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Taiwanese Smallholder Farmers' Perceptions and Barriers to Adopting Facebook

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Abstract

Social media is an effective tool used in extension services and mass/distance education. Facebook is a successful social network site for information gathering and sharing. Facebook's penetration rate is higher in Taiwan than in any other Asian country. The purpose of this study was to determine the influences of selected factors on the adoption of Facebook by Taiwanese smallholder farmers. The study examined smallholder farmers' perceptions of Facebook according to Rogers' (2003) characteristics of an innovation and smallholder farmers' perceptions of potential barriers to adopting Facebook. Three hundred and fifty one smallholder farmers participated in the survey research. Respondents were asked to rate their perceptions of Facebook and potential barriers to adopting Facebook: relative advantages, compatibility, complexity, trialability, observability, financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns. Respondents held positive perceptions of compatibility, complexity, observability, relative advantage, and trialability as characteristics of Facebook. Respondents neither agree nor disagree with respect to technology concerns, financial concerns, concerns about time, planning issues, and concern about incentives for the adoption of Facebook. Future research should focus on perceptions of potential barriers by smallholder farmers who were in early and middle stages of the innovation-decision process. This may help extension services understand better the barriers that slow down the speed of Facebook adoption by smallholder farmers.

Keywords: Adoption, Diffusion, Taiwan, Smallholder farmers, Facebook

Introduction

Farmers need to apply up-to-date skills and new technologies to manage and market their business in an efficient way. Agricultural education depends heavily on professional training and development. When discussing human resource development for the agricultural workforce, Rivera and Alex (2008) wrote agricultural education systems include distance education, extension services, formal education, and in-service training. These outreach education services help farmers prepare for conquering new challenges. Using popular communication tools can help farmers stay connected with extension agents, other farmers, and the farming community (Ganpat, Ramjattan, & Strong, 2016). Miller and Hsu (2003) noted that Taiwan's entry into the World Trade Organization in 2002 has resulted in a need to "diversify agriculture development" (p. 450).

Taiwan is a subtropical island located in East Asia. In 2012, only 5% of the workforce was employed in agriculture in Taiwan. According to the Taiwan Council of Agriculture (2013), the average age of farmers in Taiwan was 61 years. Fewer and fewer young people stay in farming. Encouraging the young generation to engage in farming has become a critical issue in Taiwan. Smallholder farming is the main operation mode in Taiwan. Family income is 20% less for farm households than for all households. To increase the income and operational effectiveness of smallholder farmers, the Taiwan Council of Agriculture encourages farmers to join local agricultural production marketing groups. Chang and Tsai (2015) found that Taiwanese farmers generally learn about agricultural technology and acquire farming knowledge from other farmers by sharing information and following the practical examples of other farmers. Another way for Taiwanese farmers to learn is from government extension programs. Farmers learn from other farmers and from extension outreach education through agricultural production marketing groups. Farmers who grow the same crops in same area join together as agricultural production and marketing groups to cooperate with governmental organizations to improve production and marketing performance. Regional farmers' associations and regional extension provide services and grants to support the groups. Farmers share knowledge of how to improve their production methods and sales via routine group meetings. Extension agents and staff of regional farmers' associations attend the meetings to see how the groups operate and supervise the groups. They also give training on weed and pest control, introduce new agricultural technologies, and update agricultural policies and regulations to farmers. Farmers get useful and practical information during group meetings.

Social media and Internet adoption have changed people's approaches to information seeking and delivery (Henroid, Ellis, & Huss, 2003). Through social media, farmers can gather useful information and disseminate the information about their agricultural products. Social media is an effective tool for extension services and mass/distance education. In addition, with increased awareness of food safety, consumers want to communicate directly with the farmer who grew their food. Social media bridges the communication gap between consumers and farmers. To facilitate knowledge exchange and communications among farmer communities and between farmers and their customers, the Taiwan Council of Agriculture encourages farmers to adopt social media for gathering agricultural information and interacting with potential consumers. Facebook is a successful social network site for information gathering and sharing. Some

agriculture-related foundations and agriculture extension systems in Taiwan have used their Facebook pages to publicize the latest agricultural information and events. They also answer questions from farmers via Facebook. This shortens communication time and distance. In addition, farmers can communicate with their customers directly via Facebook to eliminate concerns about food safety and raise awareness about domestic food security.

Rogers' (2003) diffusion of innovation theory was used for the theoretical framework of this study and bound by Taiwanese farmers' perceptions of the characteristics of Facebook use and barriers to Facebook use. Rogers (2003) defined an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p.12). Using existing studies, Rogers produced a systematic classification of the characteristics of innovation. These five attributes of innovations are relative advantage, compatibility, complexity, trialability, and observability. The use of Rogers (2003) diffusion of innovation theory has been widely used by researchers to study innovations in international agricultural and extension education (e.g., Gunter, J., Moore, K. M., Eubank, S., & Tino, G., 2016; Poolsawas & Napasintuwong, O., 2013; Shelburne, Lawver, Ulmer, Stephenson, Magogo, 2016; Wynn, Coppedge, & Strong, 2013).

Relative advantage is "the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 2003, p. 229). The relative advantage of an innovation is a strong predictor of the rate of adoption. According to White, Meyers, Doerfert, and Irlbeck (2014), U.S. agriculturists considered communicating agricultural information as the relative advantage of social media. Social media brought an entire new way of creating and sharing information. Gillespie's (2011) found that beef producers valued using social media to create relationships. Research has shown that the relative advantages of Facebook are: information sharing, communication, cooperation, and entertainment (Lee & Suh, 2013; Maman & Usluel, 2010). These functions can be considered important factors impacting the adoption of Facebook.

Compatibility is "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 240). Facebook integrates the functions of these online communication tools, meeting the communication needs of users. As the most popular social networking site, the functions of Facebook also meet collaboration, information sharing, and entertainment needs (Mazman & Usluel's, 2010; Lee & Suh, 2013). Lee and Suh's (2013) show that Facebook users believe that Facebook is compatible with their real life. This increases adaptation of Facebook because the values and beliefs of users are not in conflict with new technology.

Complexity is "the degree to which an innovation is perceived as difficult to understand and use" (Rogers, 2003, p. 257). Complexity is the only negative attribute toward innovation adoption. Mazman and Usluel (2010) and Davis (1989) regard complexity as "ease of use". An innovation with high complexity may produce high entry barriers, delaying the adoption of the innovation. Interestingly, Lee and Suh (2013) found that Facebook users did not perceive ease of use on Facebook because Facebook provides too many functions. Thus, innovation technologies with user-friendly and easy-access interfaces are much more likely to be adopted.

Trialability is "the degree to which

an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 258). Roger states that trialability is more essential to earlier adopters than later adopters because later adopters may already be surrounded by earlier adopters. Accessibility may a barrier for beef producers adopting social media (Gillespie, 2011).

Observability is "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 258). Generally, a hardware innovation has more observability than a software innovation because physical objects are more easily observed by people. Though Facebook is not a hardware innovation with a physical object to be observed, as a very popular social networking site, it is also easily observed. In some senses, this makes Facebook like a physical object. According to Gillespie (2011), the key factor influencing U.S. beef producers' adoption of social media was observability.

When the attributes of an innovation are not perceived as positive, potential users tend to not adopt it. Telg and Barnes (2012) found that members of Florida Young Farmers & Ranchers thought that the Florida Farm Bureau Federation should adopt social media for internal and external communications. Rogers (2003) indicated that relative advantage and compatibility have the greatest influence on the rate of adoption. Mazman and Usluel (2010) found that relative advantage helped forecast the adoption of Facebook. Their study showed Facebook adoption was positively related to relative advantage and simplicity.

Barriers may slow or stop potential users adopting new technology. Technology concern is a significant barriers to adopting technology. (Buehrer, Senecal, & Pullins, 2005; Del Aguila-Obra & Padilla-Melendez, 2006; Jamerson, 2013; Newbury, Humphreys, & Fuess, 2014; Steinman & Hawkins, 2010; Warren, 2004). Li and Lindner (2007) found technology concerns were a moderate barrier to the adoption of Web-based education in China. Social media is a good tool for marketing of small business. However, businesses that use social media to promote their products may face associated technology concerns: legal risks, such as copyright, data security, and privacy issues (Steinman & Hawkins, 2010). According to Newbury et al. (2014), extension educators needed better control of social media privacy and better quality of Internet accessibility to adopt social media in Wisconsin and New York states. The owners of Kentucky wineries were concerned about technology because they did not have fast to Internet access to use social media (Jamerson, 2013). The Oregon State University extension service conducted a study in assessing faculty and staff of two Oregon counties on technology adoptions for facilitating learning and communications (Diem, Gamble, Hino, Martin, & Meisenbach, 2009). The results showed that time, money, and training were the main barriers to technology adoption. Lack of a system-wide technology plan might also be a barrier. Texas Cooperative Extension county extension agents had similar concerns when they considered adopting eExtension, a web-based multimedia learning modules system (Harder & Lindner, 2008). Lack of training and technical support also prevent potential users from Internet technology adoption (Buehrer et al., 2005; Harder & Lindner, 2008).

According to Gillespie (2011), time is not a new barrier for agriculturists to adopt communication technologies. Farmers tend to finish their routine job first before thinking about using computers. Rogers wrote that an incentive for people to try an innovation can increase the degree of relative advantage of the innovation. Aleke, Ojiako, and Wainwright (2010) concluded that government support plays a critical role

in adoption of online communication tools. When government organizations adopt online communication tools as information dissemination channels and provide support to farmers to access this information, farmers are also motivated to adopt online communication tools. Personal interest in social media may be a factor in agriculturalists decision whether to adopt social media. Gillespie (2011) found the main reason that U.S. beef producers did not adopt social media was that they were not interested in using social media.

Purpose and Objectives

The purpose of this research was to describe the influence of selected factors on the adoption of Facebook by smallholder farmers in central Taiwan. The objectives were describe smallholder farmers' perceptions of Facebook according to Rogers' (2003) characteristics of an innovation (relative advantage, compatibility, complexity, trialability, and observability), and smallholder farmers' perceptions of potential barriers (financial concerns, concerns about time, technology concerns, planning issues, and concerns about incentives) to adopting Facebook.

Methods

A descriptive research design was applied for this study. Descriptive research is important in education (Gall, Gall, & Borg, 2007). Data was collected in person using an instrument based on Harder's (2007) diffusion of eXtension among extension agents study. The characteristics of an innovation are used to measure five main attributes of innovation diffusion (Rogers, 2003). Harder's (2007) instrument was modified in this study to match the context of Facebook. The questionnaire was translated into traditional Chinese by the researcher. The questionnaire contained sections examining: stage in the innovation-decision process; the involvement and perceptions of Facebook; the potential barriers to Facebook; and the characteristics of respondents.

To test the reliability and face validity of the instrument, a pilot study was conducted with 42 farmers in the Dahu area who were not included in the sample population. Each internal scale was tested using Cronbach's alpha coefficient (Cronbach, 1951). Based on participant feedback in the pilot study two additional barriers were added: financial concerns and planning issues. Due to the low alpha level of concerns about incentives in pilot test, the researcher revised the statements for this factor. Reliability for the final instrument was: Relative Advantage (α=.98); Compatibility (α=.96); Complexity (α=.93); Trialability (α=.97); Observability (α=.95); Financial Concerns (α=.92); Concerns about Time (α=.96); Concerns about Incentive (α=.95); Planning Issues (α=.96); and Technology Concerns (α=.93).

The target population was farm families of Dahu Farmers' Association in Miaoli County in 2015. The total target population was approximately 3,905 people. Dillman's (2008) formula was adapted to calculate an appropriate sample size of this study. The final sample size (N=350) is within ±5 percentage points at a 95% confidence level, with a 50/50 split of a possible sample of 378. To ensure the homogeneity of the social system, participants were all farmers who attended group meetings of agricultural production and marketing groups under the Dahu Farmers' Association. Caution is warranted against generalizing the findings, conclusion, and recommendations beyond the target population; Dahu Farmers' Association members may not be representative of all smallholder farmers in Taiwan. Participants were asked to rate 63 statements based upon a five-point

summated scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). The true limits of the scale scores where interpreted as follows: 1-1.5 = *Strongly Disagree*, 1.51-2.5 = *Disagree*, 2.51-3.5 = *Neither Disagree nor Agree*, 3.51-4.5 = *Agree*, 4.51-5 = *Strongly Agree*. The researcher randomly selected fifteen groups and attended their group meetings to collect data; 376 respondents participated in the survey. Two participants opted out. An additional 23 responses were removed due to missing data. Thus, 351 (93.4%) questionnaires served as the data sample. Descriptive statistics was computed. The alpha level for data analysis was set *a priori* at .05. Study variable were: compatibility, complexity, concerns about time, concerns about incentives, financial concerns, observability, planning issues, relative advantage, technology concerns, and trialability.

Finding/Results

The first objective was to determine smallholder farmers' perceptions of Facebook according to Rogers' (2003) characteristics of an innovation. Farmers agreed Facebook had a relative advantage (M = 3.73, SD = .59), was observable (M = 3.72, SD = .62), was triable (M = 3.57, SD = .81), was compatible with their believed values, past experiences and needs (M = 3.56, SD = .58), and perceived as not complex (M = 3.51, SD = .59). The grand mean and standard deviation of each factor is shown in Table 1.

Table 1
Respondents' Perceptions of Facebook by Construct

Construct	*M*	*SD*
Relative Advantage	3.73	.59
Observability	3.72	.62
Trialability	3.57	.81
Compatibility	3.56	.58
Complexity	3.51	.59

Note: N = 351. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Seven relative advantage items were evaluated by respondents. Table 2 shows the mean and standard deviation of each item. Responding farmers tended to agree with all of the statements. The statement "Using Facebook to get information of daily life is easier than the traditional way" (M=3.76, SD= .65) has the highest mean. The statement "Using Facebook as a resource will make marketing easier" (M= 3.71, SD= .62) had the lowest mean and standard deviation.

Table 2
Respondents' Perceptions of the Relative Advantage of Facebook

Relative Advantage Items	*n*	*M*	*SD*
Using Facebook to get information of daily life is easier than the traditional way	351	3.76	.65
Using Facebook to obtain information is more time-saving	351	3.75	.64
Using Facebook to gather agricultural information is easier than traditional ways	351	3.74	.67
Using Facebook to share my farm stories is easier than the traditional way	351	3.73	.64
Using Facebook to interact with agriculturists is easier than the traditional way	351	3.73	.62
Using Facebook to market my farm products is less cost than the traditional way	351	3.72	.64
Using Facebook to interact with my customers is easier than the traditional way	351	3.71	.64
Using Facebook as a resource will make marketing easier	350	3.71	.62

Note: Overall *M* = 3.73, *SD* = .59. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Seven compatibility items were evaluated. Table 3 shows the mean and standard deviation of each item. Respondents tend to agree with most of the statements. The statements "I use Facebook to get daily life information" (*M*= 3.62, *SD*= .64) had the highest mean. Respondents tend to neither agree nor disagree with the statement "Facebook meets my need of marketing" (*M*= 3.44, *SD*= .65).

Table 3
Respondents' Perceptions of the Compatibility of Facebook

Compatibility Items	*n*	*M*	*SD*
I use Facebook to get daily life information	351	3.62	.64
I acquire potential customer via Facebook	351	3.60	.66
Via Facebook, I can cultivate trusted relationships with my customers	351	3.59	.66
It is necessary to use Facebook to marketing my farm product	351	3.59	.65
I use Facebook to get real-time information from government & extension service	351	3.56	.65
Facebook meets my need of communication	351	3.55	.64
Facebook meets my need of marketing	351	3.44	.65

Note: Overall *M* = 3.56, *SD* = .58. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Five complexity items were evaluated. Table 4 shows the mean and standard deviation of each item. Responding farmers tend to agree with some statements. The statement "Using Facebook to access information is easy for me" (*M*= 3.59, *SD*= .64) had the highest mean. Respondents tend to neither agree nor disagree with the statements "I am confident to use Facebook" (*M*= 3.49, *SD*= .69), and "Facebook seems user-friendly" (*M*= 3.43, *SD*= .67).

Table 4
Respondents' Perceptions of the Complexity of Facebook

Complexity Items	*n*	*M*	*SD*
Using Facebook to access information is easy for me	351	3.59	.64
Facebook is a good communication channel for me	351	3.58	.66
Using Facebook seems simple	351	3.50	.66
I am confident to use Facebook	351	3.49	.69
Facebook seems user-friendly	351	3.43	.67

Note: Overall *M* = 3.51, *SD* = .59. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Seven trialability items were evaluated. Table 5 shows the mean and standard deviation of each item. Respondents tend to agree with most of the statements. The statement "I can click "like" on Facebook" (*M*=3.64, *SD*= .90) had the highest mean. Responding farmers tend to neither agree nor disagree with the statement "Accessing Facebook is free" (*M*= 3.43, *SD*= .90).

Table 5
Respondents' Perceptions of the Trialability of Facebook

Trialability Items	*n*	*M*	*SD*
I can click "like" on Facebook	351	3.64	.90
I can reply my friends' message on Facebook	351	3.60	.87
I can use "share" function on Facebook	351	3.58	.87
I can post messages on Facebook	351	3.58	.85
I can upload photos to Facebook	351	3.56	.86
I can chat to my friends on Facebook	351	3.55	.85
Accessing Facebook is free	351	3.43	.90

Note: Overall *M* = 3.57, *SD* = .81. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Six observability items were evaluated. Table 6 shows the mean and standard deviation for each item. Respondents tend to agree with all the statements. The statement "I can easily observe my friends' activities on Facebook" (*M*= 3.79, *SD*= .73) had the highest mean. The statement "Facebook is a highly visible social media" (*M*= 3.61, *SD*= .64) had the lowest mean.

Table 6
Respondents' Perceptions of the Observability of Facebook

Observability Items	*n*	*M*	*SD*
I can easily observe my friends' activities on Facebook	351	3.79	.73
Many of my friends use Facebook	351	3.79	.72
My friends have invited me to "like" their Facebook pages	351	3.78	.72
I know my farmer friends use Facebook to promote their farm products	351	3.74	.70
The website of Facebook is well publicized	351	3.63	.67
Facebook is a highly visible social media	351	3.61	.64

Note: Overall *M* = 3.72, *SD* = .62. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

The second objective was to describe farmers' concerns regarding adopting Facebook. Farmers neither agree nor disagree that technology concerns (*M*= 3.29, *SD*= .71), financial concerns (*M*= 3.00, *SD*= .83), concerns about time (*M*= 2.80, *SD*= .84), planning issues (*M*= 2.79, *SD*=.80) or concern about incentives (*M*=2.72, *SD*= .77) were potential barriers to adoption of Facebook. The grand mean and standard deviation of each factor is shown in Table 7.

Table 7
Respondents' of Perceptions of Potential Barriers to Facebook by Construct

Construct	*M*	*SD*
Technology concerns	3.29	.71
Financial concerns	3.00	.83
Concern about time	2.80	.84
Planning issues	2.79	.80
Concern about incentives	2.72	.77

Note: *N* = 351. Scale: *Strongly Disagree* = 1, *Disagree* = 2, *Neither Disagree nor Agree* = 3, *Agree* = 4, *Strongly Agree* = 5.

Five items measuring financial concerns were evaluated. Table 8 shows the mean and standard deviation of each item. Responding farmers tend to neither disagree nor agree with each of the statements. The statement "Cost of advertisement fee on Facebook" had the highest mean (*M*= 3.27, *SD*= .96). The statement "Lack of financial resources to support the necessary devices technologies" had the lowest mean (*M*= 2.83, *SD*= .91).

Table 8
Respondents' Perceptions of Financial Concern as a Potential Barrier to Facebook

Financial Concern Items	*n*	*M*	*SD*
Cost of advertisement fee on Facebook	350	3.27	.96
Cost of monthly internet connection fee	350	3.13	.95
Cost of purchasing the necessary devices technologies	349	2.91	.95
Lack of financial resources to promote my farm Facebook page or my personal Facebook offline	350	2.88	.97
Lack of financial resources to support the necessary devices technologies	350	2.83	.91

Note: Overall *M* = 3.00, *SD* = .83. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Five items of concern about time were evaluated. Table 9 shows the mean and standard deviation of each item. Responding farmers tend to neither disagree nor agree with each of the statements. The statement "Lack of time available is a barrier for me to respond to online requests for information in time" had the highest mean (*M*= 2.88, *SD*= .92). The statement "Lack of time is a barrier for me to learn how to use Facebook" had the lowest mean (*M*= 2.71, *SD*= .88).

Table 9
Respondents' Perceptions of Concerns about Time as a Potential Barrier to Facebook

Concern about Time Items	*n*	*M*	*SD*
Lack of time available is a barrier for me to respond to online requests for information in time	351	2.88	.92
Lack of time available to develop materials for marketing on Facebook is a barrier for me to utilize Facebook	351	2.87	.92
Because I spend my free time working another job, lack of time is a barrier to using Facebook to market my farm	351	2.82	.91
I do not have time to use Facebook for marketing because I spend most of my time farming	350	2.76	.90
Lack of time is a barrier for me to learn how to use Facebook	351	2.71	.88

Note: Overall *M* = 2.80, *SD* = .84. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Eight items regarding concerns about incentives were evaluated. Table 10 shows the mean and standard deviation of each item. Responding farmers tend to neither disagree nor agree with each of statements. The statement "Lack of crops selling increase for marketing on Facebook" had the highest mean (*M*=2.86, *SD*=.97). The statement "Because traditional communication ways are good enough for me, I don't have any motivation to use Facebook" had the lowest mean (*M*= 2.52, *SD*= .83).

Table 10

Respondents' Perceptions of Concerns about Incentives as a Potential Barrier to Facebook

Concern about Incentive Items	*n*	*M*	*SD*
Lack of crops selling increase for marketing on Facebook	349	2.86	.97
Lack of support from governmental organizations is a barrier to Facebook use	350	2.79	.91
Lack of correlation between using Facebook and getting useful information	351	2.76	.88
Lack of correlation between using Facebook and getting potential customers	351	2.75	.87
I have fear of new technology	351	2.73	.89
Lack of award for involvement with Facebook	350	2.71	.87
Because my friends and family don't use Faceboo, I am not interested in using Facebook	351	2.66	.87
Because traditional communication ways are good enough for me, I don't have any motivation to use Facebook	351	2.52	.83

Note: Overall *M* = 2.36, *SD* = .68. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Seven items measuring planning issues were evaluated. Table 11 shows the mean and standard deviation of each item. Responding farmers tend to neither disagree nor agree with each of statements. The statement "Lack of planned opportunities for farmers to learn about the benefit of using Facebook" had the highest mean (*M*= 2.94, *SD*= .92). The statement "I have no idea what should I do on Facebook" (*M*= 2.66, *SD*= .89) had the lowest mean.

Table 11

Respondents' Perceptions of Planning Issue as a Potential Barrier to Facebook

Planning Issue Items	*n*	*M*	*SD*
Lack of planned opportunities for farmers to learn about the benefit of using Facebook	351	2.94	.92
Lack of strategic planning for connecting potential customers on Facebook	351	2.86	.90
Lack of strategic planning for marketing from online to offline	351	2.85	.90
Lack of strategic planning for marketing on Facebook	350	2.75	.90
Lack of identified (perceived or real) need for using Facebook	351	2.75	.89
Lack of strategic planning for getting information on Facebook	351	2.71	.86
I have no idea what should I do on Facebook	351	2.66	.89

Note: Overall *M* = 2.79, *SD* = .80. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Five items measuring technology concern were evaluated. Table 12 shows the mean and standard deviation of each item. Responding farmers tend to neither disagree nor agree with each of statements. The statement of "Concern of legal issue (e.g., computer crime, hackers, copyright)" had the highest mean (*M*= 3.44, *SD*= .78). The statement of "Lack of appropriate equipment for accessing Facebook (e.g., smart phone, desktop)" (*M*= 3.15, *SD*= .82) had the lowest mean. Among barriers, technology concerns were the highest concerns (overall *M* = 3.29) perceived by responding farmers.

Table 12
Respondents' Perceptions of Technology Concerns as a Potential Barrier to Facebook

Technology concern Items	*n*	*M*	*SD*
Concern of legal issue (e.g., computer crime, hackers, copyright)	351	3.44	.78
Lack of adequate Internet connection speed	351	3.43	.77
Lack of knowledge is a barrier for me to use Facebook	350	3.27	.82
Lack of training programs for me to learn how to use Facebook	350	3.19	.85
Lack of appropriate equipment for accessing Facebook (e.g., smart phone, desktop)	351	3.15	.82

Note: Overall *M* = 3.29, *SD* = .71. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*.

Conclusions, Implications, and Recommendations

The first objective was to describe farmers' perceptions of Facebook based on Rogers' (2003) characteristics of an innovation (relative advantage, compatibility, complexity, trialability, and observability). Respondents had positive attitudes toward perceptions of relative advantage, compatibility, complexity, trialability, and observability as the characteristics of Facebook. They had the most positive perceptions of relative advantage.

Smallholder farmers in this study perceived that Facebook makes information receiving and sharing easier and more time-effective than traditional methods. They also agree that interacting with other agriculturists and customers via Facebook is easier than traditional methods. This finding is consistent with previous studies (Gillespie, 2011; Mazman & Usluel, 2010; White et al., 2013). Respondents agreed that using Facebook for marketing farm products is easier and less costly than traditional methods. This finding is consistent with previous studies that show that Facebook could be an affordable cost-effective investment as a communication and marketing platform for small business to release product information and to reach a larger audience (Ouoba, 2011; Yates & Vallas, 2012).

Rogers (2003) indicated that "an idea that is more compatible is less uncertain to the potential adopter and fits more closely with the individual's situation" (p. 240). Rogers (2003) also suggested evaluating compatibility of an innovation by previously introduced ideas and client needs. Respondents hold a positive attitude toward the compatibility of Facebook and agreed that Facebook meets their needs in terms of communication, information receiving, acquiring potential customers, and cultivating trusted relationships with customers. Though respondents agreed that it is necessary to use Facebook to increase sales of their farm products, they neither agree nor disagree with respect to whether Facebook meets their marketing needs. This indicates that Facebook is not a major marketing tool for the smallholder farmers. They may do marketing via other channels more often.

Facebook was not perceived to be complicated by the smallholder farmers. Respondents agreed that accessing information on Facebook is easy. They also agreed that Facebook is a good communication channel for them. Participants neither agree nor disagree with respect to whether Facebook was user-friendly. Respondents neither disagree nor agree they have the confidence to use Facebook. This finding is consistent with Lee and Suh's study (2013) that Facebook

users did not perceive ease of use on Facebook because Facebook provides too many different functions. A possible explanation is that in this study both Facebook users and non-users were asked to answer these questions. An implication exists that non-users of Facebook may tend to hold a negative attitude toward these questions.

Respondents perceived the trialability of Facebook positively. The standard deviation for trialability was higher relative to other attributes. This means respondents had quite contrasting perceptions on the trialability of Facebook. Respondents agreed they could try many functions of Facebook such as replying to messages, sharing, posting messages, uploading photos, and chatting. Participants, however, neither disagreed nor agreed that accessing Facebook is free. This is interesting because creating a Facebook account and accessing Facebook does not require any fee. A possible explanation is that non Facebook users may think accessing Facebook is not free. Another explanation is non Facebook users do not have devices or stable Internet speed to access Facebook.

Though Rogers (2003) indicated that a software component of an innovation is not obvious to observation and has a relatively slower rate of adoption, respondents had positive perceptions of Facebook's observability. They agreed Facebook is a highly visible social media tool and many of their friends use Facebook. A possible explanation is the popularity of Facebook as the number one social networking site in the world. It also has been popular for more than six years in Taiwan. This had meant that Facebook has moved from the online to the offline world. Thus, the observability of Facebook is perceived positively even by smallholder farmers in a rural area.

As a social networking site, Facebook is a mature product on the market. This may be the reason that respondents had positive perceptions toward these five attributes of Facebook. In addition, Facebook is still developing new functions. At the time of the study, Facebook introduced new e-commerce functions. Users can now create Facebook stories and sell products on Facebook directly. Smallholder farmers may follow this trend to use Facebook as an online store to increase sales of crops.

The recommendation for practice is to host workshops for farmers to train them to use Facebook for marketing. Recommendations for future research are: explore which tools smallholder farmer use for marketing; explore those Facebook non-users' perceptions of the characteristics of Facebook to understand better the adoption rate of Facebook; and conduct a focus group interview for farmers who have purchased Facebook advertisement to see if they are the innovators of adopting Facebook.

The second objective of the study was to describe farmers' perceptions of potential barriers to adopting Facebook (financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns). Respondents neither agree nor disagree with respect to technology concerns, financial concerns, concerns about time, planning issues or concern about incentives for the adoption of Facebook.

Respondents tended to neither agreed nor disagreed with these five concerns regarding the adoption of Facebook. An implication exists that respondents in the early stages of innovation-decision process may rate these concerns relatively highly, while respondents in the late stages of the innovation-decision process may rate these concerns as less important.

Respondents appeared not to have

many financial concerns. This may be the reason that only nine respondents have bought advertisements on Facebook. Respondents tended to neither agree nor disagree about time as a concern. They rated highest on “Lack of time available is a barrier for me to respond to online requests for information in time”. As previously mentioned, farmers have many routine jobs to do. It may be hard for them to reply to online requests instantly. Respondents neither agreed nor disagreed that they had concerns about incentives. They rated highest on “Lack of crops selling increase for marketing on Facebook”. This may be the reason that respondents rated lowest on “Facebook meets my need of marketing” in perceptions of compatibility. Respondents tended to neither agree nor disagree with respect to planning issues. They rated highest on “Lack of planned opportunities for farmers to learn about the benefit of using Facebook”. This may indicate some respondents need to know the benefit of using Facebook. Respondents had the greatest concerns about technology among these five potential barriers though they held statistically similar perceptions of technology concerns. They rated highest on “Concern of legal issue (e.g., computer crime, hackers, copyright).” This finding is consistent with previous studies (Steinman & Hawkins, 2010; Gillespie, 2011).

Future research should attempt to focus on emerging technological innovations; tracking attributes and barriers longitudinally. This may help provide a more accurate view of attributes and barriers of innovations that both succeed and fail. Additional research focusing solely on perception of barriers and attributes by potential adopters who are still at the early or middle stages of innovation-decision process. This may help understand better why innovations are adopted or rejected. Potential adopters at the late stages of the innovation-decision may already have overcome barriers or may not perceive as many barriers as the potential adopters who remain at the early stages of innovation-decision process. Research focusing on those smallholder farmers who have rejected innovations is also needed. Continued research is needed to describe potential attributes and barriers to adoption or rejection of innovations by smallholder farmers is needed to help them remain competitive. The research should be expanded to included broader population of farmers in Taiwan and other countries.

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