentioned using YouTube as an alternative marketing tactic, wherein their vegetables are vlogged by their child.

4. Conclusions

The study was able to understand better the current implementation of technology, specifically e-commerce, in the lives of the farmers of Palangue Agrarian Reform Cooperative (PARC). These farmers have problems when it comes to selling their crops and are also burdened with the never-ending price increase for the goods they need for farming or personal purchases. Based on their knowledge of e-commerce and their current farming practices, their perceptions on possibly adopting e-commerce were measured. It was found that perceived innovativeness (PI; $p = 0.001$), perceived usefulness (PU; $p < 0.000$), information awareness (IA; $p < 0.000$), and social influence (SI; $p < 0.000$) were significantly correlated with their willingness to adopt (WTA) e-commerce to help improve their sales practices. The monthly data allocation was also statistically significant ($p = 0.001$) with WTA.

Despite this finding and the farmers' ready access to technology (internet service/connection, personal/household devices, etc.), e-commerce is not the primary way of selling produce. Improving communication and coordination within the cooperative could help ease the problems of the oversupply of specific crops and centralizing and convening farming efforts in their area. The adoption of e-commerce as a means of selling produce can come after improvements are made to existing systems and increased government support is received. While this study focuses on WTA e-commerce, implementation and integration should be further studied while closely monitoring farmers' current practices, gathering feedback on farmer e-commerce uses, and comparing such data with traditional selling methods to suggest more realistic approaches to improve farmers' livelihoods.

Author Contributions: Conceptualization, D.J.S.O. and G.R.A.; methodology, D.J.S.O. and G.R.A.; investigation, D.J.S.O.; writing—original draft preparation, D.J.S.O.; writing—original draft preparation, G.R.A.; supervision, G.R.A.; funding acquisition, D.J.S.O. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: The data presented in this study are available in <https://docs.google.com/document/d/1hFCujdctHJbYfoil1MrWfwaOkDdwsryr/edit> (accessed on 1 October 2023).

Acknowledgments: The authors thank the Palangue Agrarian Reform Cooperative (PARC) farmers for their participation in this study.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Esguerra, D.J. Metro Manila Placed under "Community Quarantine" Due to COVID-19. Newsinfo.inquirer.net. Available online: <https://newsinfo.inquirer.net/1240942/breaking-metro-manila-placed-undercommunity-quarantine-due-to-covid-19> (accessed on 15 June 2022).
2. Food and Agriculture Organization. Rapid Assessment of the Impact of COVID-19 on Food Supply Chains in the Philippines—Philippines. ReliefWeb. Available online: <https://reliefweb.int/report/philippines/rapid-assessment-impact-covid-19-foodsupply-chains-philippines> (accessed on 15 June 2022).
3. Domingo, K. 90,000 Businesses Remain Closed Due to COVID-19 Pandemic. ABS-CBN News. Available online: <https://news.abscbn.com/business/09/28/20/number-of-closed-businesses-closure-affectedcovid19-coronavirus-disease-pandemic-philippines> (accessed on 15 June 2022).
4. Dela Peña, K. The Malady of Food Waste: Millions Starve as Trash Bins Fill with Leftovers. INQUIRER.net. Available online: <https://newsinfo.inquirer.net/1505252/themalady-of-food-waste-millions-starve-as-trash-bins-fill-with-leftovers> (accessed on 15 June 2022).
5. Food Shortage Looms Amid Quarantine. Philippine Daily Inquirer. Available online: <https://newsinfo.inquirer.net/1250716/food-shortage-looms-amid-quarantine> (accessed on 15 June 2022).
6. GMA News Online. Typhoon-Hit Quezon Province Needs Massive Replanting Program, Governor Says. GMA News Online. Available online: <https://www.gmanetwork.com/news/news/regions/765771/typhoon-hit-quezonprovince-needs-massive-replanting-program-governor-says/story/> (accessed on 15 June 2022).
7. Rita, J. Agriculture Damage in Caraga Due to Auring Reaches over P21M—NDRRMC. GMA News Online. Available online: <https://www.gmanetwork.com/news/news/regions/777248/agriculture-damagein-caraga-due-to-auring-reaches-over-p21m-ndrrmc/story/> (accessed on 15 June 2022).

8. Grana, R. Prices of Vegetables are Shockingly High—A Benguet Farmer Explains Why. Available online: <https://news.abscbn.com/ancx/culture/spotlight/01/14/21/prices-of-vegetables-are-shockinglyhigha-benguet-farmer-explains-why> (accessed on 15 June 2022).
9. Fenol, J. 1 in 2 Filipinos Shopped Online for First Time in 2020 Amid Pandemic: VISA Study. ABS-CBN News. Available online: <https://news.abscbn.com/business/03/18/21/1-in-2-filipinos-shopped-online-for-first-time-in-2020-amid-pandemic-visa-study> (accessed on 15 June 2022).
10. Alampay, E.A. Filipino Entrepreneurs on the Internet. *Sci. Technol. Soc.* **2008**, *13*, 211–231. [CrossRef]
11. Cordero, T. AgriNurture, DA, Bataan Freeport Authority Ink Digitalization Program Accord. GMA News Online. Available online: <https://www.gmanetwork.com/news/money/companies/785752/agrinurture-dabataan-freeport-authority-ink-digitalization-program-accord/story/> (accessed on 15 June 2022).
12. The Good News Pilipinas Team. Filipino Technologies Turn Cavite Homes into Safe, Healthy Havens. Good News Pilipinas. Available online: <https://www.goodnewspilipinas.com/filipino-technologies-turn-cavite-homesinto-safe-healthy-havens/> (accessed on 15 June 2022).
13. Biong, I. Cavite Farmers' Coop Lowers Its Prices, Donates Goods in Response to ECQ. INQUIRER.net. Available online: <https://newsinfo.inquirer.net/1258599/cavitefarmers-coop-lowers-its-prices-donates-goods-in-response-to-ecq> (accessed on 15 June 2022).
14. Mayuga, J.L. DAR, Groups to Establish Vegetable Farm in Naic. BusinessMirror. 28 February 2022. Available online: <https://businessmirror.com.ph/2022/02/28/dar-groups-toestablish-vegetable-farm-in-naic/> (accessed on 15 June 2022).
15. Diaz, A.C.; Sasaki, N.; Tsusaka, T.W.; Szabo, S. Factors affecting farmers' willingness to adopt a mobile app in the marketing of bamboo products. *Resour. Conserv. Recycl. Adv.* **2021**, *11*, 200056. [CrossRef]
16. Eastin, M.J. Diffusion of E-Commerce: An Analysis of the Adoption of four E-Commerce Activities. *Telemat. Inform.* **2002**, *19*, 251–267. [CrossRef]
17. Agarwal, R.; Prasad, J. A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology. *Inf. Syst. Res.* **1998**, *9*, 204–215. [CrossRef]
18. Alalwan, A.A.; Baabdullah, A.M.; Rana, N.P.; Tamilmani, K.; Dwivedi, Y.K. Examining adoption of mobile internet in Saudi Arabia: Extending TAM with perceived enjoyment, innovativeness and trust. *Technol. Soc.* **2018**, *55*, 100–110. [CrossRef]
19. Fagan, M.; Kilmon, C.; Pandey, V. Exploring the adoption of a virtual reality simulation. *Campus-Wide Inf. Syst.* **2012**, *29*, 117–127. [CrossRef]
20. Gefen, D.; Straub, D. The Relative Importance of Perceived Ease of Use in IS Adoption: A Study of E-Commerce Adoption. *J. Assoc. Inf. Syst.* **2000**, *1*, 1–30. [CrossRef]
21. Quimba, F.M.A.; Calizo, S.C. Determinants of E-Commerce Adoption of Philippine Businesses. 2019. Available online: <https://www.econstor.eu/handle/10419/240975> (accessed on 25 May 2022).
22. Yang, S.; Lu, Y.; Gupta, S.; Cao, Y.; Zhang, R. Mobile payment services adoption across time: An empirical study of the effects of behavioral beliefs, social influences, and personal traits. *Comput. Hum. Behav.* **2012**, *28*, 129–142. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.