CHARACTERISTICS AND BARRIERS IMPACTING THE DIFFUSION OF FACEBOOK AMONG SMALLHOLDER FARMERS IN CENTRAL TAIWAN

A Dissertation

by

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ABSTRACT

Social media helps farmers located in geographically isolated rural areas stay connected to the world. 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. In Taiwan, Facebook's penetration rate is higher 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 the relationships between characteristics of smallholder farmers, innovation characteristics, stage in the innovation-decision process, and potential barriers to the adoption of Facebook. A descriptive and correlational research design was used for this study. Three hundred and fifty one smallholder farmers participated in the survey.

Nearly half of the responding farmers were at the stage of "implementation." Sixteen respondents were at stage of "confirmation." Ninety-seven respondents were at the stage of "knowledge." Thirty respondents were at the stage of "no knowledge." Most respondents had Facebook accounts. The most common usages of Facebook were to connect with friends, receive agricultural information, read daily news and information, share daily life stories with others, and share professional knowledge with others. Nearly half of respondents with Facebook accounts used Facebook for farm marketing purposes.

Respondents held positive perceptions of relative advantage, compatibility, trialability, observability and low complexity as characteristics of Facebook.

Respondents held neutral perceptions regarding technology concerns, financial concerns, concerns about time, planning issues, and concern about incentives for the adoption of Facebook.

The respondents were significantly different in perception of Facebook based on years of farming experience, gender, age, education, and income. Responding farmers also expressed significant differences between their perceptions of potential barriers by years of farming experience, farm size, gender, age, education level, and income status. Significant negative relationships existed between smallholder farmers' perceptions of Facebook and potential barriers to Facebook. Trialability, planning issues, relative advantage, compatibility, observability, education, complexity, technology concerns, and age served as powerful predictors of respondents' stages in the innovation-decision process.

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CHAPTER I

INTRODUCTION

In the global agricultural market, Taiwan and the United States are in close partnership. Statistics from the United States Department of Agriculture (USDA) in 2012 reported that Taiwan is the sixth largest export market of U.S. agricultural products. One third of agricultural products imported into Taiwan are from the United States. United States is also one of the top three export markets for Taiwanese agricultural products (Taiwan Council of Agriculture, 2012b). For decades, Taiwan and the United States have been partners in agricultural trade and global agricultural development forums designed to accelerate cooperation in agricultural development. The Joint Center of Texas A&M Borlaug Institute and National Chung Hsing University (NCHU) International Agriculture Complex was established to stimulate cooperation in agricultural development between the United States and Taiwan. Texas A&M University's Borlaug Institute is rooted in international agricultural development and implements agricultural training programs worldwide. NCHU is a public university in central Taiwan with a well-known College of Agriculture and Natural Resources. The cooperation between the Borlaug Institute and NCHU aims to create a better future for global and local agricultural development. Understanding the needs of people working in agriculture in Taiwan can help bring a positive impact to local extension services and global agricultural development organizations.

Agricultural knowledge and information are vital for facilitating rural development. Understanding these needs and developing educational training programs are critical for the human resource development of farmers. Agriculture is a highly knowledge-intensive field. 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. In their discussion of human resource development for the agricultural workforce, Rivera and Alex (2008) wrote that agricultural education systems include extension services, formal education, in-service training, and mass/distance education while discussing human resource development for the agricultural workforce. 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.

A review of the historical and current situation of Taiwanese farmers, social media in Taiwan, statement of the problem, research objectives, theoretical framework, definition of terms, significance of the study, and limitations of the study are presented in this chapter.

Taiwanese Farmers

Taiwan is a subtropical island located in East Asia. The total area of Taiwan is about 13,855 square miles. In the early 20th century, sugarcane refining and camphor extraction were the main export goods of Taiwanese agriculture. In the late 20th century, the main export as well as domestic dominant crop was rice. Taiwan's entry into the

World Trade Organization in 2001 created a significant challenge for Taiwanese agriculture. The exemption from customs duty for foreign agricultural imports severely influenced the demand and the price of domestic crops. Taiwanese agriculture focuses on marketing and exporting specialty crops to other countries. The main exported agricultural goods are green soybean, phalaenopsis, weever, and high-mountain tea.

The Taiwanese population has shifted from rural areas to fast-growing urban areas due to the decline of domestic agriculture and increasing labor demands of the engineering industry. In the 1970s, 35% of the workforce was employed in agriculture. However, in 2012, only 5% of the workforce was employed in agriculture in Taiwan. Compared to the 1990s, 280,000 fewer people were employed in agriculture in 2012. According to the Taiwan Council of Agriculture (2013b), 17% of Taiwan agriculturists are under 40 years old while 17% of agriculturists are over 65 years old. The average age of farmers in Taiwan was 61years. The predicted average of farmers in ten years will be 71 years. Fewer and fewer young people stay in farming. Encouraging the young generation to engage in farming has become a critical issue in Taiwan.

The agricultural operation mode in Taiwan is represented mainly by smallholder farms. The average farm size is only about 1.73 acres per family (Taiwan Council of Agriculture, 2012a). The average annual farm household income in Taiwan is $32,117 US Dollars (USD) per farm family. The annual income from agricultural crops and products ($6,961 USD) is lower than the income from elder farmer annuity and agricultural subsidies ($7,668 USD). Family income is, on average, 20% less for farm households than for all households. Smallholder farmers face difficulties accumulating

investment, increasing incomes, and expanding the scale of their operations. Prices for agricultural products are lower when smallholder farmers sell to wholesalers compared to selling crops directly to consumers because smallholder farmers lack sufficient bargaining power when negotiating the price of their agricultural products (Taiwan Council of Agriculture, 2013a). As a result, smallholder farmers have generally failed to implement modernized cultivating methods to increase their production.

To increase the 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 in Taiwan, most farmers do not have a college education. 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 and non-government organizations. Farmers learn from other farmers and from extension outreach education through agricultural production marking groups.

These groups are the fundamental units for agricultural production in Taiwan. 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. Each group usually has fifteen to thirty members. These groups are registered groups under regional farmers' associations. Regional farmers' associations and regional extensions provide services and grants to support the groups. Each group is required to host bi-monthly meetings. In group meetings, farmers

share their knowledge of how to improve their production methods and sales. 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. Sales agents from agricultural chemical companies attend the farmers' group meetings to promote their products and provide services. Therefore, farmers get useful and practical information during the group meetings. As a result, farmers attend the meetings regardless of whether they are members of the group or not.

Social Media in Taiwan

The Internet has already had a great impact on agriculture. The two main impacts of the Internet on agriculture are farmers gathering useful information online and the ability of farmers to communicate with their customers online (American Business Media Agri Council, 2012). Social media and Internet adoption have changed people's approaches to information seeking and delivery (Henroid, Ellis, & Huss, 2003). Social media helps farmers located in geographically isolated rural areas stay connected to the world. Through social media, farmers can gather useful information and disseminate the information about their agricultural products. Social media plays an important role in delivering the latest information to rural areas. 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 improve communication and knowledge exchange among farmer communities and between farmers and their customers, the Taiwan Council of Agriculture encourages farmers to adopt social media to gather agricultural information and to interact with potential consumers. Farming communities regularly share information and knowledge about new agricultural technologies, market information, location, availability and prices of farm inputs, diagnostic information about plant and animal diseases, and soil problems (Ballantyne, 2006).

Social media is two-way online communication media. It provides electronic communication software technologies for social networking. Users can share ideas, personal messages, information, and other content via the Internet (Merriam-Webster's online dictionary, n.d.). People use social media for staying connected to family and friends, developing professional networking, organizing social events or meetings, promoting their business, and socializing (Waters, 2010). Using these two-way communication methods has a positive impact on businesses (Yates & Vallas, 2012).

Facebook has developed as a popular platform for getting real-time information such as news stories online. The audience can click the links and get the full information on the associated webpage. Governmental organizations and non-profit organizations in Taiwan use Facebook to communicate with the public and provide information. Facebook is a successful social network site for information gathering and sharing. In Taiwan, Facebook's penetration rate is higher than in any other Asian country. There are 14 million active Facebook users in Taiwan per month, with a nearly a 60 percent

penetration rate. Over 10 million users organize their social activities through their Facebook accounts every day (Chiu, 2013).

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. In Kaohsiung, a city in the south of Taiwan, the region extension director uses his personal Facebook account to release agricultural information and answer farmers' questions. Farmers upload photos of infected fruit trees to him via Facebook private message. After the director figures out what the disease is and the treatment needed, he replies to the farmer prompt. Also, he posts the photos and solutions on his public Facebook wall to share the information with other farmers (Yang, 2015). This shortens communication time and distance.

Facebook acts as a customized portal website for farmers to get the latest information from various sources. In addition, farmers can communicate with their customers directly via Facebook to eliminate concerns about food safety and raise awareness about domestic food security.

Statement of Problem

Because Taiwan and the United States are in the partnership to speed up cooperation in agricultural development, understanding local agricultural human resources needs in Taiwan will help bring a positive impact to local extension services and global agricultural developers. To stimulate the growth of Taiwanese agriculture, the

Taiwan Council of Agriculture encourages farmers to adopt social media to gather agricultural information and to interact with potential consumers. However, the utilization of social media by Taiwanese farmers has not yet been investigated. Without knowledge of how smallholder farmers utilize social media, agricultural development and extension services will be unable to adequately meet the needs of local farmers. This gap has to be bridged to give agricultural human resource developers a clearer picture and provide appropriate support programs for local farmers.

This study examines the adoption of the most popular social media in Taiwan, Facebook, by selected Taiwanese smallholder farmers to see how social media influences their approaches to processing information and communication. First, the study explored the factors which affect smallholder farmers in Taiwan to utilize social media.

Purpose of Study

The purpose of this research was to determine the relationships and influence of selected factors on the adoption of Facebook by smallholder farmers in central Taiwan.

Research Objectives

1. Describe selected personal characteristics of selected Taiwanese smallholder farmers.

2. Determine selected smallholder farmers' stages in the innovation-decision process, based on Li's (2004) and Harder's (2007) adaptation of Rogers' (2003) stages in the innovation-decision process (no knowledge, knowledge, persuasion, decision, implementation, and confirmation).
3. Determine the extent of selected smallholder farmers' use of Facebook.
4. Determine smallholder farmers' perceptions of Facebook according to Rogers' (2003) characteristics of an innovation (relative advantage, compatibility, complexity, trialability, and observability).
5. Determine smallholder farmers' perceptions of potential barriers (financial concerns, concerns about time, technology concerns, planning issues, and concerns about incentives) to adopting Facebook.
6. Determine if differences existed between smallholder farmers' perceptions of Facebook based on selected demographic characteristics.
7. Determine if differences existed between smallholder farmers' perceptions of potential barriers and their adoption of Facebook based on selected demographic characteristics.
8. Describe relationships between smallholder farmers' perceptions of Facebook (relative advantage, compatibility, complexity, trailability, and observability) and their perceptions of potential barriers (financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns) to the diffusion of Facebook.

9. Predict the stage in the innovation-decision process based on smallholder farmers' selected demographic characteristics, perceptions of the characteristics of Facebook, and perceptions of the barriers to the diffusion of Facebook.

Theoretical Framework

The theoretical framework used in this study is adapted from Rogers' (2003) diffusion of innovations theory. Rogers states that "diffusion is a process in which an innovation is communicated through channels over time among the members of a social system" (p. 5). The rate of adoption is the relative speed at those members of a social system adopt an innovation. Rate is defined by the time length needed by the members of a social system to adopt an innovation. An individual's adopter category which includes innovators, early adopters, early majority, late majority, and laggards determines the rates of adoption for innovations. By definition, innovators, as the pioneers who adopt an innovation, need a shorter adoption time when compared to other adopters, while laggards need the longest time to adopt an innovation or reject it. The rate of diffusing an innovation depends on the characteristics of the adopters and adopters' perceptions of the innovation. In general, the differences in adopters' socioeconomic characteristics, personality variables, and communication behaviors influence adoption of innovations (Rogers, 2003). Earlier adopters have more years of formal education and a higher socioeconomic status than later adopters. Earlier adopters can afford greater risk and uncertainty than later adopters. Earlier adopters have more

active information-seeking behavior and better knowledge of innovations than later adopters.

There are five characteristics of innovations that influence the rate of adoption: relative advantage, compatibility, complexity, trialability, and observability. Innovations that adopters consider has better relative advantage, compatibility, trialability, observability and lower complexity will be adopted earlier than other innovations (Rogers, 2003).

Diffusion of an innovation happens through the innovation-decision process in five stages: knowledge, persuasion, decision, implementation, and confirmation. Rogers describes this innovation-decision process as follows:

> the process through which an individual passes from first knowledge of an innovation (stage of knowledge), to forming an attitude toward the innovation (stage of persuasion), to a decision to adopt or reject (stage of decision), to implementation of the new idea (stage of implementation), and to confirmation of this decision (stage of confirmation) (p. 170).

Li (2004) revised Roger's stages by adding a "no knowledge" stage. The "no knowledge" stage is where a potential adopter has not yet heard of the innovation. This is the first stage of the revised Roger's stages. The most effective communication channels for persuading adopters to accept a new idea or new technology are interpersonal channels. In particular, interpersonal channels link adopters who have a similar socioeconomic status and educational background.

Significance of Study

Studying how small scale farmers utilize Facebook and the factors influencing their adoption of Facebook may have practical and academic implications. This study examined Taiwanese smallholder farmers' perceptions of Facebook, potential barriers to adopting Facebook, adopters' stages in the innovation-decision process, and adopter characteristics. The study may improve the agricultural education system by providing a better understanding of how to approach and provide extension services and mass education for the agricultural workforce. Participation in this study may facilitate smallholder farmers' decision-making and adoption processes. In addition, this study can help extend knowledge of Rogers' diffusion of innovations theory.

Definition of Terms

Relative advantage: "the degree to which an innovation is perceived as better than the idea is supersedes" (Rogers, 2003, p. 15)

Compatibility: "the degree to which an innovation is perceived as being consistent with the existing values, past experience, and needs of potential adopters" (Rogers, 2003, p. 15)

Complexity: "the degree to which an innovation is perceived as difficult to understand and use" (Rogers, 2003, p. 16)

Trialability: "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 16)

Observability: "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 16)

Limitations of the Study

This study focused on innovation adoption. Therefore, some of the participants may still be in the early stages of diffusion of innovation. They may not have had sufficient engagement with Facebook. The results of this study may be different several years later because these participants may be at a more advanced stage in the adoption process. However, the data provided a clear picture of Facebook adoption by smallholder farmers in central Taiwan. In addition, the target population is limited to smallholder farmers in central Taiwan. Due to the difference of environments, the results may not be generalized to smallholder farmers in other areas and other countries.

CHAPTER II

REVIEW OF LITERATURE

This research focused on how Taiwanese smallholder farmers adopt Facebook for communication, including receiving information and connecting to consumers. There have been various studies focusing on Facebook and social media. However, no published studies looking at the use of Facebook by smallholder farmers were found. Studies of adoption of online communication tools, including social media, by farmers and small agricultural business, and the diffusion of technologies related to social media are reviewed in order to describe the adoption and diffusion of Facebook by smallholder farmers. The literature is presented in four primary areas: (a) usage of online communication tools, (b) characteristics of innovations, (c) characteristics of adopters, and (d) barriers to adoption of innovations.

Usage of Online Communication Tools

According to Sciadas (2003), if humans do not enhance their capacity to adopt new technologies, inequalities will increase rather than decrease. Ingle (1986) believes that communication technologies can reduce the negative effects of geographical barriers for limiting access to information and knowledge and improve agriculture and rural development. Indeed, the Internet has a positive impact on the agricultural sector for gathering information and communicating with consumers in an efficient way. To improve the quality of both small scale farmers' working and everyday life, adopting online communication tools is critical. Islam and Ahmed (2012) reviewed research

studies focusing on rural residents' information-seeking behavior in both developed and developing countries. Their findings showed that the information needs and information-seeking behavior of rural areas in both developed and developing countries are similar. Rural residents look for information about everyday life. Therefore, a coordinated effort by government agencies and non-government organizations is needed to deliver everyday information, such as health, employment, religion, income generation, education, recreation, agriculture and current events, to the rural residents.

Esfahani and Asadiye's (2009) study found that communication technologies can affect agriculture in several ways such as providing information about the time and price of agricultural products, helping farmers market their products, and promoting current agriculture-related policies. With social media, distance is no longer a barrier to communication. Online communication tools can help educate farmers, deliver information, sell agricultural products, and engage in e-commerce. Online communication tools help expand the usage of e-commerce for connecting producers, traders, retailers, and suppliers directly.

In the United States, online communication tools have been adopted for agricultural development. Online communication tools improve agri-business holders' marketing skills (Sassenrath, Heilman, Luschei, Bennett, Fitzgerald, Klesius, Tracy, Williford, & Zimba, 2008). The Internet helps small agri-business holders to process large amounts of information in an efficient way. It, therefore, shortens the decision-making process and enables small agribusiness holders to market their agricultural products competitively in a globalized world. Proper use of online communication tools

in agriculture helps the agricultural workforce achieve sustainable agricultural development. Through online communication tools, farmers can access support from online information services (Mangina & Vlachos, 2005). Also, farmers can receive education, training, monitoring and consultation through online communication tools. Farmers can obtain agricultural information by accessing databases created by the government and agricultural-related organizations. Farmers can receive this kind of information by following government and farmers' organizations on social media.

Esfahani and Asadiye (2009) indicate that online communication tools facilitate interaction among researchers, extension workers, and farmers, and virtually shorten communication distances. Farmers can now get feedback from experts more easily because the effect of physical distance is minimized by online communication tools. Updated agricultural information and knowledge can be delivered and be disseminated online, including weather forecasting, production techniques, management skills, marketing information, agricultural statistics, policies, and training programs. Agricultural early warning systems can also issue warning messages via online communication tools about crop and livestock disease, pest issues, and natural disasters. With the development and expansion of online communication tools, farmers now can access more information from the Internet. The range of information resources now is much broader than ever before (Sassenrath et al., 2008). This decreases the risks of information asymmetry. Online communication tools broaden the function of extension services and enhance timely feedback for farmers and researchers. Online communication tools also increase knowledge of farming activities, and improve the

accessibility of agricultural markets and agricultural events. According to Lai and Li (2012), Taiwanese farmers would like to receive information about production and marketing events and information on training programs via short message service (SMS). The benefits of convenient, fast, and instant communication were the main reasons Taiwanese farmers would like to adopt SMS as a new way to receive information.

Many smallholder farmers promote their agribusiness or products via direct marketing (NASS, 2007). A previous study has shown that online communication tools are powerful way for smallholder farmers to manage their resources effectively, become more competitive, and increase their income (Esfahani & Asadiye, 2009). Hoffman (2009) indicates that use of social media has become essential in agricultural endeavors. By using social media, farmers have the power to impact the perception of agriculture among the public. Smallholder farmers can engage in social media to share knowledge. In addition, social media offers a cost-efficient and time-saving way to gather information and communicate with potential customers.

Facebook was established in 2004 integrating many functions of online communication tools. Papacharissi and Mendelson (2011) identify nine interpretable motivations for using Facebook: social interaction, expressive, information sharing, habitual, pass time, relaxing, entertainment, cool and new trend, companionship, professional advancement, escape, and connecting new friends. Facebook can also be used as a communication and marketing platform for small business (Ouoba, 2011; Yates & Vallas 2012). For small business, social networking sites such as Facebook are

an affordable and cost-effective investment to release product information and to reach a larger audience. Small businesses can use Facebook to engage customers by posting texts, pictures, videos, comments, and sharing articles. Small businesses can create online events on Facebook and invite customers to join them. This is a good way to start conversations and obtain feedback from customers. Farmers can use Facebook to deliver stories and news about their farms directly to their potential customers to increase sales of crops or agricultural products. In addition, farmers can use social media to build trusted relationships with consumers by sharing information about their farms. At the same time as disseminating the information regarding agribusiness and products, farmers also raise awareness to the public. Small businesses can purchase advertisements in the side column of Facebook or purchase "sponsored stories" to show their posts in the timelines of their targeted audiences (Ray, 2013). Jamerson (2013) found that wineries in Kentucky which use Facebook as a marketing tool to promote their business have increased sales. The wineries use Facebook to promote advertising, brands, events, and venues. Facebook was a channel for free advertising, communication, and management of customer relationships. The wineries promote their businesses on Facebook by posting pictures of customers, the vineyard, and events. The wineries also post news release and information on events and sales.

Lee and Suh (2013) found that the reason people use Facebook is that their friends also use Facebook. The more friends who use Facebook, the more motivation potential users have to adopt Facebook. Therefore, Facebook adopters are motivated to use Facebook to maintain their friend networks (Raacke & Bonds-Raacke, 2008). This is

no different for agriculturists. Agriculturists not only use Facebook for business purposes, they also use Facebook for personal purposes. Shaw, Meyers, Irlbeck, Doerfert, Abrams, and Morgan's (2015) studied agriculturists' personal and business of online communication tools. They found that half of the responding agriculturists reported they use Facebook for personal reasons on a daily basis to socialize and connect with friends and family. However, although many agriculturists use Facebook on a daily basis, half of responding agriculturists did not use Facebook in any way for their business.

Alhabash, Park, Kononova, Chiang, and Wise (2012) explored the motivations of Facebook use in Taiwan. The result showed that a majority (75%) of Taiwanese Facebook users have 150 or fewer friends. Three-fourths (78%) of respondents spent less than one hour daily on Facebook. For 64 percent of respondents, only one-third of their Facebook friends are real friends whom they contact daily,. This finding contradicts a previous study in the United States which found that Facebook adopters used Facebook for maintaining offline relationships (Raacke & Bonds-Raacke, 2008). Nearly 90% of respondents used Facebook for personal purposes. Very few (1.7 %) of respondents use Facebook only for business purposes. Nearly nine percent of respondents use Facebook for both personal and business purposes. Taiwanese Facebook users had highest scores for maintaining social connections, viewing friends' social status updates, and using content provided by Facebook (e.g., applications with Facebook and playing games) as their motivations for using Facebook.

Characteristics of Innovations

The definition of an innovation proposed by Rogers (2003) is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p.12). The characteristics of innovations as perceived by potential adopters influence their rate of adoption. 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.

Relative advantage is "the degree to which an innovation is perceived as better than the idea is supersedes" (Rogers, 2003, p. 229). It also means "a ratio of the expected benefits of an innovation" (Rogers, 2003, p. 233). The relative advantage of an innovation is considered as one of the strongest predictors of the rate of adoption. If adopters perceive an innovation to have a significant relative advantage, the innovation will have a rapid rate of adoption. Incentives may also be awarded to adopters to encourage trial of a new technology, speeding up the rate of adoption of innovations. Incentives could be positive or negative. The effects of incentives may increase the relative advantage of the new technology.

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. Vitak and Ellison (2012) conducted a study on exchanging informational and support-based resources on Facebook, finding that Facebook users perceived the ability to broadcast requests to their network as a primary benefit of Facebook. "Surely somebody

out of the 350 people [in my network] would have an answer to something I needed, or know where to direct me to find it" (Vitak & Ellison, 2012, p. 10). Gillespie's (2011) study of U.S. beef producers' use and perceptions of social media found that beef producers find clear value in using social media to create relationships with those they network with, including other producers and beef industry organizations. These findings are consistent with both studied by Mazman and Usluel's (2010) and Lee and Suh (2013). Their research which indicated that the relative advantages of Facebook are: information sharing, communication, cooperation, and entertainment. 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). A compatible new idea should be consistent with users' sociocultural values and beliefs, previously adopted technologies, and/or needs. Facebook is compatible with previously introduced online communication technologies such as blogs, online discussion groups, and instant messenger. In addition, 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). As with relative advantage, a higher degree of perceived compatibility is related to a higher rate of adoption. 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". The definition of "ease of use" proposed by Davis (1989) is "the degree to which a person believes that using a particular system would be free of effort" (p. 82). 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. Some researchers found that low complexity is a key factor in the adoption of new technology (Batz et al., 1999). Sassenrath et al. (2008) indicate that the learning curve for adopting online communication tools can often be steep. If the complexity of the online communication tools is high, farmers may need more time to adopt these tools or may refuse to adopt them. 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. In other words, earlier adopters have fewer opportunities to observe or follow others when they adopt the innovation. Accessibility may be the barrier for beef

producers adopting social media even on a trial-basis because access to a computer or internet may not be always available for agriculturists (Gillespie, 2011).

Observability is "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 258). Rogers suggests that "the observability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption" (p.258). Generally, a hardware innovation (with a physical object) has more observability than a software innovation (with virtual object) 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. People may read news about Facebook, see the logo of Facebook on printed advertisements, and talk about the articles or pictures they have seen on Facebook. 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. However, most of these members did not want to adopt social media as individuals because they did not perceive the attributes of social media within the Florida Farm Bureau Federation.

Rogers (2003) indicates that relative advantage and compatibility have the greatest influence on the rate of adoption. Mazman and Usluel (2010) found that relative

advantage is the most important factor in predicting the adoption of Facebook. Their study showed Facebook adoption has a significant positive relationship with relative advantage and simplicity. Avery et al. (2010) conducted a study on the use of social media among public relations practitioners within the medical industry. Their results show that lack of trialability and observability are the most common barriers to the adoption of social media.

Barriers of Adoption

Barriers may slow or stop potential users adopting new technology. The following review of the literature shows the barriers to adopting information communication technology.

Technology concern is one of the most 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;). 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. When marketing on social media, one should be aware of legal restrictions on data security and privacy (Steinman & Hawkins, 2010). Gillespie (2011) also reaches similar conclusions of technology concerns. Some U.S. beef producers decided not to use social media because of Internet security issues. 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. Warren (2004) indicated that low Internet coverage is a barrier to technology adoption in the United Kingdom. Until recently, many rural areas have lacked a stable Internet connection. The owners of Kentucky wineries were concerned about technology because they did not have fast to Internet access to use social media (Jamerson, 2013). Zambia farmers faced the same situation. Poor telecommunications infrastructure in rural area slowed their adoption of information communication technologies (Kalusopa, 2005).

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, and 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. Wisconsin and New York extension directors had similar concerns about social media (Newbury et al., 2014). Time, money, and training were needed for extension directors to adopt social media. Texas Cooperative Extension county extension agents had similar concerns when they considered adopting eExtension, a web-based multimedia learning modules system (Harder & Lindner, 2008). Texas agents had significant concerns about time, incentives, planning issues, finance and technology. For Zambia farmers, pricy internet services and lack of financial support from government were significant barriers to developing information communications technologies for smallholder farmers (Kalusopa, 2005). An improvement in the information support system for agricultural development was

needed. 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. "Cows must be milked, the fields cultivated, rations mixed, and hay put up. Data entry and software learning, on the other hand, can be put off…the time required [for learning new technology] is substantial" (Iddings & Apps, 1990. para. 9). The time costs involved in learning new technology may prevent farmers from technology adoption (Smith, Paul, Goe, & Kenney, 2004). Jamerson (2013) found that Kentucky winery owners who are not involved in social media were also concerned about time because they lacked sufficient time to keep up with social networking due to part-time jobs which occupied their available time. This finding is consistent with American Red Cross personnel who perceived that a lack of human resources, especially time, is a barrier to the use social media (Briones, Kuch, Liu & Jin, 2011).

Rogers wrote that an incentive for people to try an innovation can increase the degree of relative advantage of the innovation. In other words, a lack of incentives may be a barrier to innovation diffusion. Foster and Rosenzweig (1995) found that there are two opposing effects of social networking during the adoption decision. When an individual's incentives for adoption increase, the number of members in the social system adopting the innovation rises as well. However, this may also create an incentive to delay adoption as a result of free-riding behavior and information overload. Aleke et al. (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. According to Michaelidou, Siamagka, and Christodoulides (2011), the main barrier to adopting social media is a view among small and medium-sized business that social media is irrelevant or unhelpful for their business. 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.

Characteristics of Adopters

Many previous studies have shown that the diffusion of an innovation may be influenced by characteristics of adopters. Rogers (2003) classified adopters into five categories: innovators, early adopters, early majority, late adopters, and laggards by their speed of adoption. Innovators who first adopt an innovation require a shorter adoption period when compared to other adopters, while laggards need the longest time to adopt an innovation or reject it. The rate of diffusing an innovation depends on how adopters perceive the innovation and the characteristics of the adopter. Rogers stated "each adopter category consists of individuals with a similar degree of innovativeness" (p. 267). Rogers found that adopters within the same category are likely to have common characteristics in terms of socioeconomic status, personality variables, and communication behavior. Generally, earlier adopters have more years of formal

education and higher social status than later adopters. Earlier adopters are more literate and wealthier than later adopters. Earlier adopters have lager-size units (farms) than later adopters. In addition, earlier adopters have better interpersonal connections within their social system than later adopters. Earlier adopters have more contact with change agents and have greater exposure to both mass communication channels and interpersonal communication channels than later adopters. Earlier adopters are more active when seeking information about innovations than later adopters. Finally, earlier adopters have better knowledge of innovations than later adopters. The most effective communication channels when persuading adopters to accept a new idea or new technology are interpersonal channels. In particular, interpersonal channels link adopters who have a similar socioeconomic status and education background.

The diffusion of an innovation occurs through the innovation-decision process in five stages: knowledge, persuasion, decision, implementation, and confirmation. Rogers (2003) defined this innovation-decision process as:

> "the process through which an individual passes from first knowledge of an innovation (stage of knowledge), to forming an attitude toward the innovation (stage of persuasion), to a decision to adopt or reject (stage of decision), to implementation of the new idea (stage of implementation), and to confirmation of this decision (stage of confirmation)" (p. 170).

This process is a type of decision-making and information-seeking activity. Li (2004) revised Roger's stages by adding a "no knowledge" stage. The "*no knowledge*" stage is defined as a potential adopter who has never heard of the innovation. This is the

first stage of the revised Roger's stages. The *knowledge* stage takes place "when an individual (or other decision-making unit) learns of the innovation's existence and gains some understanding of how it functions" (Rogers, 2003, p. 20). *Persuasion* occurs when an individual forms a positive or negative attitude toward an innovation. A *decision* is made "when an individual engages in activities that lead to a choice to adopt or reject the innovation" (Rogers, 2003, p. 20). *Implementation* takes place when an individual begins to use the innovation. Finally, c*onfirmation* occurs "when an individual seeks reinforcement of an innovation-decision that has already been made" (Rogers, 2003, p. 20).

Ali and Kumar (2011) found that the socio-demographic backgrounds of information communication technology adopters, including education, social category, and income status influence decision-making abilities. More highly educated farmers have better decision-making abilities and are more likely to adopt online communication tools to acquire information. This is consistent with Ali's (2012) findings which show that education, income, and social category of farmers are key factors that influence adoption of information communication technology. In addition, farmers who are more likely to use Internet-based information usually run a diversified cropping system and have smaller farms. Ali also found that adoption of information communication technology is influenced by off-farm income. Farmers who have extra income from non-farming businesses are more willing to adopt information communication technology. Smallholder farmers are more likely to adopt information communication technology when compared to large-scale farm holders. This contradicts Rogers (2003)'s conclusion

that earlier adopters have lager-size farms than later adopters. Smallholder farmers are more aware of need to adopt modern agricultural technologies to increase productivity and profitability. Interestingly, farmers who grow diversified crops over a year are more willing to adopt online communication tools.

Yueh, Chen, Chiu, and Lin (2013) identified factors which affect farmers' perceptions of learning Internet-based communication technology in Taiwan. The study shows that farmers' characteristics are related to their perception of training effectiveness. Farmers with a higher level of education have a better perception of learning effectiveness. This finding is consistent with previous studies. The age of farmers is an important factor influencing training effectiveness criteria, including perceived satisfaction, usefulness, mastery level of learning, and confidence of learning transfer. This finding is consistent with previous studies in the United States that show Facebook users are significantly younger than non-users because younger users may be more comfortable with online communication (Raacke & Bonds-Raacke, 2008).

Gender may also be a predictor of adoption of online communication tools. Yueh et al. (2013) show that gender has a significant influence on three dimensions: perceived usefulness, mastery level of learning, and confidence of learning transfer. Raacke and Bonds-Raacke (2008) also find that male users have more friends on Facebook than female users.

Conceptual Framework

The conceptual framework of this study is modified from Harder (2007). Harder (2007) used Rogers' (2003) diffusion of innovations theory as a theoretical framework for studying the adoption of eXtension by Texas Cooperative Extension County Extension agents. Harder (2007) conceptualized agents' stages in the innovation-decision process as dependent upon their personal characteristics, their perceptions of the characteristics, and barriers to eXtension. This study is modified from Harder's (2007) framework, with selected small scale farmers' stages in the innovation-decision process conceptualized as dependent upon their perceptions of the characteristics of Facebook use, barriers to Facebook use, and their personal characteristics. In addition, this study investigates how Facebook is used for obtaining information, communicating with customers, and developing professional networks by selected small scale farmers. The following figure illustrates the conceptual framework based on Rogers' (2003) innovation diffusion theory used in this study.

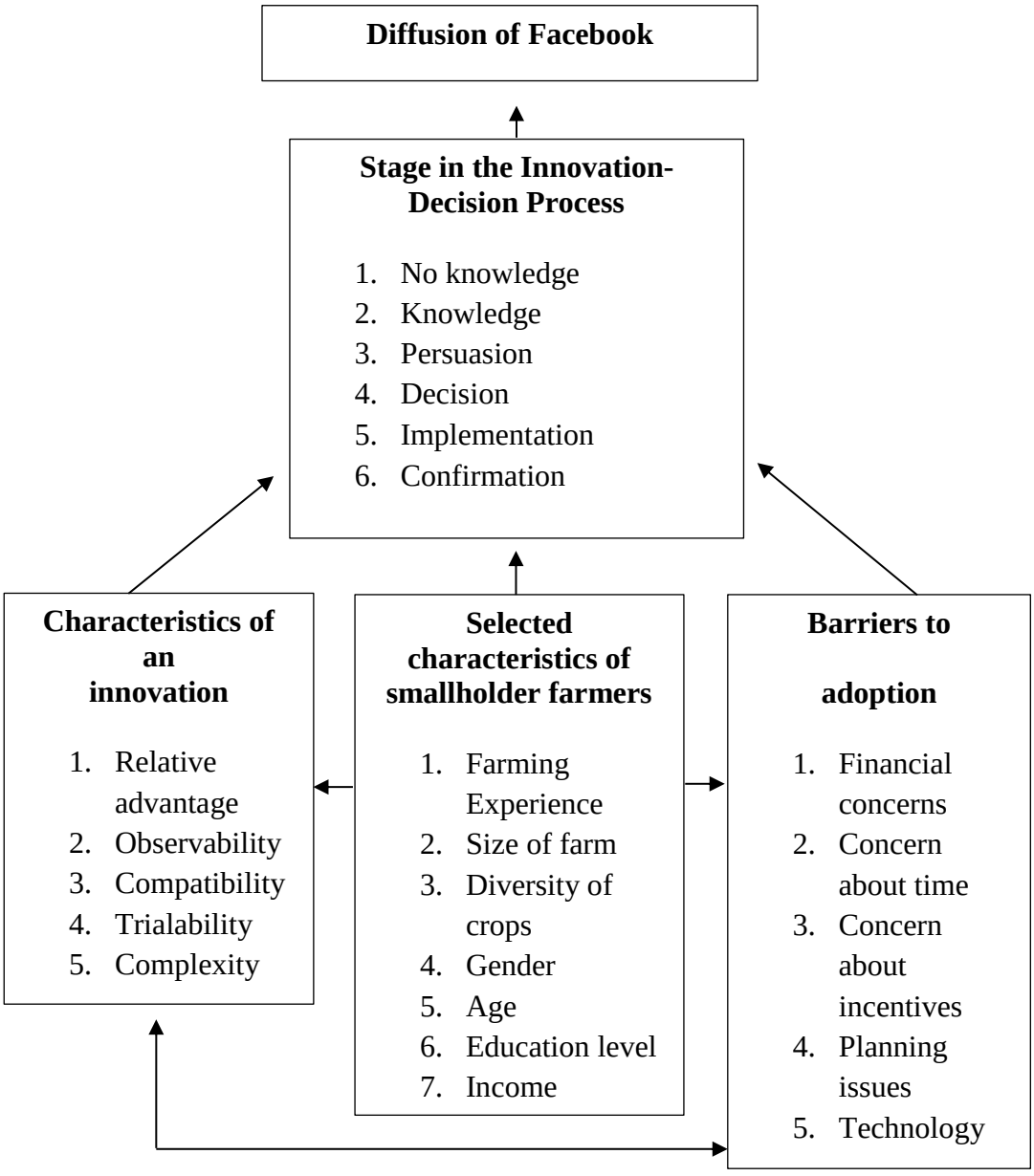

Figure 1. Conceptual Framework for the Diffusion of Facebook.

CHAPTER III

METHODOLOGY

Research Design

A descriptive and correlational research design was used for this study. Descriptive research is important in education (Gall, Gall, & Borg, 2007). This type of research involves making detailed descriptions of educational phenomena. Most educational research tends to focus on cause-and-effect relationships. To build a strong basis for explaining cause-and-effect relationships, a clear and accurate description of educational phenomena must be generated (Gall, Gall, & Borg, 2007). Correlational research design is also very useful in studies of education. The primary advantage of correlational design is that it allows researchers to investigate the relationships among a large number of variables in a single study. Another advantage of the correlational research design is that the strength of the relationships among studied variables can be discovered (Gall, Gall, & Borg, 2007).

Subject Selection

The target population was farm families of Dahu Farmers' Association in Miaoli County in 2015. There are 1,100 registered farmers in the Dahu Farmers' Association. Government regulations provide that only one member of each farm family can register as a farmer. Thus, 1,100 registered farmers represent 1,100 farm families. According to the Taiwan Council of Agriculture (2012a), the average number of members of each farm family is 3.55. Therefore, the total target population is about 3,905 people.

Dillman's (2008) formula is adapted to compute the sample size of this study. The final sample size (N=350) is within ±5 percentage points with a 95% confidence level and a 50/50 split. Cluster random sampling was adapted for selecting study participants (Fraenkel & Wallen, 2008). There are fifty agricultural production and marketing groups under the Dahu Farmers' Association. Each group typically has fifteen to thirty members. 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. The researcher randomly selected fifteen groups and attended their group meetings to collect data.

Instrument

A questionnaire was used to collect data. Questionnaires are widely used in educational research to collect data that are not easily observed such as inner experiences, opinions, values, interests, and preferences (Gall, Gall, & Borg, 2007). The original instrument was designed by Harder (2007) to study the diffusion of eXtension among extension agents in Texas. Harder's instrument includes four dimensions examining: (a) stages in the innovation-decision process, (b) characteristics of eXtension, (c) potential barriers to eXtension, and (d) the characteristics of respondents. The characteristics of an innovation are used to measure five main attributes of innovation diffusion (Rogers, 2003). Five potential barriers to the adoption of eXtension were investigated: (a) financial concerns, (b) concerns about time (c) concerns about incentives, (d) planning issues, and (e) technology concerns. Selected demographic

variables were (a) primary role in extension, (b) county category, (c) age, (d) gender, and (e) educational level.

Based on previous studies mentioned in the review of literature, Harder's (2007) instrument was modified in this study to match the context of Facebook. Harder's (2007) instrument uses an online format. The questionnaire in this study was converted to a printed format. The official language in Taiwan is traditional Chinese. Thus, the questionnaire was translated into traditional Chinese by the researcher (see Appendix for questionnaire layout in both English and traditional Chinese). The questionnaire contained four sections examining (a) stage in the innovation-decision process, (b) the involvement and perceptions of Facebook, (c) the potential barriers to Facebook, and (d) the characteristics of respondents.

Dillman (2000) suggests that the first question of a questionnaire should be easy, avoid controversial topics, and be interesting and applicable to everyone. The first question in this questionnaire asked participants to select their favorite social media by checking the logo of the social media. Response options are: "Google +," "Facebook," "Twitter," "Line," and "others."

Section A of the questionnaire was designed to define each respondent's stage in the innovation-decision process of Facebook adoption. The only item in this section asked respondents to select the statement which can describe most closely their innovation-decision stage. Respondents could select from six stages. The first stage, (a) no knowledge, is included based on Li's (2004) and Harder's (2007) conclusion that an addition stage should be added to describe a situation where adopters were not yet aware

of the innovation. The second to sixth stages are based on Rogers' (2003) theory of the innovation-decision process: (b) knowledge, (c) persuasion, (d) decision, (e) implementation, and (f) confirmation.

Section B was designed to measure the selected farmers' involvement and perceptions of Facebook. Respondents are asked to state their involvement with Facebook. The first question asks respondents if they have Facebook accounts. If the respondents answer "no," they were asked to skip the following questions. If the respondents answer yes, they were asked the following questions: (a) how many "friends" they had connected with on Facebook (fewer than 100 friends, 101-200 friends, 201-300 friends, 301-400 friends, 401-500 friends, or more than 500 friends); (b) how long they has been on Facebook (less than 1 year, 1-3 years, 4-6 years, 7-9 years, or more than 9 years); (c) how often they logged into Facebook each week (open response); (d) how often they updated their Facebook profile each week (open response); (e) how often they interacted with other users on Facebook each week (open response); and (f) what they used Facebook for (connect with family, connect with friends, read daily news and information, receive agricultural information, share professional knowledge with others, share daily life story with others, organize meetings, develop professional networking, marketing their farm, and other)

The second part of section B was to measure farmers' perceptions of Facebook. All respondents were asked to rate 33 statements on a five-point Likert-type scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). The scale was interpreted as: *Strongly Disagree*=1.00-1.50,

Disagree=1.51-2.50, *Neither Disagree nor Agree*=2.51-3.50, *Agree*=3.51-4.50, *Strongly Agree*=4.51-5.00. The attributes of innovations proposed by Rogers (2003) were used to group the statements into five constructs as follows: (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability.

The findings of previous studies (Mazman & Usluel, 2010; White, Meyers, Doerfert, & Irlbeck, 2013; Shaw, Meyers, Irlbeck, Doerfert, Abrams, & Morgan, 2015) were used by the researcher to develop individual statements. Statements were also modified from Harder's (2007) original instrument. Table 1 shows a sample of the statements from Section B of the questionnaire.

The last part of Section B was used to measure farmers' involvement in marketing on Facebook. The first question asked respondents if they use Facebook to market their farm products. If the respondents answered "no," they were asked to skip the rest of the section. If the respondents answered yes, they were asked (a) how often they posted farm-related information on Facebook each week (open response), (b) the page they use to post farm-related information on Facebook (farm Facebook page, personal Facebook, or both of above), (c) if they have created a Facebook page for their farm by answering "yes" or "no." If respondents answered "no," they were asked to skip the rest of the section. If their answer was yes, they were asked: (a) how long ago they created their farm Facebook page (less than 1 year, 1-3 years, 3-6 years, 7-9 years, or longer than 9 years), (b) how many people "like" their farm Facebook page (less than 100 people, 101-250 people, 251-500 people, 501-750 people, 751-1000 people, or more

than 1000 people), and (c) have they ever purchased advertising on Facebook by answering "yes" or "no."

Table 1

Sample Statements from Section B: Characteristics of Facebook

Statement	Characteristic
Using Facebook to market my farm products is less-cost than the traditional way	Relative Advantage
Facebook meets my need of communication	Compatibility
Facebook seems user-friendly	Complexity
I can upload photos on Facebook	Trialability
Facebook is a highly visible social media	Observability

Section C was designed to measure the selected farmers' perceptions of potential barriers to the adoption of Facebook. Respondents are required to rate 30 statements on a five-point Likert-type scale (1 = *Strongly Disagree*, 2= *Disagree*, 3= *Neither Disagree nor Agree*, 4= *Agree*, 5= *Strongly Agree*). The scale was interpreted as follows: *Strongly Disagree*=1.00-1.50, *Disagree*=1.51-2.50, *Neither Disagree nor Agree*=2.51-3.50, *Agree*=3.51-4.50, *Strongly Agree*=4.51-5.00. Li (2004) and Harder (2007) suggested using categories to group the statement into constructs. The constructs were (a) financial concerns, (b) concern about time, (c) concern about incentives, (d) planning issues, and (e) technology concerns. A comment box was provided for respondents to address other potential barriers that were not provided as options. The findings of Aleke et al. (2010), Steinman and Hawkins (2010), and Jamerson (2013) contributed to the development of

individual statements by the researcher. Statements were also modified from Harder's (2007) instrument. Table 2 shows a sample of the statements from Section C.

Table 2

Sample Statements from Section C: Potential Barriers

Statement	Characteristic
Lack of financial resources to support the necessary devices technologies	Financial concerns
I do not have time to use Facebook for marketing because I spend most of my time farming	Concern about time
Lack of support from governmental organizations is a barrier for me to use Facebook	Concern about incentives
Lack of strategic planning for marketing on Facebook	Planning issues
Concern of legal issue (e.g., computer crime, hackers, copyright)	Concerns about technology

Section D was designed to measure selected personal characteristics (agricultural production and marketing group, farmland size, diversity of crops, years of farming experience, gender, age, educational level, and extra income from non-farming). The variables were selected because of their relationships with adopters and the stage of the innovation-decision process. Respondents were asked to indicate which agricultural production and marketing group they belong to by filling out a blank space. Respondents were asked to answer how many vegetables, fruits, and flowers they grow currently by filling out a blank space. For the question of farmland size, a blank space was provided for the respondents to fill out. The respondents were asked to answer how long they had been a farmer (less than 1 year, 1-5 years, 6-10 years, 11-15 years, 16-20 years, 21-25 years, or more than 25 years). Gender response options were male and female. The

respondents were asked to write down their age in a blank space. In Taiwan, the compulsory education system included elementary school education and junior high school education from 1967 to 2014. Before 1967, compulsory education included only elementary school education. After 2014, senior high school education has become part of compulsory education. Students must attend either a senior high school or vocational high school instead. Thus, education response options were categorized according to the highest academic degree the respondent obtained (elementary school, junior high school, senior high school, bachelor's, master's, or PhD). The respondents were also asked to provide their income from both farming and non-farming jobs (main income from farming jobs, extra income from non-farming jobs, and main income from non-farming jobs).

The last question of section D was a comment box, providing respondents a place to express any additional feedback about using Facebook. Data collected from this comment box were not considered in this study.

Instrument Review

The instrument for content validity was reviewed by a panel of experts composed of faculty members in the Department of Agricultural Leadership, Education, and Communications at Texas A&M University and the director of communications at the Dahu Farmers' Association. Several statements were modified for wording. A request for exempt status was approved by the Texas A&M University Office of Research Compliance Institutional Review Board in April 2015.

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. The pilot study was carried out in May 2015. Respondents were required to read the information sheet, sign the consent form, answer the paper-based questionnaire, and return the completed questionnaire to the researcher. Each internal scale was tested using Cronbach's alpha coefficient (Cronbach, 1951). A reliability level of .80 and above is acceptable (Gall, Gall, & Borg, 2007). Table 3 shows the reliability levels for internal scales. The original instrument only contained three factors as potential barriers: concern about time, concerns about incentives, and technology concerns. Based on participant feedback in the pilot study, the researcher added two more factors in this section: 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.

Table 3

Reliability Levels of Scales

	α Levels	
Scale	Pilot Study	Formal Study
Relative Advantage	.99	.98
Compatibility	.99	.96
Complexity	.97	.93
Trialability	.99	.97
Observability	.98	.95
Financial Concerns	*	.92
Concerns about time	.86	.96
Concerns about incentives	.07	.95
Planning issues	*	.96
Technology concerns	.93	.93

Note: Reliability levels ≥ .80 were acceptable.
*Factors were not included in the original instrument

Data Collection

Formal data collection with the approved final instrument began in late July 2015. Fifteen agricultural production and marketing groups were randomly selected to be surveyed. These groups were selected: Special crop II, Vegetable I, Vegetable IV, Vegetable IX, Vegetable XI, Vegetable XXIII, Vegetable XXXIII, Vegetable XXXV, Fruit XI, Fruit XIII, Fruit XVII, Fruit XVIII, Fruit XX, Fruit XXVI, and Fruit XXVIIII. The researcher visited each group's bi-monthly group meeting and distributed the questionnaires. Each participant was asked/required to read the information sheet and sign the consent form before they started answer the questionnaire. Data collection was completed in early September 2015.

Data Analysis

The data were analyzed using the IBM SPSS statistical software package. Descriptive and inferential statistics was computed. The alpha level for data analysis was set *a priori* at .05. The independent variables for the study were: (a) farming experience, (b) size of farm, (c) diversity of crops, (d) gender, (e) age, (f) educational level, and (g) extra income from non-farming. The dependent variables for the study are: (a) stage in the innovation-decision process, (b) relative advantage, (c) compatibility, (d) complexity, (e) trialability, (f) observability, (f) financial concerns, (g) concerns about time, (h) concerns about incentives, (i) planning issues, and (j) technology concerns.

Objective One

Frequencies and percentages were calculated to describe the selected personal characteristics (years of farming experience, diversity of crops, farm size, gender, age, educational level, and extra income from non-farming) of selected farmers in the Dahu area, Taiwan. The percentages and frequencies are appropriate for describing categorical data. (Gall, Gall, & Borg, 2007).

Objective Two

Frequencies and percentages were calculated to describe the responding farmers' stages in the innovation-decision process (no knowledge, knowledge, persuasion, decision, implementation, and confirmation). As previously mentioned, innovation-decision stage was considered as a dependent variable in this study.

Objective Three

Frequencies and percentage were calculated to describe the extent (how many participants own Facebook accounts, how many "friends" they have, how long they have had a Facebook account, how frequently they log into Facebook, how frequently they update their profile, how frequently they interact with other users, selected usage of Facebook, how frequently they post farm-related information, the page they post farm-related information on, how long they have had a farm Facebook page, how many people "like" their farm Facebook page, and whether they have purchased advertising on Facebook) of selected smallholder farmers' use of Facebook.

Objective Four

Selected smallholder farmers' perceptions of Facebook were reported by cumulating the sum of the scores for the items within each construct for each respondent. The mean scores of each construct for each respondent were calculated. The mean and standard deviation for each construct was calculated. The constructs were the five attributes of an innovation: (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability (Rogers, 2003). The means and standard deviations for all the items in each construct were also calculated.

Means were interpreted as follows for describing responses: 1.00-1.50=Strongly Disagree, 1.51-2.50=Disagree, 2.51-3.50=Neither Agree or Disagree, 3.51-4.50=Agree, and 4.51-5.00=Strongly Agree.

Objective Five

Five constructs were applied to measure selected smallholder farmers' perceptions of potential barriers to Facebook adoption: (a) financial concerns, (b) concerns about time, (c) concerns about incentives, (d) planning issues, and (e) technology concerns. The perceptions of potential barriers were reported by cumulating the sum of the scores for each item within each construct for each respondent. The mean scores of each construct for each respondent were calculated. The mean and standard deviation for each construct were calculated. The means and standard deviations for all the items within each construct were also calculated.

Means were interpreted as follows for describing responses: between 1.00-1.50=Strongly Disagree, 1.51-2.50=Disagree, 2.51-3.50=Neither Agree or Disagree, 3.51-4.50=Agree, and 4.51-5.00=Strongly Agree.

Objective Six

Based on Rogers' (2003) characteristics of an innovation (relative advantage, compatibility, complexity, trialability, and observability), one-way analysis of variance (ANOVA) and *t*-tests were used to discover if significant differences existed based on the selected personal characteristics (farming experience, size of farm, diversity of crops, gender, age, educational level, and extra income status) and the farmers' perceptions of Facebook.

To describe the strength of association between the variables, Cohen's interpretation of effect sizes are calculated (Cohen, 1988; Cohen, 1992). Results from one-way ANOVA were interpreted by defining small (.10), medium (.25), and large (.40) effect size levels (Cohen, 1988), and *t*-test results were interpreted by defining small, medium, and large effect size at the .20, .50, .80 levels, respectively (Cohen, 1988). Statistical power level was calculated where differences existed. Results from both one-way ANOVA and *t*-test were interpreted as strong power at the .80 level (Cohen, 1988). Post hoc tests when needed were used to identify where significant differences existed between groups.

Objective Seven

ANOVA and *t*-tests were used to determine if significant differences existed between the selected demographic characteristics (size of farm, diversity of crops, gender, age, educational level, and extra income status) and the farmers' perceptions of potential barriers ((a) financial concerns, (b) concerns about time, (c) concerns about incentives, (d) planning issues, and (e) technology concerns) to the adoption of Facebook.

To evaluate the strength of association between the variables, Cohen's interpretation of effect sizes will be calculated (Cohen, 1988; Cohen, 1992). Results from one-way ANOVA were interpreted by defining small (.10), medium (.25), and large (.40) effect size levels (Cohen, 1988), and *t-test* results were interpreted by defining small, medium, and large effect size at the .20, .50, .80 levels (Cohen, 1988). Statistical power level was calculated if the difference where differences existed. Results from both ANOVA and *t*-test were interpreted as strong power at the .80 level (Cohen, 1988). Post hoc tests were used to identify the items of significant difference between the groups when needed.

Objective Eight

Pearson's correlation coefficient was calculated to determine the relationships between perceptions of Facebook and potential barriers. According to Gall, Gall and Borg (2007), Pearson's *r* defines the strength of a relationship between two continuous variables. The levels of Pearson's *r* were interpreted by Davis (1971) to describe the

strength of the relationships. If the *r* value is equal to or higher than .70, the relationship between two variables is very strong. If the *r* value is .50 to .69, the relationship between two variables is substantial. If the *r* value is .30 to .49, the relationship between two variables is moderate. If the *r* value is .10 to .29, the relationship between two variables is low. If the *r* value is .01 to .09, the relationship between two variables is negligible.

Objective Nine

Based on the selected smallholder farmer' perceptions of the characteristics of Facebook, perceptions of the potential barriers to the diffusion of Facebook, and selected demographic characteristics, discriminant function analysis was used to discover the predictor variables for stages in the innovation-decision process. When the criterion variable is categorical, discriminant function analysis is a suitable statistical process for dealing with the data (Gall, Gall, & Borg, 2007).

CHAPTER IV

RESULTS

Response Rate

The target population was farm families from the Dahu Farmers' Association in Miaoli County in 2015. The total target population was about 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. Fifteen agricultural production and marketing groups were randomly selected. 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.

Objective One: Findings

Data for Dahu region farmers' selected personal characteristics (years of farming, diversity of crops, farm size, gender, age, educational level, and extra income from non-farming) is reported in this section.

Farming Experience

Table 4 shows the distribution of responding farmers according to their years of farming experience. A majority of responding farmers have farming experience about 11-15 years (n=99), 6-10 years (n=64), 0-5 years (n=58) and 16-20 years (n=54). The

remaining respondents are with farming experience 21-25 years (*n*=49), and more than 25years (*n*=26). Median years of farming was 14.

Table 4

Distribution of Respondents by Farming Experience

Farming Experience	*f*	%
0-5 years	58	16.6
6-10 years	64	18.2
11-15 years	99	28.2
16-20 years	54	15.4
21-25 years	49	14.0
Over 25 years	26	7.4

Note: *N*=350. One participant did not respond to this question

Diversity of Crops

Table 5 shows the distribution of responding farmers according to whether they grow single crops or multiple crops. Approximately 44% of respondents only grow one crop and 55% grow two or more different crops.

Table 5

Distribution of Respondents by Diversity of Crops

Diversity of Crops	*f*	%
Single crop	156	44.4
Multiple crops	190	54.1

Note: *N*=346. Five participants did not respond to this question

Farm Size

A majority of respondents' had a farm size of smaller than 1 hectare (*n*=192). 117 respondents stated their farm sizes was between 1.1 and 2.0 hectares. 35 respondents reported their farm was larger than 2 hectares (see Table 6).

Table 6

Distribution of Respondents by Farm Size

Farm Size	*f*	%
Smaller than 1 hectare	192	54.7
1.1-2.0 hectares	117	33.3
Larger than 2 hectares	35	10.2

Note: *N*=344. Seven participants did not respond to this question.
1 hectare =2.47 acres

Gender

Table 7 shows that the distribution of responding farmers by gender. The majority of respondents are male (*n*=269). Only seventy-three respondents are female.

Table 7

Distribution of Respondents by Gender

Gender	*f*	%
Male	269	76.6
Female	73	20.8

Note: *N*=342. Nine participants did not respond to this question

Age

Table 8 shows the distribution of respondents by age. A plurality of responding farmers were 51-60 years old (*n*=103), 41-50 years old (*n*=82), and 61-70 years old (*n*=74). Due to the low number of respondent in the age range 18-30 (*n*=11), respondents are combined in the age range 31-40 (*n*=44) into a category called "18-40" (*n*=55) for all data analysis in this study. Fifty-five respondents report their age to be in the range of 18 to 40 years old. Thirty-three respondents were more than 71 years old. the median age of farmers was 54 years old.

Table 8

Distribution of Respondents by Age

Age	*f*	%
18-40	55	15.9
41-50	82	23.4
51-60	103	29.3
61-70	74	21.1
71+	33	9.4

Note: *N*=347. Four participants did not respond to this question

Education

Table 9 shows the distribution of respondents by education level. A plurality of responding farmers completed senior high school (*n*=143), while junior high school was the highest level of education completed by 89 farmers. Fewer respondents have completed only elementary school (*n*=61) and or have a bachelor's degree (*n*=52). Due to the low number of respondent with master's and doctoral degrees (*n*=5), respondents

are combined with Bachelor's degree into a category called "Bachelor's degree +" (*n*=57) for all data analysis in this study. Senior high school was the median level of education completed by responding farmers.

Table 9

Distribution of Respondents by Education Level

Education Level	*f*	%
Elementary school	61	17.4
Junior high school	89	25.4
Senior high school	143	40.7
Bachelor's +	57	16.3

Note: *N*=350. One participant did not respond to this question

Income Status

Table 10 shows the distribution of responding farmers by income status. A majority of responding farmers only have income from farming work (*n*=188). Fewer farmers have a main income from farming and extra income from non-farming job (*n*=116). The fewest respondents reported that their main income was from non-farming jobs (*n*=43).

Table 10

Distribution of Respondents by Income

Income	*f*	%
Farming income only	188	54.2
Extra income from non-farming	116	33.0
Main income from non-farming	43	12.3

Note: *N*=347. Four participants did not respond to this question

Objective Two: Findings

Table 11 shows the distribution of respondents by their stages in the innovation-decision process. Objective two was to describe farmers' stage of the Facebook innovation-decision process (no knowledge, knowledge, persuasion, decision, implementation, and confirmation). A majority of responding farmers stated they were in the "implementation" (*n* =171) or "knowledge" (*n*= 97) stages. The remaining farmers were in the "no knowledge" (*n* =30), "persuasion" (*n* =23) or "confirmation" (*n* = 16) stages.

Table 11

Distribution of Respondent by Innovation-Decision Stage

Stage in the Innovation-Decision Process	Corresponding Statements	*f*	%
No knowledge	I have never heard of Facebook.	30	8.5
Knowledge	I have heard of Facebook, but have not decided whether or not I like or dislike Facebook.	97	26.7
Persuasion	I have decided that I like or dislike Facebook.	23	6.6
Decision	I have decided that I will or will not use Facebook.	14	4.0
Implementation	I am using Facebook.	171	48.7
Confirmation	I have used Facebook long enough to evaluate whether or not Facebook will be part of my farmer's career.	16	4.6

Note: *N*=351

Figure 2 shows the percentage of respondents in each stage of the Facebook innovation-decision process (no knowledge: 8.5%, knowledge: 26.7 %, persuasion: 6.6%, decision: 4.0%, implementation: 48.7%, and confirmation: 4.6%).

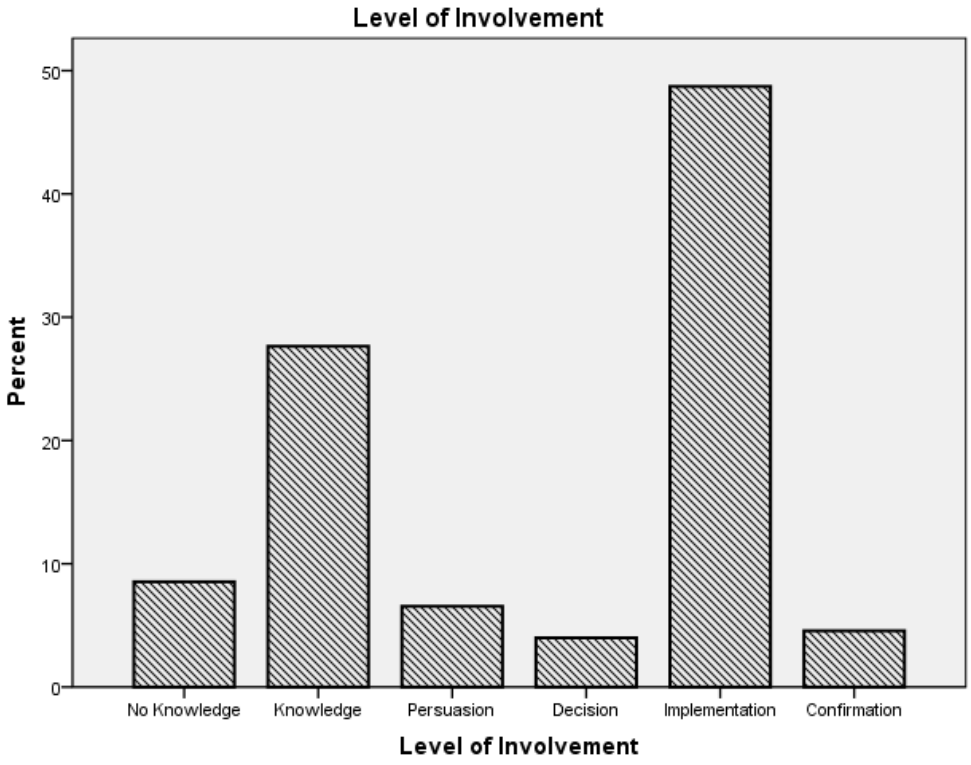

Figure 2. Distribution of Respondent by Innovation-Decision Stage.

Objective Three: Findings

The third objective was to describe the extent of responding farmers' use of Facebook.

Facebook Account

Over 63% of responding farmers reported they have Facebook accounts while 36.8% of responding farmers reported they do not (see Table 12). The following extent of use of Facebook by responding farmers were based on respondents who have a Facebook account (*N* =222).

Table 12

Distribution of Respondents by Owning a Facebook Account

Owning a Facebook Account	*f*	%
Yes	222	63.2
No	129	36.8

Note: *N*=351

Number of Friends on Facebook

Respondents who have Facebook accounts were asked the following questions. The first question is how many friends they had on Facebook. The majority of respondents had 101-200 friends (*n* = 62), 201-300 friends (*n* = 51), and less than 100 friends (*n* = 50). The remaining farmers reported they had 301-400 friends (*n*=29), 401-500 friends (*n* = 15), and more than 500 friends (*n* = 14) (see Table 13).

Table 13

Distribution of Respondents by Number of Friends on Facebook

Number of Friends on Facebook	*f*	%
Less than 100 friends	50	22.6
101-200 friends	62	28.1
201-300 friends	51	23.1
301-400 friends	29	13.1
401-500 friends	15	6.8
More than 500 friends	14	6.3

Note: *N*=221

Length of Time Owning a Facebook Account

Table 14 shows the distribution of responding farmers by length of time owning a Facebook account. The majority of respondents reported they had had a Facebook accounts for 4-6 years (*n*= 99) and 1-3 years (*n*= 90). The remaining respondents reported they had had Facebook accounts for less than one year (*n* = 20), 7-9 years (*n*= 11) or more than nine years (*n* = 2).

Table 14

Distribution of Respondents by Time Length of Having a Facebook Account

Time Length of Having a Facebook Account	*f*	%
Fewer than 1 year	20	5.7
1-3 years	90	25.6
4-6 years	99	28.2
7-9 years	11	3.1
More than 9 years	2	0.6

Note: *N*=222

Frequency of Facebook Access

Table 15 shows the distribution of responding farmers by weekly frequency of Facebook access. The majority of respondent reported they access Facebook 2-7 times per week (*n* = 166). The remaining respondents access Facebook more than 15 times per week (*n* = 22), 8-14 times per week (*n* = 17), or once or less than once per week (*n* = 17).

Table 15

Distribution of Respondents by Frequency of Accessing Facebook per Week

Frequency of Accessing Facebook per Week	*f*	%
Once or less than once	17	7.8
2-7 times	166	75.8
8-14 times	17	7.8
More than 15 times	22	8.7

Note: *N*=222

Frequency of Updating Facebook Status

Table 16 shows the distribution of responding farmers by the weekly frequency of updating Facebook status. The majority of respondents reported that they updated their Facebook status once or less than once per week (*n* = 112) and 2-7 times per week (*n*= 96). The remaining respondents reported that they updated their Facebook status more than 15 times per week (*n* = 9) or 8-14 times per week (*n* = 5).

Table 16

Distribution of Respondents by Frequency of Updating Facebook Status per Week

Frequency of Updating Facebook Status per Week	*f*	%
Once or less than once	112	50.5
2-7 times	96	43.2
8-14 times	5	2.3
More than 15 times	9	4.1

Note: *N*=222

Frequency of Interacting with Other Users on Facebook

Table 17 shows the distribution of responding farmers by their weekly frequency of interacting with other users on Facebook. The majority of respondents reported that they interacted with other users on Facebook 2-7 times per week (*n* = 92), more than 15 times per week (*n* = 71), and 8-14 times per week (*n* = 46). Fewer respondents interacted with other users on Facebook once or less than once per week (*n* = 11).

Table 17

Distribution of Respondents by Frequency of Interacting with Other Users on Facebook

Frequency of Interacting with other users on Facebook per week	*f*	%
Once or less than once	11	5.0
2-7 times	92	42.2
8-14 times	46	20.6
More than 15 times	71	32.1

Note: *N*=220

Selected Usage of Facebook

Table 18 shows the distribution of selected usage of Facebook. Most responding farmers used Facebook to connect with friends (*n* = 211), receive agricultural information (*n* = 172), read daily news and information (*n* = 171), share daily life story with others (*n* = 150), share professional knowledge with others (*n* = 148), and connect with family (*n*= 147). Fewer respondents used Facebook to develop professional networks (*n* = 75), organize meetings (*n* = 63), and market their farms (*n* = 54). One respondent selected "other" and reported he or she used Facebook for customer service.

Table 18

Distribution of Selected Usage of Facebook

Selected Usage of Facebook	*f*	%
Connect with friends	211	95.0
Receive agricultural information	172	77.5
Read daily news and information	171	77.0
Share daily life stories with others,	150	67.6
Share professional knowledge with others	148	66.7
Connect with family	147	66.2
Develop professional networks	75	33.8
Organize meetings	63	28.4
Market my farm	54	24.3
Other	1	0.5

Note: *N*=222. The percentage exceeds 100 due to multiple options chosen

Using Facebook for Farm Marketing

Table 19 shows the distribution of responding famers by whether they use Facebook for farm marketing. 51.8% of responding farmers reported they did not use Facebook to market their farm products while 48.2% of responding farmers reported

they did. The following extent of use of Facebook by responding farmers were based on the report of these respondents who used Facebook for marketing (*N* =107).

Table 19

Distribution of Respondents by Whether They Use Facebook for Farm Marketing

Use of Facebook for Farm Marketing	*f*	%
Yes	107	48.2
No	115	51.8

Note: *N*=222

Weekly Frequency of Marketing on Facebook

Table 20 shows the distribution of responding farmers by their frequency of marketing on Facebook. The majority of respondents reported they posted farm marketing information once or less than once per week (n = 54), and 2-7 times per week (n = 47). Fewer respondents reported they posted farm marketing information more than 15 times per week (n = 2) or 8-14 times per week (n = 1).

Table 20

Distribution of Respondents by Frequency of Marketing on Facebook per Week

Frequency of Marketing on Facebook per week	*f*	%
Once or less than once	54	51.9
2-7 times	47	45.2
8-14 times	1	1.0
More than 15 times	2	1.9

Note: *N*=104

Facebook Page for Posting Marketing Information

Table 21 shows the distribution of responding farmers by which page of Facebook they posted farm marketing information on. The majority of respondents reported that they posted farm marketing information both on their farm's Facebook page and their personal Facebook wall (n = 65). Fewer respondents reported they posted farm marketing information on personal Facebook wall only (n = 24) or on their farm's Facebook page only (n = 16).

Table 21

Distribution of Respondents by Facebook Page for Posting Marketing Information

Facebook Page for posting Marketing Information	*f*	%
Farm's Facebook page	16	15.2
Personal Facebook wall	24	22.9
Both of above	65	61.9

Note: *N*=105

Farm Facebook Page

Table 22 shows the distribution of responding farmers by whether they own a farm Facebook page. 80% of responding farmers reported they had a Facebook page for their farms while 20% of responding farmers reported they did not. The following extent of use of Facebook by responding farmers were based on the reports of these respondents who had farm Facebook pages (N =84).

Table 22

Distribution of Respondents by Whether They Own a Farm Facebook Page

Own a Farm Facebook Page	*f*	%
Yes	84	80.0
No	21	20.0

Note: *N*=105

Time Length of Time Respondents Have Owned a Farm Facebook Page

Table 23 shows the distribution of responding farmers by time of length they have owned a farm Facebook page. A majority of respondents reported that they had had their farm Facebook page for 4-6 years (*n* = 36) and 1-3 years (*n* = 29). The remaining respondents reported they had had their Facebook page for farm less than 1 year (*n* = 15), 7-9 years (*n*= 3), or more than 9 years (*n* = 1).

Table 23

Distribution of Respondents by Time Length of Owning a Farm Facebook Page

Time Length of Owning a Farm Facebook Page	*f*	%
Less than 1 year	15	17.9
1-3 years	29	34.5
4-6 years	36	42.9
7-9 years	3	3.6
More than 9 years	1	1.2

Note: *N*=84

Amount of "Likes" on Farm Facebook Page

Table 24 shows the distribution of responding farmers by how many people "like" their farm Facebook pages. The majority of respondents reported they had 251-500

people (*n* = 26), less than 100 people (*n* = 25), and 101-250 people (*n* = 23) "like" their farm Facebook pages. The remaining respondents reported they had 501-750 people (*n* = 4), 751-1000 people (*n* = 3), or more than 1000 people (*n* = 3) "like" their farm Facebook pages.

Table 24

Distribution of Respondents by Amount of "Likes" on Farm Facebook Page

Amount of "Likes" on Farm Facebook Page	*f*	%
Less than 100 people	25	29.8
101-250 people	23	27.4
251-500 people	26	31.0
501-750 people	4	4.8
751-1000 people	3	3.6
More than 1000 people	3	3.6

Note: *N*=84

Experience of Purchasing Advertisements on Facebook

Table 25 shows the distribution of responding farmers by experience of purchasing advertisements on Facebook. Only 10.7% of responding farmers reported they had purchased advertisements on Facebook while 89.3% of responding farmers reported they had not.

Table 25

Distribution of Respondents by Experience of Purchasing Advertisements on Facebook

Experience of Purchasing Advertisements on Facebook	*f*	%
Yes	9	10.7
No	75	89.3

Note: *N*=84

Objective Four: Findings

Objective four was to describe farmers' perceptions of Facebook by Rogers' (2003) characteristics of an innovation. On a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*), farmers agree 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 26.

Table 26

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
Low Complexity	3.51	.59

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

Relative Advantage

Seven relative advantage items were evaluated by respondents from "strongly disagree" to "strongly agree" on a five-point scale (1 = *Strongly Disagree,* 2 = *Disagree,* 3 = *Neither Disagree nor Agree,* 4 = *Agree,* 5 = *Strongly Agree*). Table 27 shows the mean and standard deviation of each item. Responding farmers tend to agree with the statements "Using Facebook to get information of daily life is easier than the traditional way" (*M*=3.76, *SD*= .65), "Using Facebook to obtain information is more time-saving" (*M*= 3.75, *SD*= .64), "Using Facebook to gather agricultural information is easier than the traditional way" (*M*= 3.74, *SD*= .67), "Using Facebook to share my farm stories is easier than the traditional way" (*M*= 3.73, *SD*= .64), "Using Facebook to interact with other agriculturists is easier than the traditional way" (*M*= 3.73, *SD*= .62), "Using Facebook to market my farm products is less cost than the traditional way" (*M*= 3.72, *SD*= .64), "Using Facebook to interact with my customers is easier than the traditional way" (*M*= 3.71, *SD*= .64), and "Using Facebook as a resource will make marketing easier" (*M*= 3.71, *SD*= .62).

Table 27

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 the traditional way	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 other 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*.

Compatibility

Seven compatibility items were evaluated from "strongly disagree" to "strongly agree" on a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). Table 28 shows the mean and standard deviation of each item. Respondents tend to agree with the statements "I use Facebook to get daily life information" (*M*= 3.62, *SD*= .64), "I acquire potential customer via Facebook" (*M*= 3.60, *SD*= .66), "Via Facebook, I can cultivate trusted relationships with my customers" (*M*= 3.59, *SD*= .66), "It is necessary to use Facebook to marketing my farm product" (*M*= 3.59, *SD*= .65), "I use Facebook to get real time information from government and extension service" (*M*= 3.56, *SD*= .65), and "Facebook meets my need

of communication" (*M*= 3.55, *SD*= .64). Respondents tend to neither agree nor disagree with the statement "Facebook meets my need of marketing" (*M*= 3.44, *SD*= .65).

Table 28

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 and 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*.

Complexity

Five complexity items were evaluated from "strongly disagree" to "strongly agree" on a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). Table 29 shows the mean and standard deviation of each item. Responding farmers tend to agree with the statements "Using Facebook to access information is easy for me" (*M*= 3.59, *SD*= .64), "Facebook is a good communication channel for me" (*M*=3.58, *SD*=66), and "Using Facebook seems simple" (*M*= 3.50, *SD*= .66). 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 29

Respondents’ Perceptions of the Low 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*.

Trialability

Seven trialability items were evaluated from “strongly disagree” to “strongly agree” on a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). Table 30 shows the mean and standard deviation of each item. Respondents tend to agree with the statements “I can click "like" on Facebook” (*M*=3.64, *SD*= .90), “I can reply my friends' message on Facebook” (*M*= 3.60, *SD*= .87), “I can use "share" function on Facebook” (*M*= 3.58, *SD*= .87), “I can post messages on Facebook” (*M*=3.58, *SD*= .85), “I can upload photos to Facebook” (*M*= 3.56, *SD*= .86), and “I can chat to my friends on Facebook” (*M*= 3.55, *SD*= .85). Responding farmers tend to neither agree nor disagree with the statement “Accessing Facebook is free” (*M*= 3.43, *SD*= .90).

Table 30

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*.

Observability

Six observability items were evaluated from "strongly disagree" to "strongly agree" on a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). Table 31 shows the mean and standard deviation for each item. Respondents tend to agree with all the statements "I can easily observe my friends' activities on Facebook" (*M*= 3.79, *SD*= .73), "Many of my friends use Facebook" (*M*= 3.79, *SD*= .72), "My friends have invited me to "like" their Facebook pages" (*M*= 3.78, *SD*= .72), "I know my farmer friends use Facebook to promote their farm products" (*M*= 3.74, *SD*= .70), "The website of Facebook is well publicized" (*M*= 3.36, *SD*= .67), and "Facebook is a highly visible social media" (*M*= 3.61, *SD*= .64).

Table 31

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*.

Objective Five: Findings

Objective five was to describe farmers' perceptions of potential barriers. On a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*), responding 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 32.

Table 32

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.

Financial Concerns

Five items measuring financial concerns were evaluated from "strongly disagree" to "strongly agree" on a five-point scale (1 = *Strongly Disagree,* 2 = *Disagree,* 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). Table 33 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 33

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*.

Concerns about Time

Five items of concern about time were evaluated from "strongly disagree" to "strongly agree" on a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). Table 34 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 34

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*.

Concern about Incentives

Eight items regarding concerns about incentives were evaluated from "strongly disagree" to "strongly agree" on a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). Table 35 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 35

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 for me to use Facebook	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 Facebook™, 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*.

Planning Issues

Seven items measuring planning issues were evaluated from "strongly disagree" to "strongly agree" on a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). Table 36 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 36

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*.

Technology Concerns

Five items measuring technology concern were evaluated from "strongly disagree" to "strongly agree" on a five-point scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree*). Table 37 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 these five concerns, technology concerns were the highest concerns (overall *M* = 3.29) perceived by responding farmers.

Table 37

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*.

Objectives Six: Findings

Objective six was to explore if significant differences exist between selected personal characteristics (years of farming experience, size of farm, diversity of crops, gender, age, educational level, and extra income status) and the farmers' perceptions of Facebook (relative advantage, compatibility, complexity, and trialability, and complexity).

Years of Farming Experience

Responding farmers had significant differences in their perceptions of Facebook in trialability and observability by years of farming experience (see Table 38). There were significant differences in the perception of trialability of Facebook by years of farming experience F (5, 343) = 6.02, p<.05. The effect size was negligible (η^2 = .07). Statistical power was high (.99 >.80). Games-Howell's test was applied to detect the

item of difference between groups due to the unequal variances. Farmers with 21-25 years of farming experience (*M*= 3.18, *SD*= .79) showed significant differences ($p<.05$) from farmers with less than 0-5 years of farming experience (*M*= 3.86, *SD*= .60), farmers with 6-10 years of farming experience (*M*= 3.72, *SD*= .89), and farmers with 11-15 years of farming experience (*M*= 3.60, *SD*= 82) in perception of trialability of Facebook. Farmers with 0-5 year farming experience (*M*= 3.86, *SD*= .60) showed significant differences from farmers with over 25 years of farming experience (*M*= 3.29, *SD*= .77) in perception of trialability of Facebook.

There were significant differences in perception of observability of Facebook, $F(5, 344) = 2.39$, $p<.05$. The effect size was negligible ($\eta^2 = .04$). Statistical power did not reach .80 level. Games-Howell test was applied to detect the item of difference between groups due to the unequal variances. Farmers with over 25 years' experiences (*M*= 3.45, *SD*= .62) showed significant differences from farmers with 0-5 years of farming experiences (*M*= 3.82, *SD*= .51), farmers with 6-10 years of farming experiences (*M*= 3.85, *SD*= .72), and farmers with 11-15 years of farming experiences (*M*= 3.76, *SD*= .59) in perception of observability of Facebook. Farmers with 6-10 years of farming experiences (*M*= 3.85, *SD*= .72) showed significant differences from farmers with 16-20 years of farming experiences (*M*= 3.61, *SD*= .63) and farmers with 21-25 years of farming experiences (*M*= 3.64, *SD*= .58 in perception of observability of Facebook.

There were no other significant differences in perceptions of Facebook by years of farming experience. There was no significant difference in perceptions of the relative advantage of Facebook by years of farming experience F (5, 343) = 1.78, p>.05. The effect size was negligible (η^2 = .03). There were no statistically significant differences in perceptions of the compatibility of Facebook by years of farming experience F (5, 344) = 1.22, p>.05. The effect size was negligible (η^2 = .02). There was no statistically significant difference in perceptions of the complexity of Facebook by years of farming experience F (5, 344) = 1.32, p>.05. The effect size was negligible (η^2 = .02).

Table 38

Analysis of Variance for Perceptions of Facebook by Years of Farming Experience

Construct	*n*	*M*	*SD*	*F*	*p*
Relative Advantage					
0-5 years	58	3.86	.58	1.78	.12
6-10 years	64	3.82	.59		
21-25 years	49	3.72	.48		
11-15 years	99	3.72	.61		
16-20 years	53	3.62	.57		
Over 25 years	26	3.52	.59		
Compatibility					
0-5 years	58	3.66	.53	1.22	.30
6-10 years	64	3.66	.58		
11-15 years	99	3.55	.56		
16-20 years	54	3.49	.63		
21-25 years	49	3.48	.58		
Over 25 years	26	3.47	.68		
Complexity					
0-5 years	58	3.64	.57	1.32	.56
11-15 years	99	3.55	.57		
6-10 years	64	3.55	.61		
16-20 years	54	3.46	.58		
21-25 years	49	3.42	.61		
Over 25 years	26	3.37	.62		
Trialability					
0-5 years	58	3.86	.60	6.02*	.01
6-10 years	64	3.72	.89		
11-15 years	99	3.60	.82		
16-20 years	54	3.48	.77		
Over 25 years	25	3.29	.77		
21-25 years	49	3.18	.79		
Observability					
6-10 years	64	3.85	.72	2.39*	.04
0-5 years	58	3.82	.51		
11-15 years	99	3.76	.59		
21-25 years	49	3.64	.58		
16-20 years	54	3.61	.63		
Over 25 years	26	3.45	.62		

Note: Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree.*
*$p<.05$.

Farm Size

Responding farmers showed no significant differences in their perceptions of Facebook by their farm size (see Table 39). There were no differences in perceptions of the relative advantage of Facebook by farm size, F (2, 340) = 2.35, p>.05. The effect size was negligible (η^2 = .01). There were no differences in perceptions of the compatibility of Facebook by farm size, F (2, 341) = 2.64, p>.05. The effect size was negligible (η^2 =.02). There were no differences in perceptions of the complexity of Facebook by farm size, F (2, 341) = .78, p>.05. The effect size was negligible (η^2 = .01). There were no differences in perceptions of the trialability of Facebook by farm size, F (2, 340) = 1.93, p>.05. The effect size was negligible (η^2 = .01). There were no differences in perceptions of the observability of Facebook by farm size, F (2, 341) = 1.79, p>.05. The effect size was negligible (η^2 = .01).

Table 39

Analysis of Variance for Perceptions of Facebook by Farm Size

Construct	*n*	*M*	*SD*	*F*	*p*
Relative Advantage					
Larger than 2 hectares	35	3.91	.59	2.35	.10
1-2 hectares	117	3.76	.61		
Smaller than 1 hectare	191	3.69	.56		
Compatibility					
Larger than 2 hectares	35	3.78	.64	2.64	.07
1-2 hectares	117	3.56	.61		
Smaller than 1 hectare	191	3.54	.54		
Complexity					
Larger than 2 hectares	35	3.63	.64	.78	.46
Smaller than 1 hectare	192	3.51	.58		
1-2 hectares	117	3.50	.62		
Trialability					
Larger than 2 hectares	35	3.81	.86	1.93	.15
Smaller than 1 hectare	192	3.58	.70		
1-2 hectares	116	3.48	.93		
Observability					
Larger than 2 hectares	35	3.90	.64	1.79	.17
1-2 hectares	117	3.74	.67		
Smaller than 1 hectare	192	3.69	.57		

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

Diversity of Crops

Responding farmers had no significant differences in their perceptions of Facebook by diversity of crops (see Table 40). Perceptions of the relative advantage of Facebook showed no differences according to diversity of crops, t (261) = 1.05, p>.05. The effect size was negligible (d = .05). Perceptions of the compatibility of Facebook showed no difference by diversity of crops, t (262) = .92, p>.05. The effect size was negligible (d =.05). Perceptions of the complexity of Facebook showed no difference by

diversity of crops, t (262) = .35, p>.05. The effect size was negligible (d = .03). Perceptions of the trialability of Facebook showed no difference by diversity of crops, t (261) = 1.44, p>.05. The effect size was negligible (d = .05). Perceptions of the observability of Facebook showed difference by diversity of crops, t (262) = .19, p>.05). The effect size was negligible (d = .04).

Table 40

Comparison of Respondents' Perceptions of Facebook by Diversity of Crops

Construct	*n*	*M*	*SD*	*t*	*p*
Relative Advantage					
Single crop	155	3.79	.55	1.05	.30
Multiple crops	108	3.71	.58		
Compatibility					
Single crop	156	3.61	.53	.92	.36
Multiple crops	108	3.71	.58		
Complexity					
Multiple crops	108	3.56	.57	.35	.73
Single crop	156	3.53	.58		
Trialability					
Multiple crops	108	3.49	.80	1.44	.15
Single crop	155	3.63	.83		
Observability					
Multiple crops	108	3.75	.59	.19	.85
Single crop	156	3.74	.58		

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

Gender

Responding farmers had significant differences in their perceptions of Facebook by gender (see Table 41). Females (M = 3.87, SD = .55) and males (M = 3.07, SD = .60) had a statistically significant differences in perceptions of the relative advantage of

Facebook, t (339) = 2.21, $p < .05$. The effect size was negligible ($d = .01$). Statistical power did not reach the level of .80. Females ($M = 3.71$, $SD = .53$) and males ($M = 3.53$, $SD = .60$) had a statistically significant difference in perceptions of the compatibility of Facebook, t (340) = -2.51, $p < .05$. The effect size was negligible ($d = .02$). Statistical power did not reach the level of .80. Female ($M = 3.79$, $SD = .78$) and male ($M = 3.51$, $SD = .59$) had a statistically significant difference in perceptions of the trialability of Facebook, t (339)= 2.65, $p < .05$). The effect size was negligible ($d = .02$). Statistical power did not reach the level of .80. Females ($M = 3.79$, $SD = .78$) and males ($M = 3.51$, $SD = .59$) had a statistically significant difference in perceptions of the observability of Facebook, t (340) = -2.87, $p < .05$. The effect size was negligible ($d = .02$). The statistical power level was high (.82 >.80).

Perceptions of the complexity of Facebook showed not difference by gender, t (340) = -1.24, $p>.05$). The effect size was negligible ($d = .00$).

Table 41

Comparison of Respondents' Perceptions of Facebook by Gender

Construct	*n*	*M*	*SD*	*t*	*p*
Relative Advantage					
Female	72	3.87	.55	2.21*	.03
Male	269	3.70	.60		
Compatibility					
Female	73	3.71	.53	2.51*	.01
Male	269	3.53	60		
Complexity					
Female	73	3.60	.56	1.24	.22
Male	269	3.50	.60		
Trialability					
Female	73	3.79	.78	2.65*	.01
Male	268	3.51	.59		
Observability					
Female	73	3.90	.60	2.87*	.01
Male	269	3.68	.61		

Note: Scale: 1 = *Strongly Disagree,* 2 = *Disagree,* 3 = *Neither Disagree nor Agree,* 4 = *Agree,* 5 = *Strongly Agree.*
*p<.05.

Age

Responding farmers had significant differences in their perceptions of Facebook by age (see Table 42). Differences were found in perception of relative advantage of Facebook by age, F (4, 341) = 5.87, p<.05. The effect size was negligible (η^2 = .06). The statistical power level was high (.98 >.80). Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers in the age range 61-70 years (M= 3.55, SD= .54) were significantly different (p<.05) from farmers in the age range 18-40 years (M= 3.92, SD= .60) and farmers in the age range in 41-50 years (M= 3.87, SD= .50) in perception of relative advantage of Facebook.

Differences were found in perceptions of the compatibility of Facebook by age, F (4, 342) = 6.74, p<.05. The effect size was negligible (η^2 = .07). Statistical power level was high (.98 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers in the age range in 61-70 years (M= 3.37, SD= .56) showed significant differences (p<.05) from farmers in the age range 18-40 years (M= 3.74, SD= .59) and farmers in the age range 41-50 years (M= 3.74, SD= .50) in perceptions of the compatibility of Facebook. Farmers in the age range over 71 years (M= 3.36, SD= .66) showed significant differences from farmers in the age range 41-50 years (M= 3.74, SD= .50) in perception of compatibility of Facebook.

Differences were found in perception of complexity of Facebook by age, F (4, 342) = 5.31, p<.05). The effect size was negligible (η^2 = .06). The statistical power level was high (.97 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers in the age range 61-70 years (M= 3.34, SD= .64) showed significant differences (p<.05) from farmers in the age range 18-40 years (M= 3.69, SD= .63) and farmers in the age range 41-50 years (M= 3.66, SD= .49) in perceptions of complexity of Facebook.

Differences were found in perception of trialability of Facebook by age, F (4, 341) = 14.33, p<.05. The effect size was low (η^2 = .15). Statistical power level was high (1.00 >.80). Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers aged over 71 years (M= 2.94, SD= .91) showed significant differences (p<.05) from farmers in the age range 18-40 years (M= 3.94, SD= .65), farmers in the age range 41-50 years (M= 3.82, SD= .69), and farmers in

the age range 51-60 years (*M*= 3.55, *SD*= .81) in perception of trialability of Facebook. Farmers in the age range 61-70 years (*M*= 3.26, *SD*= .70) showed significant differences ($p<.05$) from farmers in the age range 18-40 years (*M*= 3.94, *SD*= .65) and farmers in the age range 41-50 years (*M*= 3.82, *SD*= .69) in perception of trialability of Facebook. Farmers in the age range 18-40 years (*M*= 3.94, *SD*= .65) showed significant differences ($p<.05$) from farmers in the age range 51-60 years (*M*= 3.55, *SD*= .81) in perception of trialability of Facebook.

Differences were found in perception of observability of Facebook by age, F (4, 342) = 5.29, $p<.05$. The effect size was negligible ($\eta^2 = .06$). The statistical power level was high (.97 >.80). Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers in the age range 61-70 years (*M*= 3.57, *SD*= .55) showed significant differences ($p<.05$) from farmers in the age range 18-40 years (*M*= 3.88, *SD*= .56) and farmers in the age range 41-50 years (*M*= 3.88, *SD*= .55) in perception of observability of Facebook. Farmers in the age range 51-60 years (*M*= 3.67, *SD*= .64) showed significant differences ($p<.05$) from farmers aged over 71 years (*M*= 3.46, *SD*= .75) in perceptions of observability of Facebook.

Table 42

Analysis of Variance for Perceptions of Facebook by Age

Construct	*n*	*M*	*SD*	*F*	*p*
Relative Advantage					
18-40	55	3.92	.60	5.87*	.01
41-50	81	3.87	.50		
51-60	103	3.73	.62		
61-70	74	3.55	.54		
71+	33	3.50	.66		
Compatibility					
41-50	82	3.74	.50	6.74*	.01
18-40	55	3.74	.59		
51-60	103	3.52	.58		
61-70	74	3.37	.56		
71+	33	3.36	.66		
Complexity					
18-40	55	3.69	.63	5.31*	.01
41-50	82	3.66	.49		
51-60	103	3.51	.55		
61-70	74	3.34	.64		
71+	33	3.30	.61		
Trialability					
18-40	55	3.94	.65	14.33*	.01
41-50	81	3.82	.69		
51-60	103	3.55	.81		
61-70	74	3.26	.70		
71+	33	2.94	.91		
Observability					
41-50	82	3.88	.55	5.29*	.01
18-40	11	3.88	.56		
51-60	103	3.67	.64		
61-70	74	3.57	.55		
71+	33	3.46	.75		

Note: Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree.*
*$p<.05$.

Education

Responding farmers showed significant differences in their perceptions of Facebook by education (see Table 43).

Differences were found in perception of relative advantage of Facebook by education, F (3, 345) = 16.38, p<.05. The effect size was low (η^2 = .13). The statistical power level was high (1.00 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with elementary education (M= 3.45, SD= .60) showed significant differences (p<.05) from farmers with senior high school education (M= 3.83, SD= .55) and farmers with Bachelor's and graduate degrees (M= 4.06, SD= .52) in perceptions of the relative advantage of Facebook. Farmers with junior high education (M= 3.55, SD= .55) showed significant differences (p<.05) from farmers with senior high school education (M= 3.83, SD= .55) and farmers with Bachelor's degrees (M= 4.06, SD= .54) in perceptions of the relative advantage of Facebook.

Differences were found in perception of compatibility of Facebook by education, F (3, 346) = 20.19, p <.05). The effect size was low (η^2 = .15). Statistical power level was high (1.00 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with elementary education (M= 3.21, SD= .61) showed significant differences (p<.05) from farmers with senior high school education (M= 3.66, SD= .54) and farmers with Bachelor's and graduate degrees (M= 3.91, SD= .50) in perceptions of the compatibility of Facebook. Farmers with junior high education (M= 3.43, SD= .52) showed significant differences (p<.05) from farmers

with senior high school education (*M*= 3.66, *SD*= .54) and farmers with Bachelor's and graduate degrees (*M*= 3.91, *SD*= .50) in perceptions of compatibility of Facebook. Farmers with senior high education (*M*= 3.66, *SD*= .54) showed significant differences (*p*<.05) from farmers with Bachelor's and graduate degrees (*M*= 3.91, *SD*= .50) in perceptions of the compatibility of Facebook.

Differences were found in perceptions of the complexity of Facebook by education, F (3, 346) = 17.01, p <.05. The effect size was low (η^2 = .13). The statistical power level was high (1.00 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with elementary education (*M*= 3.19, *SD*= .64) showed significant differences (*p*<.05) from farmers with senior high school education (*M*= 3.62, *SD*= .51) and farmers with Bachelor's and graduate degrees (*M*= 3.84, *SD*= .56) in perceptions of the complexity of Facebook. Farmers with a junior high education (*M*= 3.38, *SD*= .52) showed significant differences (*p*<.05) from farmers with senior high school education (*M*= 3.62, *SD*= .51) and farmers with Bachelor's and graduate degrees (*M*= 3.84, *SD*= .56) in perceptions of the complexity of Facebook.

Differences were found in perception of trialability of Facebook by education, F (3, 456) = 37.35, p <.05). The effect size was medium (η^2 = .25). The statistical power level was high (1.00 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with elementary education (*M*= 2.89, *SD*= .75) showed significant differences (*p*<.05) from farmers with junior high education (*M*= 3.36, *SD*= .73), farmers with senior high school education

(*M*= 3.74, *SD*= .69), and farmers with Bachelor's and graduate degrees (*M*= 4.16, *SD*= .66) in perceptions of the trialability of Facebook. Farmers with junior high education (*M*= 3.36, *SD*= .73) showed significant differences ($p<.05$) from farmers with senior high school education (*M*= 3.74, *SD*= .69) and farmers with Bachelor's and graduate degrees (*M*= 4.16, *SD*= .66) in perceptions of the trialability of Facebook. Farmers with senior high education (*M*= 3.74, *SD*= .69) showed significant differences ($p<.05$) from farmers with Bachelor's and graduate degrees (*M*= 4.16, *SD*= .66) in perception of the trialability of Facebook.

Differences were found in perception of observability of Facebook by education, F (3, 346) = 15.04, $p<.05$). The effect size was low ($\eta^2 = .12$). The statistical power level was high (1.00 >.80). A Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers with elementary education (*M*= 3.44, *SD*= .66) showed significant differences ($p<.05$) from farmers with senior high school education (*M*= 3.82, *SD*= .54) and farmers with Bachelor's and graduate degrees (*M*= 4.06, *SD*= .54) in perceptions of the observability of Facebook. Farmers with junior high education (*M*= 3.54, *SD*= .61) showed significant differences ($p<.05$) from farmers with senior high school education (*M*= 3.82, *SD*= .54) and farmers with Bachelor's and graduate degree (*M*= 4.06, *SD*= .54) in perception of observability of Facebook. Farmers with senior high education (*M*= 3.82, *SD*= .54) showed significant differences ($p<.05$) from farmers with Bachelor's and graduate degree (*M*= 4.06, *SD*= .54) in perceptions of the observability of Facebook.

Table 43

Analysis of Variance for Perceptions of Facebook by Education

Construct	*n*	*M*	*SD*	*F*	*p*
Relative Advantage					
Bachelor's +	57	4.06	.52	16.38*	.00
Senior high school	143	3.83	.55		
Junior high school	89	3.55	.55		
Elementary school	60	3.45	.60		
Compatibility					
Bachelor's +	57	3.91	.50	20.19*	.00
Senior high school	143	3.66	.54		
Junior high school	89	3.43	.52		
Elementary school	61	3.21	.61		
Complexity					
Bachelor's +	57	3.84	.56	17.01*	.00
Senior high school	143	3.62	.51		
Junior high school	89	3.38	.54		
Elementary school	61	3.19	.64		
Trialability					
Bachelor's +	57	4.16	.66	37.35*	.00
Senior high school	143	3.74	.69		
Junior high school	89	3.36	.73		
Elementary school	60	2.89	.75		
Observability					
Bachelor's +	57	4.06	.54	15.04*	.00
Senior high school	143	3.82	.54		
Junior high school	89	3.54	.61		
Elementary school	61	3.44	.66		

Note: Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree.*
*$p<.05$.

Income

Responding farmers had significant differences in their perceptions of Facebook by income status (see Table 44). Differences were found in perception of trialability of Facebook by income status, F (2, 343) = 5.40, p <.05. The effect size was negligible (η^2 = .00). Statistical power did not reach the .80 level. Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers with main income from non-farming (M= 3.86, SD= .6) showed significant differences (p<.05) from farmers only having income from farming (M= 3.46, SD= .84) in perception of trialability of Facebook.

There were no other significant differences in perceptions of Facebook by income status. There was no significant difference in perceptions of the relative advantage of Facebook by income status, F (2, 343) = 1.14, p>.05. The effect size was negligible (η^2 = .01). There was no significant difference in perceptions of the compatibility of Facebook by income status, F (2, 344) = 1.79, p>.05. The effect size was negligible (η^2 = .01). There was no significant difference in perceptions of the complexity of Facebook by income status, F (2, 344) = .68, p>.05. The effect size was negligible (η^2 = .00). There was no significant difference in perceptions of the observability of Facebook by income status, F (2, 344) = .43, p>.05. The effect size was negligible (η^2 = .00).

Table 44

Analysis of Variance for Perceptions of Facebook by Income

Construct	*n*	*M*	*SD*	*F*	*p*
Relative Advantage					
Main income from non-farming	43	3.83	.52	1.14	.32
Extra income from non-farming	116	3.74	.62		
Farming income only	187	3.69	.59		
Compatibility					
Main income from non-farming	43	3.64	53	1.79	.17
Extra income from non-farming	116	3.62	.65		
Farming income only	188	3.51	.56		
Complexity					
Main income from non-farming	43	3.61	.57	.68	.51
Farming income only	188	3.51	.61		
Extra income from non-farming	116	3.48	.58		
Trialability					
Main income from non-farming	43	3.86	.69	5.40*	.01
Extra income from non-farming	116	3.62	.78		
Farming income only	187	3.46	.84		
Observability					
Main income from non-farming	43	3.77	.56	.43	.65
Farming income only	188	3.74	.63		
Extra income from non-farming	116	3.68	.62		

Note: Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree.*
*$p<.05$.

Objective Seven: Findings

Objective seven was to explore if significant difference existed between the selected personal characteristics (years of farming experience, size of farm, diversity of crops, gender, age, educational level, and extra income status) and the farmers' perceptions of potential barriers (financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns).

Years of Farming Experience

Responding farmers showed significant differences in their perceptions of potential barriers by years of farming experience (see Table 45).

There were significant differences in the perception of financial concerns by years of farming experience, F (5, 343) = 4.77, p<.05. The effect size was negligible (η^2 = .07). Statistical power was high (.98 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with 21-25 years of farming experience (M= 3.45, SD= .66) showed significant differences (p<.05) compared to farmers with 6-10 years of farming experience (M= 2.85, SD= .78) and farmers with 11-15 years of farming experience (M= 2.84, SD= .81) on financial concerns.

There were significant differences in the perceptions of concerns about time, F (5, 344) = 2.59, p<.05. The effect size was negligible (η^2 = .04). Statistical power was high (.84 >.80). A Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers with 21-25 years of farming experience (M= 3.45, SD= .66) showed significant differences (p<.05) from farmers with 0-5 years of farming experience (M= 2.71, SD= .68) and farmers with 11-15 years of farming experience (M= 2.72, SD= .83) in perceptions of concerns about time.

There were statistically significant differences in the perceptions of concerns about incentives, F (5, 343) = 2.93, p<.05. The effect size was negligible (η^2 = .04). Statistical power was high (.88 >.80). Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers with 21-25

years of farming experience (*M*= 2.96, *SD*= .76) showed significant differences (p<.05) from farmers with 11-15 years of farming experience (*M*= 2.59, *SD*= .69) in perceptions of concerns about incentives.

There were statistically significant differences in the perceptions of technology concerns, F (5, 343) = 2.94, p<.05. The effect size was negligible (η^2 = .04). Statistical power was high (.85 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with 0-5 years of farming experience (*M*= 3.09, *SD*= .73) showed significant differences from farmers with farmers with 21-25 years of farming experience (*M*= 3.44, *SD*= .61), farmers with farmers with 16-20 years of farming experience (*M*= 3.44, *SD*= .76) and farmers with over 25 years farming experience (*M*= 3.51, *SD*= .74) in perception of technology concerns.

There was no significant difference in perceptions of planning issues by years of farming experience, F (5, 344) = 2.42, p>.05). The effect size was negligible (η^2 = .03).

Table 45

Analysis of Variance for Perception of Potential Barriers by Years of Farming Experience

Construct	*n*	*M*	*SD*	*F*	*p*
Financial Concerns					
21-25 years	49	3.45	.66	4.77*	.00
16-20 years	54	3.08	.95		
0-5 years	57	3.08	.78		
6-10 years	63	2.85	.78		
11-15 years	99	2.84	.81		
Over 25 years	26	2.81	.83		
Concerns about Time					
21-25 years	49	3.12	.85	2.59*	.02
16-20 years	54	2.97	.91		
6-10 years	64	2.76	.83		
11-15 years	99	2.72	.83		
0-5 years	57	2.71	.68		
Over 25 years	26	2.53	.94		
Concerns about Incentives					
16-20 years	54	2.97	.88	2.93*	.01
21-25 years	49	2.96	.76		
0-5 years	58	2.68	.73		
Over 25 years	26	2.65	.87		
6-10 years	63	2.59	.75		
11-15 years	98	2.59	.69		
Planning Issues					
Over 25 years	26	3.03	.94	2.42	.06
21-25 years	49	2.97	.76		
16-20 years	54	2.96	.84		
0-5 years	58	2.69	.74		
6-10 years	63	2.68	.76		
11-15 years	99	2.66	.78		
Technology Concerns					
Over 25 years	26	3.51	.74	2.94*	.01
16-20 years	54	3.44	.76		
21-25 years	49	3.44	.61		
11-15 years	98	3.30	.69		
6-10 years	64	3.15	.70		
0-5 years	57	3.09	.73		

Note: Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree.*
*$p<.05$.

Farm Size

Responding farmers showed significant differences in their perceptions of potential barriers by their farm size (see Table 46).

There were significant differences in the perceptions of concerns about time, F (2, 341) = 3.30, p<.05. The effect size was negligible (η^2 = .02). Statistical power did not reach the .80 level. Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with smaller than one hectare farms (M= 2.91, SD= .83) showed significant differences from farmers with 1.1-2.0 hectares' farm size (M= 2.68, SD= .85).

There was no difference in the perceptions of financial concerns by farm size, F (2, 340) = .96, p>.05. The effect size was negligible (η^2 = .01). There were no differences in the perceptions of concerns about incentives by farm size, F (2, 340) = 2.13, p>.05. The effect size was negligible (η^2 = .01). There was no difference in the perceptions of planning issues by farm size, F (2, 341) = 2.48, p>.05. The effect size was negligible (η^2 = .01). There was no difference in the perceptions of technology concerns by farm size, F (2, 340) = .59, p>.05. The effect size was negligible (η^2 = .00).

Table 46

Analysis of Variance for Perception of Potential Barriers by Farm Size

Construct	*n*	*M*	*SD*	*F*	*p*
Financial Concerns					
Smaller than 1 hectare	190	3.05	.81	.96	.38
1.1-2.0 hectares	117	2.94	.84		
Larger than 2 hectares	35	2.91	.88		
Concerns about Time					
Smaller than 1 hectare	191	2.91	.83	3.30*	.04
1.1-2.0 hectares	117	2.68	.85		
Larger than 2 hectares	35	2.66	.85		
Concerns about Incentives					
Smaller than 1 hectare	190	2.79	.76	2.13	.12
1.1-2.0 hectares	117	2.63	.77		
Larger than 2 hectares	35	2.65	.85		
Planning Issues					
Smaller than 1 hectare	191	2.87	.79	2.48	.09
1.1-2.0 hectares	117	2.71	.82		
Larger than 2 hectares	35	2.60	.73		
Technology Concerns					
Smaller than 1 hectare	192	3.33	.69	.59	.56
1.1-2.0 hectares	115	3.27	.75		
Larger than 2 hectares	35	3.20	.73		

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

Diversity of Crops

Responding farmers had no significant differences in their perceptions of potential barriers by diversity of crops (see Table 47). Perceptions of financial concerns showed not difference by diversity of crops, t (342) = .26, p>.05. The effect size was negligible (d = .00). Perceptions of the compatibility of Facebook showed not difference by diversity of crops, t (343) = .75, p>.05. The effect size was negligible (d =.00). Perceptions of the complexity of Facebook showed not difference by diversity of crops, t

(342) = .90, p>.05. The effect size was negligible (d = .00). Perceptions of the trialability of Facebook showed not difference by diversity of crops, t (343) = 1.19, p>.05). The effect size was negligible (d = .00). Perceptions of the observability of Facebook showed no difference by diversity of crops, t (342) = 1.73, p>.05). The effect size was negligible (d = .01).

Table 47

Comparison of Respondents' Perceptions of Potential Barriers by Diversity of Crops

Construct	*n*	*M*	*SD*	*t*	*p*
Financial Concerns					
Single crop	155	3.01	.82	.26	.80
Multiple crops	189	2.99	.84		
Concerns about Time					
Multiple crops	190	2.83	.85	.75	.45
Single crop	155	2.76	.83		
Concerns about Incentives					
Single crop	155	2.76	.77	.90	.37
Multiple crops	189	2.68	.77		
Planning Issues					
Single crop	155	2.84	.80	1.19	.24
Multiple crops	190	2.74	.80		
Technology Concerns					
Single crop	155	3.36	.67	1.73	.09
Multiple crops	189	3.23	.74		

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

Gender

Responding farmers had significant differences in their perceptions of potential barriers by gender (see Table 48). Females (M = 3.05, SD = .82) and males (M = 2.79, SD = .84) had a statistically significant difference in perceptions of financial concerns, t

(338) = 2.37, $p < .05$. The effect size was negligible ($d = .01$). Statistical power did not reach the level of .80. Females ($M = 2.77$, $SD = .77$) and males ($M = 2.51$, $SD = .76$) had a statistically significant difference in perceptions of concerns about incentives, t (338) = 2.58, $p < .05$). The effect size was negligible ($d = .02$). Statistical power did not reach the level of .80. Females ($M = 2.84$, $SD = .80$) and males ($M = 2.60$, $SD = .79$) had a statistically significant difference in perceptions of planning issues, t (339) = 2.26, $p < .05$. The effect size was negligible ($d = .02$). Statistical power did not reach the level of .80.

Perceptions of concerns about time showed no difference by gender, t (339) = 2.37, $p > .05$). The effect size was negligible ($d = .01$). Perceptions of technology concerns showed no difference by gender, t (338) = .54, $p > .05$). The effect size was negligible ($d = .00$).

Table 48

Comparison of Respondents' Perceptions of Potential Barriers by Gender

Construct	*n*	*M*	*SD*	*t*	*p*
Financial Concerns					
Male	268	3.05	.82	2.37*	.02
Female	72	2.79	.84		
Concerns about Time					
Male	269	2.84	.84	1.82	.07
Female	72	2.64	.85		
Concerns about Incentives					
Male	267	2.77	.77	2.58*	.01
Female	73	2.51	.76		
Planning Issues					
Male	268	2.84	.80	2.25*	.03
Female	73	2.60	.79		
Technology Concerns					
Male	267	3.31	.70	.54	.60
Female	73	3.26	.77		

Note: Scale: 1 = *Strongly Disagree,* 2 = *Disagree,* 3 = *Neither Disagree nor Agree,* 4 = *Agree,* 5 = *Strongly Agree.*
*$p<.05$.

Age

Responding farmers had significant differences in their perceptions of potential barriers by age (see Table 49).

Differences were found in perception of concerns about time by age, F (4, 342) = 2.91, $p<.05$. The effect size was negligible ($\eta^2 = .03$). Statistical power did not reach the .80 level. Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers in the age range 41-50years (M= 2.61, SD= .76) showed significant differences ($p<.05$) from farmers in the age range 51-60 years (M= 2.92, SD= .85) in perception of concerns about time.

Differences were found in perception of planning issues by age, F (4, 342) = 3.62, p<.05). The effect size was negligible (η^2 = .05). Statistical power level was high (.94 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers aged over 71 years (M= 3.32, SD= .76) showed significant differences (p<.05) from farmers in the age range 18-40 years (M= 2.65, SD= .75) and farmers in the age range 41-50 years (M= 2.60, SD= .73) in perception of planning issues.

Differences were found in perception of technology concerns by age, F (4, 341) = 8.50, p<.05. The effect size was negligible (η^2 = .03). Statistical power level was high (.98 >.80). Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers aged over 71 years (M= 3.70, SD= .44) showed significant differences (p<.05) from farmers in the age range 18-40 years (M= 2.98, SD= .77), farmers in the age range 41-50 years (M= 3.31, SD= .71), farmers in the age range 51-60 years (M= 3.29, SD= .67), and farmers in the age range 61-70 years (M= 3.35, SD= .67) in perception of technology concerns. Farmers in the age range 61-70 years (M= 3.35, SD= .67) showed significant differences (p<.05) from farmers in the age range 18-40 years (M= 2.98, SD= .77) in perception of technology concerns.

There were no differences in perception of financial concerns by age, F (4, 341) = 2.38, p>.05. The effect size was negligible (η^2 = .01). There were no differences in perceptions of concerns about incentives by age, F (4, 341) = 2.38, p>.05. The effect size was negligible (η^2 = .03).

Table 49

Analysis of Variance for Perception of Potential Barriers by Age

Construct	*n*	*M*	*SD*	*F*	*p*
Financial Concerns					
71+	33	3.12	.85	1.08	.37
51-60	102	3.09	.76		
61-70	73	3.01	.87		
18-40	55	2.99	.86		
41-50	82	2.86	.84		
Concerns about Time					
71+	33	3.06	.94	2.91*	.02
51-60	103	2.92	.85		
61-70	74	2.86	.91		
18-40	55	2.66	.74		
41-50	81	2.61	.76		
Concerns about Incentives					
71+	33	2.95	.76	2.38	.052
61-70	74	2.78	.78		
51-60	101	2.76	.79		
18-40	55	2.73	.75		
41-50	82	2.52	.74		
Planning Issues					
71+	33	3.32	.76	4.53*	.00
61-70	74	2.92	.84		
51-60	102	2.78	.82		
18-40	55	2.65	.75		
41-50	82	2.60	.73		
Technology Concerns					
71+	33	3.70	.44	8.50*	.01
61-70	74	3.35	.67		
41-50	81	3.31	.71		
51-60	103	3.29	.67		
18-40	54	2.98	.77		

Note: Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree.*
*$p<.05$.

Education

Responding farmers had significant differences in their perceptions of potential barriers by education (see Table 50).

Differences were found in perception of financial concerns by education, F (3, 345) = 4.83, p<.05. The effect size was negligible (η^2 = .04). Statistical power level was high (.90 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with elementary education (M= 3.34, SD= .71) showed significant differences (p<.05) from farmers with senior high school education (M= 2.91, SD= .81) and farmers with Bachelor's and graduate degree (M= 2.80, SD= .8) in perception of financial concerns.

Differences were found in perception of concerns about time by education, F (3, 346) = 8.02, p<.05. The effect size was negligible (η^2 = .07). Statistical power level was high (.99 >.80). Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers with elementary education (M= 3.20, SD= .90) showed significant differences (p<.05) from farmers with senior high school education (M= 2.66, SD= .79) and farmers with Bachelor's and graduate degrees (M= 2.54, SD= .75) in perception of concerns about time. Farmers with junior high school education (M= 2.93, SD= .84) showed significant differences (p<.05) from farmers with senior high school education (M= 2.66, SD= .89) and farmers with Bachelor's and graduate degrees (M= 2.54, SD= .75) in perception of concerns about time.

Differences were found in perception of concerns about incentives by education, F (3, 345) = 15.01, p<.05). The effect size was low (η^2 = .12). The statistical power level was high (1.00 >.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with elementary education (M= 3.14, SD= .76) showed significant differences (p<.05) from farmers with senior high school education (M= 2.54, SD= .73) and farmers with Bachelor's and graduate degrees (M= 2.41, SD= .65) in perception of concerns about incentives. Farmers with junior high school education (M= 2.91, SD= .75) showed significant differences (p<.05) from farmers with senior high school education (M= 2.54, SD= .73) and farmers with Bachelor's and graduate degrees (M= 2.41, SD= .65) in perceptions of concerns about incentives.

Differences were found in perception of planning issues by age, F (3, 346) = 20.84, p<.05. The effect size was low (η^2 = .15). Statistical power level was high (1.00 >.80). A Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers with elementary education (M= 3.27, SD= .79) showed significant differences (p<.05) from farmers with senior high school education (M= 2.61, SD= .73) and farmers with Bachelor's and graduate degrees (M= 2.36, SD= .62) in perception of planning issues. Farmers with junior high school education (M= 3.00, SD= .79) showed significant differences (p<.05) from farmers with senior high school education (M= 2.61, SD= .73) and farmers with Bachelor's and graduate degrees (M= 2.36, SD= .62) in perception of planning issues.

Differences were found in perception of technology concerns by age, F (3, 345) = 16.02, p<.05). The effect size was low (η^2 = .11). The statistical power level was high (1.00 >.80). A Games-Howell's test was applied to detect the item of difference between groups due to the unequal variances. Farmers with elementary education (M= 3.67, SD= .52) showed significant differences (p<.05) from farmers with junior high school education (M= 3.40, SD= .68), farmers with senior high school education (M= 3.22, SD= .72) and farmers with Bachelor's and graduate degrees (M= 2.92, SD= .73) in perception of technology concerns. Farmers with junior high school education (M= 3.40, SD= .68) showed significant differences (p<.05) from farmers with Bachelor's and graduate degree (M= 2.92, SD= .73) in perception of technology concerns.

Table 50

Analysis of Variance for Perception of Potential Barriers by Education

Construct	*n*	*M*	*SD*	*F*	*p*
Financial Concerns					
Elementary school	61	3.34	.71	4.83*	.01
Junior high school	89	3.01	.87		
Senior high school	141	2.91	.81		
Bachelor's +	57	2.80	.85		
Concerns about Time					
Elementary school	61	3.20	.90	8.02*	.01
Junior high school	89	2.93	.84		
Senior high school	142	2.66	.79		
Bachelor's +	57	2.54	.75		
Concerns about Incentives					
Elementary school	61	3.14	.76	15.01*	.01
Junior high school	89	2.91	.75		
Senior high school	142	2.54	.73		
Bachelor's +	56	2.41	.65		
Planning Issues					
Elementary school	61	3.27	.79	20.84*	.01
Junior high school	89	3.00	.79		
Senior high school	142	2.61	.73		
Bachelor's +	57	2.36	.62		
Technology Concerns					
Elementary school	61	3.67	.52	16.02*	.01
Junior high school	89	3.40	.68		
Senior high school	141	3.22	.72		
Bachelor's +	57	2.92	.73		

Note: Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree.*
*$p<.05$.

Income

Responding farmers had significant differences in their perceptions of potential barriers by income status (see Table 51).

Differences were found in perception of financial concerns by income status, F (2, 343) = 3.14, p <.05. The effect size was negligible (η^2 = .02). Statistical power did not reach the .80 level. Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers who had only income from farming (M= 3.10, SD= .79) showed significant differences (p<.05) from farmers whose main income was from non-farming sources (M= 2.88, SD= .91) and famers who had income from both farming (main income) and non-farming sources (M= 2.89, SD= .77) in perception of financial concerns.

There were statistically differences in perception of concerns about incentives by income status, F (2, 343)= 3.29, p <.05. The effect size was negligible (η^2 = .02). Statistical power did not reach the .80 level. Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with only farming income (M= 2.81, SD= .78) showed significant differences (p<.05) from farmer with income from both farming (main income) and non-farming sources (M= 2.60, SD= .80) in perception of concerns about incentives.

Differences were found in perception of planning issues by income status, F (2, 344) = 3.59, p <.05. The effect size was negligible (η^2 = .02). Statistical power did not reach the .80 level. Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with only farming income (M=

2.89, *SD*= .80) showed significant differences (p<.05) from farmers with income from farming (main income) and non-farming sources (*M*= 2.66, *SD*= .84) in perception of planning issues.

Differences were found in perception of technology by income status, *F* (2, 343) = 6.23, p <.05. The effect size was negligible (η^2 = .04). The statistical power level was high (1.00>.80). Scheffe's test of conservative significant difference was applied to detect the item of difference between groups. Farmers with only farming income (*M*= 3.35, *SD*= .79) showed significant differences (p<.05) from farmers whose main income was from non-farming sources (*M*= 2.93, *SD*= .71) and farmer with income from both farming (main income) and non-farming sources (*M*= 3.30, *SD*= .75) in perception of technology concerns.

There was no significant difference in perceptions of concern about time by income status, *F* (2, 344) = 2.07, p>.05. The effect size was negligible (η^2 = .03).

Table 51

Analysis of Variance for Perception of Potential Barriers by Income Status

Construct	*n*	*M*	*SD*	*F*	*p*
Financial Concerns					
Farming income only	186	3.10	.79	3.14*	.045
Main income from non-farming	43	2.89	.77		
Extra income from non-farming	116	2.88	.91		
Concerns about Time					
Farming income only	187	2.88	.86	2.07	.13
Extra income from non-farming	116	2.70	.86		
Main income from non-farming	43	2.69	.71		
Concerns about Incentives					
Farming income only	187	2.81	.78	3.29*	.04
Main income from non-farming	42	2.60	.64		
Extra income from non-farming	116	2.60	.80		
Planning Issues					
Farming income only	187	2.89	.80	3.59*	.03
Extra income from non-farming	116	2.66	.84		
Main income from non-farming	43	2.65	.66		
Technology Concerns					
Farming income only	186	3.35	.67	6.23*	.01
Extra income from non-farming	116	3.30	.75		
Main income from non-farming	43	2.93	.71		

Note: Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Disagree nor Agree*, 4 = *Agree*, 5 = *Strongly Agree.*
*$p<.05$.

Objective Eight: Findings

Objective eight was to describe the relationship between perceptions of Facebook (relative advantage, compatibility, complexity, trialability, and observability) and potential barriers (financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns) to the diffusion of Facebook.

Relative Advantage

Table 52 shows the correlations between responding farmers' perceptions of relative advantage and the potential barriers to the diffusion of Facebook. There was a significant, substantial negative relationship (r = -.57, n = 349, p < .01) between perception of relative advantage and planning issues. There was a significant, moderate negative relationship (r = -.48, n = 348, p = .00) between perception of relative advantage and concerns about incentives. There was a significant, moderate negative relationship (r = -.44, n = 349, p < .01) between perception of relative advantage and concerns about time. There was a significant, moderate negative relationship (r = -.32, n = 348, p < .01) between perception of relative advantage and technology concerns. There was a significant, low negative relationship (r = -.29, n = 349, p < .01) between perception of relative advantage and financial concerns.

Table 52

Correlations between Relative Advantage and Perceptions of Potential Barriers to Facebook

	Relative Advantage		
Potential Barrier	*r*	*p*	Magnitude
Planning Issues	-.57*	.00	Substantial
Concerns about Incentives	-.48*	.00	Moderate
Concerns about Time	-.44*	.00	Moderate
Technology Concerns	-.32*	.00	Moderate
Financial Concerns	-.29*	.00	Low

Note: Magnitude: .01≥ *r*≥ .09= Negligible, .10≥ *r* ≥ .29= Low, .30≥ *r* ≥ .49= Moderate, .50≥ *r* ≥.69= Substantial, *r* ≥.70= Very Strong
**P<.05*

Compatibility

Table 53 shows the correlations between responding farmers' perceptions of compatibility and the potential barriers to the diffusion of Facebook. There was a significant, substantial negative relationship (r = -.60, n = 350, p < .01) between perceptions of compatibility and planning issues. There was a significant, substantial negative relationship (r = -.51, n = 349, p < .01) between perceptions of compatibility and concerns about incentives. There was a significant, moderate negative relationship (r = -.48, n = 350, p < .01) between perceptions of compatibility and concerns about time. There was a significant, moderate negative relationship (r = -.35, n = 349, p < .01) between perceptions of compatibility and technology concerns. There was a significant, low negative relationship (r = -.27, n = 349, p < .01) between perceptions of compatibility and financial concerns.

Table 53

Correlations between Compatibility and Perceptions of Potential Barriers to Facebook

	Compatibility		
Potential Barrier	*r*	*p*	Magnitude
Planning Issues	-.60*	.00	Substantial
Concerns about Incentives	-.51*	.00	Substantial
Concerns about Time	-.48*	.00	Moderate
Technology Concerns	-.35*	.00	Moderate
Financial Concerns	-.27*	.00	Low

Note: Magnitude: .01≥ *r*≥ .09= Negligible, .10≥ *r* ≥ .29= Low, .30≥ *r* ≥ .49= Moderate, .50≥ *r* ≥.69= Substantial, *r* ≥.70= Very Strong
P<.05

Low Complexity

Table 54 shows the correlations between responding farmers' perceptions of low complexity and the potential barriers to the diffusion of Facebook. There was a significant, substantial negative relationship (r = -.50, n = 350, p < .01) between perceptions of complexity and planning issues. There was a significant, moderate negative relationship (r = -.40, n = 350, p < .01) between perceptions of complexity and concerns about time. There was a significant, moderate negative relationship (r = -.39, n = 349, p < .01) between perceptions of complexity and concerns about incentives. There was a significant, low negative relationship (r = -.29, n = 349, p < .01) between perceptions of complexity and technology concerns. There was a significant, low negative relationship (r = -.21, n = 349, p < .01) between perceptions of complexity and financial concerns.

Table 54

Correlations between Low Complexity and Perceptions of Potential Barriers to Facebook

	Low Complexity		
Potential Barrier	*r*	*p*	Magnitude
Planning Issues	-.50*	.00	Substantial
Concerns about Time	-.40*	.00	Moderate
Concerns about Incentives	-.39*	.00	Moderate
Technology Concerns	-.29*	.00	Low
Financial Concerns	-.21*	.00	Low

Note: Magnitude: .01≥ *r*≥ .09= Negligible, .10≥ *r* ≥ .29= Low, .30≥ *r* ≥ .49= Moderate, .50≥ *r* ≥.69= Substantial, *r* ≥.70= Very Strong
P<.05

Trialability

Table 55 shows the correlations between responding farmers' perceptions of trialability and the potential barriers to the diffusion of Facebook. There was a significant, substantial negative relationship (r = -.65, n = 349, p < .01) between perceptions of trialability and planning issues. There was a significant, substantial negative relationship (r = -.54, n = 348, p < .01) between perceptions of trialability and concerns about incentives. There was a significant, moderate negative relationship (r = -.49, n = 349, p < .01) between perceptions of trialability and concerns about time. There was a significant, moderate negative relationship (r = -.44, n = 348, p < .01) between perceptions of trialability and technology concerns. There was a significant, moderate negative relationship (r = -.36, n = 348, p < .01) between perceptions of trialability and financial concerns.

Table 55

Correlations between Trialability and Perceptions of Potential Barriers to Facebook

	Trialability		
Potential Barrier	*r*	*p*	Magnitude
Planning Issues	-.65*	.00	Substantial
Concerns about Incentives	-.54*	.00	Substantial
Concerns about Time	-.49*	.00	Moderate
Technology Concerns	-.44*	.00	Moderate
Financial Concerns	-.36*	.00	Moderate

Note: Magnitude: .01≥ *r*≥ .09= Negligible, .10≥ *r* ≥ .29= Low, .30≥ *r* ≥ .49= Moderate, .50≥ *r* ≥.69= Substantial, *r* ≥.70= Very Strong
p<.05

Observability

Table 56 shows the correlations between responding farmers' perceptions of observability and the potential barriers to the diffusion of Facebook. There was a significant, substantial negative relationship (r = -.57, n = 350, p < .01) between perceptions of observability and planning issues. There was a significant, moderate negative relationship (r = -.49, n = 349, p < .01) between perceptions of observability and concerns about incentives. There was a significant, moderate negative relationship (r = -.46, n = 350, p < .01) between perceptions of observability and concerns about time. There was a significant, moderate negative relationship (r = -.36, n = 349, p < .01) between perceptions of observability and technology concerns. There was a significant, moderate negative relationship (r = -.32, n = 349, p < .01) between perceptions of observability and financial concerns.

Table 56

Correlations between Observability and Perceptions of Potential Barriers to Facebook

	Observability		
Potential Barrier	*r*	*p*	Magnitude
Planning Issues	-.57*	.00	Substantial
Concerns about Incentives	-.49*	.00	Moderate
Concerns about Time	-.46*	.00	Moderate
Technology Concerns	-.36*	.00	Moderate
Financial Concerns	-.32*	.00	Moderate

Note: Magnitude: .01≥ r≥ .09= Negligible, .10≥ r ≥ .29= Low, .30≥ r ≥ .49= Moderate, .50≥ r ≥.69= Substantial, r ≥.70= Very Strong
P<.05

Objective Nine: Findings

Objective nine was to explore the valid predictor variables for farmers' stage in the innovation-decision process of Facebook. A discriminant analysis was conducted to determine whether seventeen variables – perceptions of Facebook (relative advantage, compatibility, complexity, trialability, and observability), perceptions of potential barriers (financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns), and selected personal characteristics (years of farming experience, farm size, diversity of crops, gender, age, education, and income status) – could predict the stage in the innovation-decision process. Five functions were generated and the first three functions were significant (see Table 57).

The first discriminant function was significant, $\Lambda = .20$, $\chi^2 = 493.83$, $p < .05$, indicating that this function is a significant predictor of the stage in the innovation-decision process. The first discriminant function accounted for 84% of the variance in the dependent variable. The second discriminant function was significant, $\Lambda = .67$, $\chi^2 = 126.07$, $p < .05$, indicating that this function is a significant predictor of the stage in innovation-decision process. The second discriminant function accounted for 6.6% of the variance in the dependent variable. The third discriminant function was significant, $\Lambda = .79$, $\chi^2 = 74.87$, $p < .05$, indicating that this is a significant predictor of the stage of the innovation-decision process. The third discriminant function accounted for 5.2% of the variance in the dependent variable. The fourth discriminant function was not significant, $\Lambda = .90$, $\chi^2 = 34.2$, $p > .05$. The fourth discriminant function accounted for 3.4% of the variance in the dependent variable. The fifth discriminant function was not significant, Λ

=.98, χ^2 =6.49, *p*>.05. The fifth discriminant function accounted for 0.8% of the variance in the dependent variable.

Table 57

Statistical Significance of the Discriminant Functions

Test of Functions	Wilks' Lambda	χ^2	df	*p*
1 through 5	.20*	493.83	85	.00
2 through 5	.67*	126.07	64	.00
3 through 5	.79*	74.87	45	.00
4 through 5	.90	34.20	28	.19
5	.98	6.49	13	.93

Note: *$p<.05$

Table 58 shows the summary of the standardized function coefficients and correlation coefficients for the three significant functions. The variables most associated with the first function were: trialability (*b* =.39), education (*b* =.33), relative advantage (*b* =.25), and planning issues (*b* = -.24). The variables most closely correlated with the first function were: trialability (*s* = .77), planning issues (*s* = -61), relative advantages (*s* = .57), compatibility (*s* = .56), observability (*s* = .54), education (*s* = .47), complexity (*s* = .47), technology concerns (*s* = -.36), and age (*s* = -.29). The variables most associated with the second function were: observability (*b* =-.60), income (*b* =.55), farm size (*b* =.49), trialability (*b* =.41), concerns about time (*b* =.35), and education (*b* =-.33). The variables most closely correlated with the second function were: income (*s* = -.51) and farm size (*s* = -.32). The variables most associated with the third function were: education (*b* =.64), diversity of crops (*b* =.55), trialability (*b* =.46), years of farming

experience (*b* =.37), and concerns about incentives (*b* =.35). The variables most closely correlated with the third function were: diversity of crops (*s* = .46) and gender (*s* = -.25).

The original classification results revealed that 41.7% of farmers at the stage of no knowledge were correctly classified, 85.4% of farmers in the stage of knowledge were correctly classified, 13% of farmers in the stage of persuasion were correctly classified, 14.3% of farmers in the stage of decision were correctly classified, 94.9% of farmers in the stage of implementation were correctly classified, and 40% of farmers in the stage of confirmation were correctly classified. For the original sample, 76.3% were correctly classified.

Table 58
Summary Data for Discriminant Functions

	Function 1		Function 2		Function 3	
Predictor Variable	b^a	s^b	b^a	s^b	b^a	s^b
Trialability	.39	.77*	.41	.06	-.46	-.22
Planning Issues	-.24	-.61*	.04	-.03	.16	.11
Relative Advantage	.25	.57*	-.24	-.32	.13	-.04
Compatibility	.03	.56*	.11	-.17	-.19	-.07
Observability	.12	.54*	-.60	-.49	.09	-.09
Education	.33	.47*	-.33	-.04	.64	.30
Low Complexity	-.00	.47*	.04	-.24	.26	.04
Technology Concerns	-.12	-.36*	.01	-.05	.10	.03
Age	-.10	-.29*	.11	.08	.28	.19
Income	.13	.16	.55	.51*	.20	.31
Farm Size	.08	.06	.49	.32*	-.13	-.02
Diversity of Crops	-.02	.11	.15	.33	.55	.46*
Gender	-.06	.09	.01	-.06	-.21	-.25*
Concerns about Incentives	-.16	-.47	-.41	-.13	.35	.09
Concerns about Time	-.15	-.41	.35	-.00	-.19	-.26
Financial Concerns	.15	-.22	-.19	.14	.18	-.07
Years of Farming Experience	-.01	-.20	-.29	-.08	.37	.16

Note: [a]= standardized discriminant function coefficients, [b]= pooled within-group correlation coefficients.
*$p<.05$

CHAPTER V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The study's purpose, objectives, and methodology are summarized in this chapter. Conclusions, implications, and recommendations for future research and practice are then shown in the study summary.

Summary of the Study

Taiwan is a subtropical island located in East Asia. The total area of Taiwan is about 13,855 square miles. Agriculture in Taiwan is dominated by smallholder farms. For decades, Taiwan and the United States have been partners in agricultural trade and global agricultural development forums designed to accelerate cooperation in agricultural development. Understanding local agricultural human resources needs in Taiwan may can help bring a positive impact to local extension services and global agricultural development organizations. The Internet has already had a great impact on agriculture. The two main impacts of the Internet on agriculture are farmers gathering information online and the ability of farmers to communicate with their customers online (American Business Media Agri Council, 2012). Facebook is a successful social network site for information gathering and sharing. In Taiwan, Facebook's penetration rate is higher than in any other Asian country. The number of active Facebook users in Taiwan has reached 14 million per month, with a 60 percent penetration rate. More than 10 million users organize their social activities through their Facebook accounts every day (Chiu, 2013). To stimulate the growth of Taiwanese agriculture, the Taiwan Council of

Agriculture encourages farmers to adopt social media to gather agricultural information and to interact with potential consumers. However, the utilization of social media by Taiwanese farmers has not yet been investigated. Without knowledge of how smallholder farmers utilize social media, agricultural development and extension services will be unable to adequately meet the needs of local farmers. This gap has to be bridged to give agricultural human resource developers a clearer picture and provide appropriate support programs for local farmers. This study examines the adoption of the most popular social media in Taiwan, Facebook, by selected Taiwanese smallholder farmers to see how social media influences their approaches to processing information and communication. First, the study explored the factors which affect smallholder farmers in Taiwan to utilize social media.

Summary of Purpose and Objectives

The purpose of this research is to understand the influence of selected factors on the adoption of Facebook by smallholder farmers in central Taiwan. The diffusion of innovations theory developed by Rogers (2003) was applied as the framework of this study. The research objectives were:

1. Describe selected personal characteristics of selected Taiwanese smallholder farmers.
2. Determine selected smallholder farmers' stages in the innovation-decision process, based on Li's (2004) and Harder's (2007) adaption of Rogers' (2003)

stages in the innovation-decision process (no knowledge, knowledge, persuasion, decision, implementation, and confirmation).

3. Determine the extent of selected smallholder farmers' use of Facebook.
4. Determine smallholder farmers' perceptions of Facebook according to Rogers' (2003) characteristics of an innovation (relative advantage, compatibility, complexity, trialability, and observability).
5. Determine smallholder farmers' perception of potential barriers (financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns) to adopting Facebook.
6. Determine if differences exist between smallholder farmers' perceptions of Facebook based on selected demographic characteristics.
7. Determine if differences exist between smallholder farmers' perceptions of potential barriers to the adoption of Facebook by selected demographic characteristics.
8. Describe relationships between smallholder farmers' perceptions of Facebook by characteristics of an innovation (Rogers, 2003) and their perceptions of potential barriers to the adoption of Facebook.
9. Predict the stage in the innovation-decision process based upon smallholder farmers' perceptions of the characteristics of Facebook, perceptions of the barriers to the diffusion of Facebook, and selected demographic characteristics.

Summary of Methodology

A descriptive and correlational research design was used for this study. Descriptive research is important in education (Gall, Gall, & Borg, 2007). The target population was farm families from the Dahu Farmers' Association in Miaoli County in 2015. The total target population was about 3,905. Dillman's (2008) formula is adapted to calculate the sample size of this study. The final sample size (N=350) is within ±5 percentage points a 95% confidence level, with a 50/50 split. Cluster random sampling was used to select participants for the study (Fraenkel & Wallen, 2008). A paper-based questionnaire was used for data collection. The questionnaire was pilot tested for face validity and reliability testing. Cronbach's alpha coefficient was calculated for each internal scale (Cronbach, 1951). A reliability level of .80 and above is acceptable (Gall, Gall, & Borg, 2007). Because the study required surveying adult human subjects, a request for exempt status was submitted and approved by Texas A&M University Office of Research Compliance Institutional Review Board in April 2015. Formal data collection with the approved finalized instrument began in late July 2015. Fifteen agricultural production and marketing groups were randomly selected to be surveyed. The researcher visited each group's bi-monthly group meeting and distributed the questionnaires. Each participant was asked to read the information sheet and sign the consent form before they started fill out the questionnaire. Data collection was completed in early September 2015. The data were analyzed using the IBM SPSS statistical software package. Descriptive and inferential statistics were computed. The alpha level for data analysis was set a priori at. 05.

376 respondents participated in the survey. Two participants chose to opt out. 23 responses were removed due to missing data. 351 questionnaires were considered as usable responses.

The independent variables for the study are: (a) size of farm, (b) diversity of crops, (c) gender, (d) age, (e) educational level, and (f) extra income from non-farming. The dependent variables for the study are: (a) stage in the innovation-decision process, (b) relative advantages, (c) compatibility, (d) complexity, (e) trialability, (f) observability, (f) financial concerns, (g) concerns about time, (h) concerns about incentives, (i) planning issues, and (j) technology concerns.

Conclusions, Implications, and Recommendations

Objective One: Conclusions

The first objective was to describe selected personal characteristics of the respondents. Seven demographic variables were measured: (a) farming experience, (b) diversity of crops, (c) farm size, (d) gender, (e) age, (f) education, and (g) income status.

Most respondents had farming experience of between 11-15 years and 6-10 years, accounting for 46.4 percent (*n*= 163) together. The fewest respondents had over 25 years farming of experience (*n*= 26, 7.4%).

Nearly 54 percent of respondents grew two crops or more while 44.4 percent of respondents grew only one crop.

Most respondents (*n*= 192, 54.7%) had a farm area of less than one hectare (2.47 acers). The fewest number of respondents had a farm area larger than 2 hectares (*n*= 35, 10.2%).

Most of the respondents were males (*n*= 269, 76.6%); fewer respondents were female (*n*= 73, 20.8%).

Most of the respondents were 51-60 years old (*n*= 103, 29.3%), 41-50 years old (*n*= 82, 23.4%), and 61-70 years old (*n*= 74, 21.1%). Only 55 respondents were under 40 years old (15.9%). There were 33 respondents over 71 years old (9.4%).

Most respondents had a senior high school degree (*n*= 143, 40.7%) or junior high school degree (*n*= 89, 25.4%). A total of 61 respondents had elementary school degrees (17.4%). The fewest respondents had a Bachelor's or higher degree (*n*= 57, 16.3%).

Most of respondents only had income from farming (*n*= 188, 54.2%). Fewer respondents had their main income from farming and extra income from non-farming (*n*= 116, 33.0%). The fewest respondents had main income from non-farming and extra income from farming (*n*= 43, 12.3%).

Objective One: Implications

As mentioned previously, agriculture in Taiwan is dominated by smallholder farms. The average farm size is only about 1.73 acres per family (Taiwan Council of Agriculture, 2012). Furthermore, most smallholder farmers in Dahu area have smaller farms than the average throughout Taiwan. This may be because the Dahu area is mountainous. Most of the farmlands are fragmentary.

According to the annual agriculture census report by the Taiwan Council of Agriculture (2013), 31.37% of Taiwanese farmers have income only from farming sources, while 68.63% of Taiwanese farmers had extra income from non-farming jobs or had their main income from non-farming jobs. In this study, 54.2% of respondents had income only from farming sources, while 45.3% of respondents had extra income from non-farming sources or their main income from non-farming sources. Farmers in the Dahu area are, therefore, less likely to have non-farming primary jobs or part-time jobs. The reason may be that the Dahu area is a remote rural area. The local industry is mainly agriculture. Compared to other areas of Taiwan, there are fewer non-farming jobs.

Most of respondents are in range of 51-60 years old and 41-50 years old. This is similar to the results of the annual agriculture census conducted by the Taiwan Council of Agriculture (2013b). However, most respondents had 6-15 years of farming experience. The median farming experience was 14 years. This suggests that these farmers might have had jobs in other industries before moving into agriculture. It implies that respondents have the ability of social mobility.

According to the Taiwan Council of Agriculture (2013b), most Taiwanese farmers have a high school degree (27.18%) or Bachelor's or higher degree (26.27%). These figures are inconsistent with the results of this study. Most of the respondents in this study had a senior high school degree (40.7%) or junior high school degree (25.4%). This shows that the responding farmers had a lower education level than the average for farmers in Taiwan.

In this study, male respondents were way more than female respondents. The reason may be that male farmers usually represent their farm family to attend meetings of the agricultural production & marketing teams. It did not imply male farmers were more than female farmers in Taiwan.

Rogers (2003) indicates that the rate of adoption is influenced by the characteristics of adopters, including socioeconomic status, education, and wealth. The findings under the first objective show that respondents were varied in terms of farming experience, diversity of crops, farm size, gender, age, education, and income status. These characteristics of adopters may influence their rate of adopting Facebook.

Objective One: Recommendations

Based on the diffusion of innovations theory, Rogers (2003) suggests that communication messages are produced, especially for "the lower-socioeconomic subaudience in terms of their particular characteristics" (Rogers, 2003, p.464).

Further research is recommended to explore more varying characteristics of adopters, such as personality variables and communication behavior (Rogers, 2003), to see if these characteristics also influence speed of adoption.

Objective Two: Conclusions

The second objective was to explore selected smallholder farmers' stage in the innovation-decision process, based on Li's (2004) and Harder's (2007) adaption of Rogers' (2003) stages in the innovation-decision process (no knowledge, knowledge,

persuasion, decision, implementation, and confirmation). Nearly 35 percent of responding farmers were in the early stages of the innovation-decision process while 53 percent of respondents were in late stages of the innovation-decision process. Few respondents (*n* =37, 10.6%) were in middle stages of the innovation-decision process. Nearly half of the responding farmers were at the stage of "implementation" (*n* =171, 48.7%). They were currently using Facebook. Only sixteen respondents (4.6%) were at stage of "confirmation" and had engaged with Facebook long enough to evaluate whether they would use Facebook as a part of their occupation as farmers. Ninety-seven (26.7%) respondents were at the stage of "knowledge". They
had heard of Facebook but have not decided whether to hold a positive or negative attitude toward Facebook. Thirty respondents (8.5%) had never heard of Facebook before.

Objective Two: Implications

Facebook was established in 2004 in the United States. Five years later, it started to become very popular in Taiwan because of a Facebook-based game called "Happy Farm." Game players can virtually grow and harvest crops in this game. They can also steal their Facebook friends' crops. Subsequently, due to the multiple functions and popularity of Facebook, people in Taiwan started to hear the term "Facebook" frequently on TV news. Many physical stores asked customers to "check-in" on Facebook to get free gifts. Facebook not only exists in the online world, but also influences the real world. Time is involved in the innovation-diffusion process (Rogers, 2003). At the time

of this study in 2015, Facebook has been popularized in Taiwan for more than six years. The Facebook penetration rate (60%) in Taiwan is higher than in any other Asian country. This could explain why most of the respondents at least had knowledge of Facebook. Only a few (8.5%) of responding farmers had never heard of Facebook. In addition, the Taiwan Council of Agriculture encourages farmers to adopt social media to gather agricultural information and to interact with potential consumers. A project launched in 2012 called the "Farmer Writing Workshop" teaches farmers how to use Facebook to record their farming lives by uploading texts, photos and videos. This project led farmers through the stages of knowledge, persuasion, decision into the stage of implementation because farmers started to use Facebook in practice. If farmers who participated in the writing workshop are also opinion leaders in their social networks, they may increase the speed of Facebook adoption in the network.

Though Dahu is a rural area, most of area is covered by basic broadband communication technology. The Internet speed is acceptable for accessing Facebook. In addition, nearly 64 percent of Taiwanese own a mobile information and communication device such as a smartphone or tablet (Institute for Information Industry, 2015). When the basic requirements for accessing Facebook are met, the entry barrier for using Facebook is lowered. As Facebook provides the functions of receiving daily information and connecting with family and friends, it is not surprising that more than half of the responding farmers were in the late stage (stage of implementation and confirmation) of the innovation-decision process.

Individuals will stay at the stage of knowledge in the innovation-decision process if they believe the innovation is irrelevant, or if they lack adequate knowledge to proceed to the stage of persuasion, (Rogers, 2003). Nearly 27 percent of the respondents were at the stage of "knowledge". Although they have heard of Facebook, they may think Facebook is irrelevant to them or lack adequate knowledge of Facebook to proceed to next stage of innovation-decision process. It is understandable that potential adopters think that Facebook is irrelevant to them because not every innovation could be diffused and adopted by all members of a social system.

There were a few respondents (n =37, 10.6%) at the middle stages of the innovation-decision process. This shows potential adopters may move rapidly through the stages of persuasion and decision in the innovation-decision process. It may be because accessing Facebook is at no cost as long as adopters have the devices and Internet service. As mentioned before, the entry barrier to using Facebook is low. Potential adopters with enough knowledge, and positive feelings should be able to decide to sign up a Facebook account and proceed to the implementation stage.

Rogers' (2003) is not always perfectly reflected in a social system. On the other hand, perhaps the researcher did not properly categorize members of the social system into the stages of innovation-decision process.

Objective Two: Recommendations

Recommendations for practice based on Rogers' (2003) theory are to: (a) provide more information to farmers who are at the stage of knowledge about how to use

Facebook and the benefit of using Facebook for communication and information, (b) encourage opinion leaders to promote the benefit of Facebook to other individuals, (c) provide positive reinforcement to farmers who are in the stage of implementation to so they can move to the stage of confirmation.

Recommendations for future research are to: (a) investigate the innovation-decision process in other rural and urban areas of Taiwan to see if the distribution of process is different from this study, and (b) explore factors related to varying characteristics of opinion leaders.

Objective Three: Conclusions

The third objective was to describe the extent of responding farmers' use of Facebook.

Most respondents (*n*=222, 63.2%) had a Facebook account. Among respondents with a Facebook account, most respondents had 101-200 friends (28.1%), 201-300 friends (23.1%), and less than 100 friends (22.6%) on Facebook. Most respondents had owned their Facebook accounts for 4-6 years (28.2%) and 1-3 years (25.6%). Very few (0.6%) respondents had owned their Facebook accounts for more than 9 years. Most respondents (75.8%) accessed Facebook 2-7 times per week. Most respondents interacted with other users on Facebook 2-7 times (42.2%) and more than 15 times (32.1%) per week. Few respondents (5.0%) interacted with others on Facebook once or less than once per week.

The most frequently selected usages of Facebook by respondents were to connect with friends (*n* = 211) and family (*n*= 147), receive agricultural information (*n* = 172), read daily news and information (*n* = 171), share daily life stories with others (*n* = 150), and share professional knowledge with others (*n* = 148).

Nearly half of respondents with Facebook accounts used Facebook for farm marketing purposes. Among respondents using Facebook for marketing purposes, most of them carry out marketing on Facebook once or less than once (51.9%) and 2-7 times (45.2%) per week. Most respondents (80.0%) had created a Facebook page for their farms. Most respondents (61.9%) post marketing information both on their farms' Facebook page and their personal Facebook wall. Among the respondents that had created Facebook pages for their farms, most of them had owned their farm Facebook pages for 4-6 years (42.9%) and 1-3 years (34.5%). In addition, most of them had 251-300 people (31.0%), less than 100 people (29.8%), and 101-250 people (27.4%) "like" their farm pages. Finally, most of them (89.3%) had never purchased advertisements on Facebook. Only a few respondents (*n*=9, 10.7%) had purchased advertisements on Facebook.

Objective Three: Implications

For objective two, it is found that more than half of the responding farmers (53.3%) were in the late stage (stage of implementation and confirmation) of the innovation-decision process. It is assumed these respondents had Facebook accounts. However, for objective three, it was found that 63.2 percent of the respondents owned a

Facebook account. This may indicate that some respondents had tried to adopt Facebook account but no longer use Facebook.

Among the respondents with Facebook accounts, compared with results from a survey of the Taiwan population as a whole (Alhabash et al, 2012), farmers in the Dahu area had a higher number of Facebook friends. One possible explanation is this study was carried out in 2015. The previous study was carried out in 2012. The number of Facebook friends may grow year by year since the number of Facebook users continues to increase. Another possible explanation is farmers used personal Facebook account to manage and operate their farm business. In addition to real friends in the offline world, they may add customers and extension agents as Facebook friends. Though individuals tend to be connected to people who are close to them and who are relatively homophilous in social characteristics with them (Rogers, 2003), according to Granovetter (1973), customers and non-close "Facebook friends" that are considered as "weak ties" may be more helpful than close friends (as strong ties) to farmers' businesses.

The most commonly selected usages of Facebook by responding farmers are to connect with friends and family and share daily life stories with others. This finding is consistent with previous studies which indicated that the unique advantage of social network sites are facilitating social connectivity and social updates (Alhabash et al, 2012; Papacharissi & Mendelson, 2011; Thorson & Duffy, 2006; Thorson, Duffy, & Schumann, 2007). Additionally, a major advantage of Facebook is social connectivity. A high number of responding farmers with Facebook accounts used Facebook to receive

agricultural information and daily news and share professional knowledge with others. This indicates that farmers' usage of Facebook is more than for social purposes. Facebook has become a resource for information receiving and sharing. This finding is consistent with previous studies (Gillespie, 2011; Lee & Suh, 2013; Mazman & Usluel, 2010; Papacharissi & Mendelson, 2011; Vitak & Ellison, 2012; White et al., 2013)

Nearly half of respondents with Facebook accounts used Facebook for farm marketing purposes. Compared with the respondents' personal use activity, the frequency of business use activity is low. One possible explanation is that farming tasks are routine. Farmers may not think these routine tasks can be repeatedly shared with the public. Another explanation is farmers may tend to post messages more frequently only in harvest season in order to sell more crops. The frequency of marketing post in non-harvest season may be much lower than in harvest season. It may imply that responding farmers have not enough knowledge to do online marketing via social media.

Among the respondents using Facebook for marketing purposes, most (80.0%) had created Facebook pages for their farms. This finding is consistent with previous studies that show that small businesses use Facebook as a communication and marketing platform (Jamerson, 2013, Ouoba, 2011; Yates & Vallas 2012). A large proportion of respondents who created a Facebook page for their farm posted marketing information both on their farms' Facebook page and their personal Facebook wall. This indicates that small holder farmers use their personal social networks to promote their farm business. Farming business and farmers' personal lives are tied together on Facebook. A possible explanation is that most of them do not have many people who "like" their farm pages.

The dissemination of information about farm products information is not broad enough. Farmers still need their social networks to their support farming business.

Very few respondents had purchased advertisements on Facebook. A possible explanation is that the advertising fees are unaffordable for them. Another explanation is that it has never occurred to them to purchase advertisements on Facebook. The results of this section show that smallholder farmers in Dahu area mainly treated Facebook as a tool for social connection and information sharing. Though nearly half of respondents with Facebook accounts used Facebook for farm marketing purposes, they did not utilize Facebook deeply and broadly for marketing purposes. They may need advanced knowledge to use Facebook as a marketing tool.

Objective Three: Recommendations

Recommendations for practice are: (a) extension and government organizations can use Facebook to communicate with farmers for delivering information and promoting new policies, (b) to encourage farmers to use Facebook to change the perception of agriculture among the public, and (c) to host workshops for farmers to use Facebook for marketing and selling crops.

Recommendations for future research are to: (a) explore the factors influencing potential adopters who had tried to use Facebook but ended up stopping their use, and (b) investigate the extent of farmers' use of Facebook in other rural and urban areas of Taiwan to see if the results are different.

Objective Four: Conclusions

Objective four 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.

Objective Four: Implications

According to Rogers (2003), subdimensions of relative advantage include economic profitability, a decrease in discomfort, and a saving of time and effort. 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. Respondents 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 held a neutral attitude with regard 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.

Complexity of an innovation is negatively related to the rate of adoption (Rogers, 2003). 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. However, they held a neutral attitude with regard to whether Facebook is 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. Non-users of Facebook may tend to hold a negative attitude toward these questions.

Respondents perceived the trialability of Facebook positively. The standard deviation (*SD* =.81) for trialability was higher relative to other attributes. This means respondents had quite contrasting perceptions on the trialability of Facebook. Respondents agreed they can try many functions of Facebook such as replying to messages, sharing, posting messages, uploading photos, and chatting. However, they held neutral perception of 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. Gillespie's (2011) also indicated that accessibility may be the barrier for beef producers adopting social media even on a trial-basis because accessing to a computer or internet may not be always available for agriculturists.

The observability of an innovation is positively related to its adoption (Rogers, 2003). Though Rogers (2003) indicates 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 Facebook is the most popular 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.

Objective Four: Recommendations

The recommendation for practice is to host workshops for farmers to train them to use Facebook for marketing.

Recommendations for future research are: (a) explore these five attributes of other social media to see which media are perceived more positively by smallholder farmers, (b) explore which tools smallholder farmer use for marketing, (c) explore those Facebook non-users' perceptions of the characteristics of Facebook according to Rogers' (2003) diffusion of innovation theory to figure out how to improve the adoption rate of Facebook, and (d) conduct a focus group interview for farmers who have purchased Facebook advertisement to see if they are the innovators of adopting Facebook.

Objective Five: Conclusions

Objective five was to describe farmers' perceptions of potential barriers (financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns). Respondents held neutral perceptions with regard to technology

concerns, financial concerns, concerns about time, planning issues or concern about incentives for the adoption of Facebook. They rated highest on technology concerns (*M* = 3.29, *SD*= .71) and least on concerns about incentives (*M* = 2.72, *SD*= .77).

Objective Five: Implications

It was unexpected that respondents neither agreed nor disagreed with these five concerns regarding the adoption of Facebook. A possible explanation is 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. When these two groups' perceptions of potential barriers were calculated together, the statistical results tended to be neutral.

Respondents appear not to have many financial concerns. They rated highest on "cost of advertisement fee on Facebook" (*M* = 3.27, *SD*= .96). This may be the reason that only nine respondents have bought advertisements on Facebook. Respondents held a neutral attitude toward concerns about time. They rated highest on "Lack of time available is a barrier for me to respond to online requests for information in time" (*M* = 2.88, *SD*= .92). 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" (*M* = 2.86, *SD*= .97). This may be the reason that respondents rate lowest on "Facebook meets my need of marketing" (*M* = 3.44, *SD*= .65) in perceptions of compatibility. Respondents held a neutral attitude

toward planning issues. They rated highest on “Lack of planned opportunities for farmers to learn about the benefit of using Facebook” (*M* = 2.94, *SD*= .92). This may indicate some respondents need to know the benefit of using Facebook. Respondents had the greatest concerns about technology (*M* = 3.29, *SD*= .71) among these five potential barriers though they held statistically neutral perceptions of technology concerns. They rated highest on “Concern of legal issue (e.g., computer crime, hackers, copyright)” (*M* = 3.44, *SD*= .78). This finding is consistent with previous studies (Steinman & Hawkins, 2010; Gillespie, 2011).

From the results of this objective, if future research faces a similar situation (the innovation was launched several years ago), it may be better to explore the perception of potential barriers by potential adopters who are still at the early or middle stages of innovation-decision process. This may provide clearer answers to the question. Potential adopter at the late stages of the innovation-decision may already overcome the potential barriers or may not perceive as many barriers as the potential adopters who remain at the early stages of innovation-decision process.

Objective Five: Recommendations

Since the results of this objective are all seemed neutral, future research needs to figure out the perceptions of potential barriers by smallholder farmers who were in early and middle stages of the innovation-decision process. This will help extension services understand which barriers slow down the speed of Facebook adoption by smallholder farmers.

Objective Six: Conclusions

Objective six was to explore if significant difference existed between the selected personal characteristics (years of farming experience, size of farm, diversity of crops, gender, age, educational level, and extra income status) and the farmers' perceptions of Facebook (relative advantage, compatibility, complexity, and trialability, and complexity). The respondents had no difference in perception of Facebook by farm size and diversity of crops.

The respondents had statistically significant differences in perception of Facebook by years of farming experience, gender, age, education, and income. Farmers with 21-25 years of farming experience had neutral perceptions toward the trialability of Facebook, while farmers with less than farmers with 0-5 years of farming experience, farmers with 6-10 years of farming experience, and farmers with 11-15 years of farming experience agreed Facebook has trialability. Farmers with over 25 years' experience had neutral perceptions toward observability of Facebook, while farmers with 0-5 years of farming experiences, farmers with 6-10 years of farming experiences, and farmers with 11-15 years of farming experiences agreed Facebook had observability. Farmers with 6-10 years of farming experiences had significantly higher rating on observability of Facebook than farmers with 16-20 years of farming experiences and farmers with 21-25 years of farming experiences in perception of observability of Facebook.

Responding farmers had significant differences in their perceptions of Facebook by gender. Female respondents agreed Facebook has relative advantage while male respondents neither agreed nor disagreed Facebook has relative advantage. Female

respondents had significantly higher rating on perceptions of compatibility, trialability and observability of Facebook than male respondents.

Responding farmers had significant differences in their perceptions of Facebook by age. Farmers in the age range 61-70 years had significantly lower rating than farmers in the age range 18-40 years, and farmers in the age range 41-50 years on perception of relative advantage and observability of Facebook. Farmers in the age range 61-70 years neither agreed nor disagreed that Facebook has compatibility while farmers in the age range 18-40 years and farmers in the age range 41-50 years agreed Facebook has compatibility. Farmers aged over 71 years neither agreed nor disagreed that Facebook has compatibility while farmers in the age range 41-50 years agreed Facebook has compatibility. Farmers in the age range 61-70 years neither agreed nor disagreed that Facebook seems not to be complex while farmers in the age range 18-40 years and farmers in the age range 41-50 years perceived Facebook was not complex. Farmers aged over 71 years neither agreed nor disagreed that Facebook has trialability while farmers in the age range 18-40 years, farmers in the age range 41-50 years, and farmers in the age range 51-60 years agreed Facebook has trialability. Farmers in the age range 61-70 years neither agreed nor disagreed that Facebook has trialability while farmers in the age range 18-40 years and farmers in the age range 41-50 years agreed that Facebook has trialability. Farmers in the age range 18-40 years had significantly higher rating than farmers in the age range 51-60 years on perceptions of trialability of Facebook. Farmers in the age range 51-60 years agreed that Facebook has observability while farmers aged over 71 years neither agreed nor disagreed that Facebook has observability.

Responding farmers had significant differences in their perceptions of Facebook by education. Farmers with elementary education neither agreed nor disagreed that Facebook has relative advantage, compatibility trialability, observability, and lack of complexity, while farmers with senior high school education and farmers with Bachelor's and graduate degrees agreed that Facebook has relative advantage, compatibility, trialability, observability, and lack of complexity. Farmers with junior high education had significantly lower ratings on perception of the relative advantage and observability of Facebook than farmers with senior high school education and farmers with Bachelor's degrees. Farmers with junior high school education neither agreed nor disagreed that Facebook has compatibility, complexity, and trialability, while farmers with senior high school education and farmers with Bachelor's and graduate degrees agreed Facebook has compatibility, trialability and lack of complexity. Farmers with Bachelor's and graduate degrees had significantly higher ratings on trialability and observability of Facebook than farmers with senior high school education.

Responding farmers had significant differences in their perceptions of Facebook by income status. Farmers with main income from non-farming agreed that Facebook has trialability while farmers who only had income from farming neither agreed nor disagreed that Facebook has trialability.

Objective Six: Implications

The respondents showed no difference in perception of Facebook by farm size. According to Rogers (2003), earlier adopters have larger-sized farms than later adopters.

However, Ali (2012) indicated that smallholder farmers are more likely to adopt information communication technology when compare to large-scale farm holders. This study is inconsistent with both these conclusions. A possible explanation is that most respondents are smallholder farmers. Though few respondents had larger farms, compared with real large-scale farms, their farms are relatively small. The respondents showed no difference in perception of Facebook by diversity of crops. This finding is inconsistent with Ali's (2012) study that farmers who grow diversified crops over the year are more willing to adopt information communication technology.

Farming experience is related to respondents' perceptions of the trialability and observability of Facebook. Farmers with fewer years of farming experience were more likely to agree they can try some functions of Facebook and that Facebook is visible when compared to farmers with more years of farming experience. There are two possible explanations for this. First, farmers with fewer years of farming experience may be younger, although Rogers (2003) indicated that age is inconsistently related to innovation adoption. Another explanation is farmers with fewer years of farming experience may have had other non-farming jobs before they transferred to farming. This may indicate these farmers had better social mobility or had better ability to cope with uncertainty and risk than farmers with longer farming experience. This assumption is consistent with Rogers (2003) theory that earlier adopters have a greater degree of upward social mobility and are better able to deal with uncertainty and risk than later adopters. Based on the researcher's observation, many Taiwanese smallholder farmers return to rural areas after they become tired of urban life or they have retired from their

original careers. Future research can examine which explanation better reflects the actual situation.

Gender is related to respondents' perceptions of the relative advantage, compatibility, trialability and observability of Facebook. Female respondents agreed that Facebook has relative advantage while male respondents neither agreed nor disagreed that Facebook has relative advantage. Female respondents were more likely to agree on perceptions of compatibility, trialability and observability of Facebook than male respondents. This finding is partially consistent with Mansumitrchai, Park, and Chiu's (2012) study in South Korea which found that female users perceived Facebook to be more useful and tend to have more activities on Facebook when compared to males. Gillespie (2011) also produced a similar conclusion with regard to U.S. beef producers. However, our finding is inconsistent with Yueh et al.'s (2013) study that Taiwanese male farmers had more positive perceptions on learning effectiveness of information communication technology.

Responding farmers had significant differences in their perceptions of relative advantage, compatibility, complexity, trialability and observability of Facebook by age. These findings contradict Rogers' (2003) theory that age is inconsistent related to innovation adoption. In this study, younger respondents had more positive perceptions of five attributes of Facebook than older respondents. This finding is consistent with previous study in the United States that found Facebook users are significantly younger than non-users because younger users may be more comfortable with online

communication (Raacke & Bonds-Raacke, 2008). Mansumitrchai, Park, and Chiu's (2012), Samah et al. (2009), and Yueh et al. (2013) also reached similar conclusions.

Responding farmers had significant differences in their perceptions of Facebook by education. Respondents with a higher education level had more positive perceptions of five attributes of Facebook than respondents with a lower education level. This finding is consistent with Rogers' (2003) theory that earlier adopters have more years of formal education than late adopters. Potential adopters with higher socioeconomic status and a higher education level are more likely to become early adopter. Ali and Kumar (2011) and Yueh et al. (2013) also reached a similar conclusion.

Responding farmers had significant differences in their perceptions of trialability of Facebook by income status. Farmers with their main income from non-farming sources agreed that Facebook is triable while farmers who only have income from farming neither agreed nor disagreed that Facebook has trialability. This finding is consistent with Ali's (2012) conclusion that adoption of information communication technology is influenced by off-farm income. Farmers who have extra income from non-farming businesses are more willing to adopt Internet-based information technology.

Objective Six: Recommendations

Recommendations for practice are to: (a) develop basic Facebook training programs, especially for elderly farmers and (b) develop advanced Facebook training program for younger farmers.

Recommendations for future research are to: (a) explore if relationships exist between Taiwanese farmers' perceptions of Facebook and their non-farming job experience and (b) determine the difference in perceptions of Facebook by smallholder farmers and large-scale farmers.

Objective Seven: Conclusions

Objective seven was to explore if significant differences existed between the selected personal characteristics (years of farming experience, size of farm, diversity of crops, gender, age, educational level, and extra income status) and farmers' perceptions of potential barriers (financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns). Respondents had no difference in their perceptions of potential barriers by diversity of crops.

Responding farmers had significant differences in their perceptions of potential barriers by years of farming experience, farm size, gender, age, education level, and income status. There were significant differences in perceptions of potential barriers by years of farming experience. Farmers with 21-25 years of farming experience had significantly higher ratings on financial concerns than farmers with 6-10 years of farming experience and farmers with 11-15 years of farming experience. Farmers with 21-25 years of farming experience had significantly higher ratings on perceptions of concerns about time than farmers with 0-5 years of farming experience and farmers with 11-15 years of farming experience. Farmers with 21-25 years of farming experience had significantly higher ratings on perceptions of concerns about incentives than farmers

with 11-15 years of farming experience. Farmers with 0-5 years of farming experience had significantly lower ratings on perception of technology concerns than farmers with 21-25 years of farming experience, farmers with 16-20 years of farming experience, and farmers with over 25 years farming experience.

Responding farmers showed significant differences in their perceptions of concern about time by their farm size. Farmers with farm size smaller than one hectare had significantly higher ratings on concerns about time than farmers with farms of 1.1-2.0 hectares in size.

Responding farmers had significant differences in their perceptions of potential barriers by gender. Male respondents had significantly higher ratings on financial concerns and concerns about incentives and planning issues than female respondents.

Responding farmers had significant differences in their perceptions of potential barriers by age. Farmers in the age range 51-60 years had significantly higher ratings on concerns about time than farmers in the age range 41-50 years. Farmers aged over 71 years had significantly higher ratings on planning issues than farmers in the age range 18-40 years and farmers in the age range 41-50 years. Farmers aged over 71 years agreed they had technology concerns regarding Facebook use while farmers in the age range 18-40 years, farmers in the age range 41-50 years, farmers in the age range 51-60 years, and farmers in the age range 61-70 years neither agreed nor disagreed they had technology concerns regarding Facebook use. Farmers in the age range 61-70 years had significantly higher rating on technology concerns of Facebook than farmers in the age range 18-40 years.

Responding farmers had significant differences in their perceptions of potential barriers by education. Farmers with elementary education had significantly higher rating on financial concerns regarding Facebook than farmers with senior high school education and farmers with Bachelor's and graduate degrees. Farmers with elementary education had significantly higher rating on concerns about time than farmers with senior high school education and farmers with Bachelor's and graduate degrees. Farmers with junior high school education had significantly higher rating on concerns about time than farmers with senior high school education and farmers with Bachelor's and graduate degrees. Farmers with elementary education had significantly higher rating on concerns about incentives than farmers with senior high school education and farmers with Bachelor's and graduate degrees. Farmers with junior high school education had significantly higher ratings on concerns about incentives than farmers with senior high school education and farmers with Bachelor's and graduate degrees. Farmers with Bachelor's and graduate degrees disagreed they had planning issues of Facebook while other responding farmers neither agreed nor disagree they had planning issues regarding Facebook. Farmers with elementary education had significantly higher rating on planning issues than farmers with senior high school education and farmers with Bachelor's and graduate degrees in perceptions of planning issues. Farmers with junior high school education had significantly higher rating on planning issues than farmers with senior high school education and farmers with Bachelor's and graduate degree in perception of planning issues. Farmers with elementary education agreed they had technology concerns regarding Facebook while other responding farmers neither agreed

nor disagree they had technology concerns regarding Facebook. Farmers with junior high school education had significantly higher rating on technology concerns than farmers with Bachelor's and graduate degrees.

Responding farmers had significant differences in their perceptions of potential barriers by income status. Farmers with income only from farming sources had significantly higher ratings on financial concerns than farmers whose main income was from non-farming sources and farmers with income from both farming (main income) and non-farming sources. Farmers with only farming income had significantly higher ratings on concerns about incentives than farmers with income from both farming (main income) and non-farming sources. Farmers with only farming income had significantly higher ratings on planning issues than farmer with income from both farming (main income) and non-farming sources. Farmers with only farming income had significantly higher ratings on technology concerns than farmers whose main income was from non-farming sources and farmers with income from both farming (main income) and non-farming sources.

Objective Seven: Implications

The personal characteristic of diversity of crops did not influence farmers' perceptions of potential barriers to Facebook. In objective six, it is also found that personal characteristic of diversity of crops have no influence on farmers' perceptions of characteristics of Facebook. This conclusion does not support Ali's (2012) study that

diversity of crops influenced farmers' adoption of information communication technology.

Later adopters may encounter more barriers or perceive more concerns than earlier adopters. These barriers slow down their speed of innovation adoption. Years of farming experience influences farmers' perception of potential barriers. Farmers with more years of farming experience were more likely to perceive concerns about finance, time, incentives, and technology than farmers with few years of farming experience. Technology concern is one of the most important concerns when adopting technology (Buehrer, et al., 2005; Del Aguila-Obra & Padilla-Melendez, 2006; Jamerson, 2013; Newbury, et al., 2014; Steinman & Hawkins, 2010; Warren, 2004). Wisconsin and New York Extension directors had concerns about time, money, and training when considering adopting social media (Newbury et al., 2014). Rogers (2003) indicated a lack of incentives decreases an innovation's perceived relative advantage. As it mentioned in objective six, when farmers have fewer years of farming experience, this may mean they are younger or they had other jobs before they transferred to farming. If these farmers had a non-farming career before they starting farming, they may have better social mobility or have better ability to cope with uncertainty and risk than farmers with longer farming experience. This may be an explanation for why farmers with less farming experience were less likely to perceive potential barriers of Facebook.

Farmers with farms size smaller than one hectare were more likely to perceive concern about time than farmers with a farm size in the range of 1.1-2.0 hectares. This finding is consistent with Rogers (2003) discovery that earlier adopters have larger–sized

farms than later adopters. However, there is not enough evidence to define famers with larger-size farms as earlier adopter because farm size did not influence farmers' perceptions of Facebook in this study.

Responding farmers had significant differences in their perceptions of potential barriers by gender. Male respondents were more likely to perceive concerns about finance, incentives and planning issues than female respondents. Furthermore, objective six found that male farmers tended to had lower perceptions of Facebook and higher perceptions of potential barriers to Facebook. Compared with female farmers, male farmers may be later adopters of Facebook.

Responding farmers had significant differences in their perceptions of potential barriers by age. Generally, older farmers were more likely to perceive concerns about time, technology, and planning issues. This finding is consistent with previous studies in the United States which found that Facebook users are significantly younger than non-users because younger users may be more comfortable with online communication (Raacke & Bonds-Raacke, 2008). It is noticeable that farmers in the age range 18-40 had no significant difference from farmers in the age range 41-50 to potential barriers of Facebook. When developing training programs for smallholder farmers, there is no need to separate these two subgroups.

Responding farmers had significant differences in their perceptions of potential barriers by education. Rogers (2003) indicated earlier adopters have more years of formal education than later adopters. This assumption infers that farmers with a lower education level were later adopters than farmers with a higher education level. In this

study, farmers with fewer years of formal education were more likely to perceive concerns about financial, time, incentive, technology, and planning issues. This indicates later adopters perceived more concerns than earlier adopter.

Responding farmers had significant differences in their perceptions of potential barriers by income status. This finding is consistent with Ali's (2012) conclusion that off-farm income influences the adoption of information communication technology. Farmers with income only from farming were more likely to perceived concerns about finance, incentives, technology, and planning issues. Interestingly, off-farm income status did not influence smallholder farmers' concerns about time. This finding does not support Jamerson's (2013) conclusion that Kentucky wineries owners who are not involved in social media are concerned about time because some of them had part-time jobs which occupied their available time to access social media.

Objective Seven: Recommendations

Recommendations for practice are to: (a) offer more incentives to smallholder farmers. According to Rogers (2003), the main function of incentives is to increase the degree of relative advantage of an innovation. Increasing farmers' perceptions of the relative advantage of Facebook will increase the rate of adoption; (b) develop training programs, especially for male farmers, or encourage female farmers to bring their family members to training programs; and (c) provide extra technological support for elderly farmers and farmers with elementary school degrees.

Recommendations for future research are to: (a) explore why off-farm income is not related to differing perceptions of concerns about time as a barrier to the adoption of Facebook, (b) determine if there are other personal characteristics that account for differences in farmers' perceptions of potential barriers.

Objective Eight: Conclusions

Objective eight was to describe the relationship between perceptions of Facebook (relative advantage, compatibility, complexity, trialability, and observability) and potential barriers (financial concerns, concerns about time, concerns about incentives, planning issues, and technology concerns) to the diffusion of Facebook.

There was a significant, substantial negative relationship between perceptions of relative advantage and planning issues. There were significant, moderate negative relationships between perception of relative advantage and three potential barriers: concerns about incentives, concerns about time, and technology concerns. There was a significant, low negative relationship between perception of relative advantage and financial concerns.

There were significant, substantial negative relationships between perception of compatibility and two potential barriers: planning issues and concerns about incentives. There were significant, moderate negative relationships between perceptions of compatibility and two potential barriers: concerns about time and technology concerns. There was a significant, low negative relationship between perception of compatibility and financial concerns.

There was a significant, substantial negative relationship between perception of low complexity and planning issues. There were significant, moderate negative relationships between perception of low complexity and two potential barriers: concerns about time and concerns about incentives. There were significant, low negative relationships between perception of low complexity and two potential barriers: technology concerns and financial concerns.

There were significant, substantial negative relationships between perceptions of trialability and two potential barriers: planning issues and concerns about incentives. There were significant, moderate negative relationships between perception of trialability and three potential barriers: concerns about time, technology concerns, and financial concerns.

There was a significant, substantial negative relationship between perception of observability and planning issues. There were significant, moderate negative relationships between perception of observability and four potential barriers: concerns about incentives, concerns about time, technology concerns, and financial concerns.

Objective Eight: Implications

Planning issues were substantially negatively related to smallholder farmers' perceptions of relative advantage, compatibility, low complexity, trialability, and observability of Facebook. A possible explanation is farmers may have doubts about what they should do on Facebook to get most benefit from spending time and effort on Facebook. Offering suitable training programs may help to eliminate planning issues.

Concerns about incentives were substantially negatively related to smallholder farmers' perceptions of the compatibility and trialability of Facebook and moderately negatively related to smallholder farmers' perceptions of the relative advantage, complexity and observability of Facebook. Eliminating concerns about incentives may help to increase farmers' perceptions of Facebook. According to Rogers (2003), offering incentives can increase relative advantage of an innovation. In this study, offering incentives mostly increased perceptions of the compatibility and trialability of Facebook by farmers.

Concerns about time were moderately negatively related to smallholder farmers' perceptions of the relative advantage, compatibility, low complexity, trialability and observability of Facebook. It is not easy to decrease concerns about time because farmers have many routines tasks to do. Facebook is an effective tool for information sharing, marketing, and communication. Emphasizing these points when developing training programs may increase their attractiveness to farmers.

Technology concerns were moderately negatively related to smallholder farmers' perceptions of relative advantage, compatibility, trialability and observability and weakly negatively related to smallholder farmers' perceptions of low complexity. Extra technical supports should be provided to farmers to decrease their technology concerns.

Financial concerns were moderately negatively related to smallholder farmers' perceptions of trialability and observability and weakly negatively related to smallholder farmers' perceptions of relative advantage, compatibility and complexity. Compared with other potential barriers, financial concerns were the least negatively related to

farmers' perceptions of Facebook. A possible explanation is accessing Facebook requires only Internet service and a device. These requirements are not costly. Farmers may not have many financial concerns related to their perceptions of Facebook.

Objective Eight: Recommendations

Recommendations for practice are to: (a) develop a training program for smallholder farmers to improve their Facebook skills and online marketing skills, (b) encourage more agriculture-related organizations to use Facebook to communicate with smallholder farmers, (c) provide awards to stimulate farmers to get involved in Facebook communication, and (d) provide technical support to smallholder farmers.

Recommendations for future research are to: (a) determine differences in perceptions of Facebook by farmers' stage in innovation-decision process and (b) determine differences in potential barriers to Facebook by farmers' stage in the innovation-decision process.

Objective Nine: Conclusions

Objective nine was to explore the valid predictor variables for farmers' stage in the Facebook innovation-decision process. Five functions were generated and first three functions were significant. For the overall sample, 76.3% were correctly classified. The first discriminant function accounted for 84% of the variance in the dependent variable. The variables most closely correlated with the first function were: trialability, planning

issues, relative advantages, compatibility, observability, education, complexity, technology concerns, and age. The second discriminant function accounted for 6.6% of the variance in the dependent variable. The variables most closely correlated with the second function were: income and farm size. The third discriminant function accounted for 5.2% of the variance in the dependent variable. The variables most closely correlated with the third function were: diversity of crops and gender.

Objective Nine: Implications

In the first discriminant function, 84% of the variance in the dependent variable is accounted for. Five characteristics of Facebook (trialability, relative advantages, compatibility, observability, and complexity), two potential barriers to Facebook (planning issues and technology concerns), and two personal characteristics (education and age) were significantly correlated with stages in the innovation-decision process. The findings of this study were partially consistent with Harder's (2007) conclusion that complexity, trialability, technology concerns, and education level were correlated with stage in the innovation-decision process. The findings were partially consistent with Rogers' (2003) theory that relative advantage and compatibility have the most influence on the rate of adoption, although complexity, trialability, and observability were also predictor variables in this study. Rogers (2003) also indicated that education can be a predictor variable. This finding is supported in this study. Age was a predictor variable in this study. This finding is inconsistent with Roger's (2003) theory that earlier adopters have no difference from later adopter by age.

Rogers (2003) defined the diffusion process as "an innovation is communicated through certain channels over time among the members of a social system". In Harder's (2007) conclusion, this model was not accurate enough to predict stage in the innovation-decision process. However, this model worked fairly well in this study. A possible explanation is that the innovations and social systems were totally different in these two studies. Harder's study focused on diffusion of eXtension among Texas cooperative Extension county agents. This study focused on diffusion of Facebook among smallholder farmers in Taiwan. Thus, future research may consider using this model to determine the predictor variables for the stage in the innovation-decision process.

Objective Nine: Recommendations

Recommendations for practice are to: (a) develop training program for farmers to improve their planning skills to decrease planning issues and (b) provide technical support to smallholder farmers to decrease technology concerns.

Exploring the predictor variables for the stage in the innovation-decision process based on extent of farmers' use of Facebook is recommended for future research.

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APPENDIX A

Informed Consent Form

This research is conducted by Chia-Wei Chang, PhD candidate in the Department of Agricultural Leadership, Education, and Communications at Texas A&M University.

Before answering the survey, please read and confirm the Consent Form below.

Purpose: This study investigates how small scale farmers use Facebook and the factors of influencing their adoption of Facebook™.

Procedure: You will complete a questionnaire about your experience and perceptions of using Facebook™.

Risks and benefits: There are no known risks or discomforts associated with this study. The results obtained may eventually improve the agricultural education system to have better understanding on approaching and providing the extension service and mass education for agricultural workforce.

Compensation: There is no compensation in this study.

Voluntary participation: Participation in this study is voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. The alternative to participate in this study is to not participate. What this means is that you can decide to not participate. You are free to withdraw from the study at any time, at no
penalty. Withdrawal from the study will in no way prejudice your future interactions with the personnel administering or supervising the study, or with Texas A&M University.

Confidentiality: All identifying information obtained from this study will be kept strictly confidential, except as may be required by law. Any information that could be used to identify you or your child will be kept under lock and key. Data files will not contain potentially identifying information.

Consent: I have read and understood the above information, have had any questions answered satisfactorily, and I willingly consent to participate in this study. I understand that if I should have any questions about my rights as a research subject, I can contact Human Subjects Protection Program at Texas A&M University at 979-458-4067.
I can also contact the Chia-Wei Chang by email (chiaweiwei@tamu.edu),
or by phone at 979-997-4568. I have received a copy of this consent form.

- ◯ Yes
- ◯ No

Which social media is your favorite one?

Please indicate your favorite social media.

- ☐

- [ ]
- [ ]
- [ ]
- [ ] Other: Please write down your favorite social media
- [ ] None

Level of involvement with Facebook

An online social media called Facebook™ has been launched in 2004. Please indicate your level of involvement with Facebook™:

- ○ I have never heard of Facebook™
- ○ I have heard of Facebook™, but have not decide whether or not I like or dislike Facebook™
- ○ I have decide that I like or dislike Facebook™
- ○ I have decided that I will or will not use Facebook™
- ○ I am using Facebook™
- ○ I have used Facebook™ long enough to evaluate whether or not Facebook will be part of my farmer's career

Facebook

Do you have any personal Facebook™ accounts?

- ○ Yes
- ○ No. (If you select this option, Please skip to answer Q.9)

How many "friends" do you connect on Facebook™?

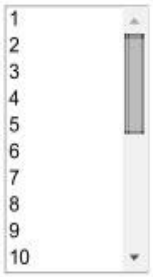
- ○ Less than 100 friends
- ○ 101-200 friends
- ○ 201-300 friends
- ○ 301-400 friends
- ○ 401-500 friends

- More than 500 friends

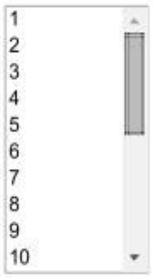
For how long have you set up your Facebook™ account approximately ?

- Less than 1 year
- 1-3 years
- 4-6 years
- 7-9 years
- More than 9 years

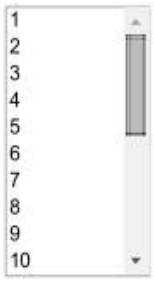
How many times do you access Facebook™ per week approximately?



How many times do you update your profile on Facebook™ per week approximately? (For example: posting, uploading photos, or sharing articles.)



Hoe many times do you interact with other users on Facebook™ per week approximately? (For example: "Like" others' posts or photos, leaving comments, or messaging/chatting with others)



I use Facebook to:

- [ ] Connect with family
- [ ] Connect with friends
- [ ] Read daily news and information
- [ ] Receive agricultural information
- [ ] Share professional knowledge with others
- [ ] Share daily life story with others
- [ ] Organize meetings
- [ ] Develop professional networking
- [ ] Market my farm
- [ ] Other: (Please describe it in the blank box)

Below is a list of characteristics that may impact the diffusion of Facebook™ among small scale farmers. Please read each item carefully before indicating your answer by checking the appropriate box.

Relative Advantage of Facebook™

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
Using Facebook™ to interact with other agriculturists is easier than the traditional way	○	○	○	○	○
Using Facebook™ to share my farm stories is easier than the traditional way	○	○	○	○	○
Using Facebook™ to market my farm products is less-cost than the traditional way	○	○	○	○	○
Using Facebook™ as a resource will make marketing easier	○	○	○	○	○
Using Facebook™ to gather agricultural information is easier than the traditional way	○	○	○	○	○
Using Facebook™ to get information of daily life is easier than the traditional way	○	○	○	○	○
Using Facebook™ to obtain information is more time-saving	○	○	○	○	○
Using Facebook™ to interact with my customers is easier than the traditional way	○	○	○	○	○

Compatibility of Facebook™

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
Facebook™ meets my need of marketing	○	○	○	○	○
Facebook™ meets my need of communication	○	○	○	○	○
Via Facebook™, I can cultivate trusted relationships with my customers.	○	○	○	○	○
It is necessary to use Facebook™ to marketing my farm product	○	○	○	○	○
I acquire potential customer via Facebook™	○	○	○	○	○
I use Facebook™ to get real-time information from government ans extension service	○	○	○	○	○
I use Facebook™ to get daily-life information	○	○	○	○	○

Complexity of Facebook™

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
Facebook™ seems user-friendly	○	○	○	○	○
Using Facebook™ seems simple	○	○	○	○	○
Using Facebook™ to access information is easy for me	○	○	○	○	○
Facebook™ is a good communication channel for me	○	○	○	○	○
I am confident to use Facebook™	○	○	○	○	○

Trialability of Facebook™

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
I can upload photos to Facebook™	○	○	○	○	○
I can post messages on Facebook™	○	○	○	○	○
I can chat to my friends on Facebook™	○	○	○	○	○
I can click "like" on Facebook™	○	○	○	○	○
I can reply my friends' message on Facebook™	○	○	○	○	○
I can use "share" function on Facebook™	○	○	○	○	○
Accessing Facebook™ is free	○	○	○	○	○

Observability of Facebook™

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree

The website of Facebook™ is well-publicized	○	○	○	○	○
Facebook™ is a highly visible social media	○	○	○	○	○
Many of my friends use Facebook™	○	○	○	○	○
My friends have invited me to "like" their Facebook™ page	○	○	○	○	○
I can easily observe my friends' activities on Facebook™	○	○	○	○	○
I know my farmer friends use Facebook to promote their farm products	○	○	○	○	○

Using Facebook for marketing purpose

Do you use Facebook™ to market your farm or farm products?

- ○ Yes
- ○ No (If you select this option, Please SKIP to answer Q.20)

How many times do you post farm-related information on Facebook™ per week approximately?

1
2
3
4
5
6
7
8
9
10

When you post farm-related information on Facebook™, you post it on:

- ○ Your farm's Facebook™ page
- ○ Your personal Facebook™ wall
- ○ Both of above

Have you created a Facebook™ page for your farm?

- ○ Yes
- ○ No (If you select this option, Please skip to answer the next block of this instrument.)

If you have created a Facebook™ page for your farm, how long is this page been created approximately?

- less than a year
- 1-3 years
- 4-6 years
- 7-9 years
- More than 9 years

How many people "like" your Facebook™ page of your farm?

- Less than 100 people
- 101-250 people
- 251-500 people
- 501-750 people
- 751-1000 people
- More than 1001 people

Have you ever purchased advertisement on Facebook?

- Yes
- No

Possible barriers to the diffusion of Facebook

Below is a list of possible barriers to the diffusion of Facebook™ among smallholder farmers. Please read each item carefully before indicating your perception of each possible barrier by clicking the appropriate button

Financial concerns

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Lack of financial resources to support the necessary devices technoligies	○	○	○	○	○
Lack of financial resources to promote my farm Facebook page or my personal Facebook offline	○	○	○	○	○
Cost of purchasing the necessary devices technologies	○	○	○	○	○
Cost of monthly internet connection fee	○	○	○	○	○
Cost of advertisement fee on Facebook	○	○	○	○	○

Concerns about time

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Lack of time is a berrier for me to learn how to use Facebook™					
I do not have time to use Facebook™ for marketing because I spend most of my time farming					
Because I spend my free time working another job, lack of time is a barrier to using Facebook to market my farm.					
Lack of time available is a barrier for me to respond to online requests for information in time					
Lack of time available to develop materials for marketing on Facebook is a barrier for me to utilize Facebook™					

Concerns about incentives

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Because traditional communication ways are good enough for me, I don't have any motivation to use Facebook					
Lack of support from governmental organizations is a barrier for me to use Facebook™					
Because my friends and family don't use Facebook™, I am not interested in using Facebook					
Lack of correlation between using Facebook and getting potential customers					
Lack of correlation between using Facebook and getting useful information					
Lack of award for involvement with Facebook					
Lack of crops selling increase for marketing on Facebook					
I have fear of new technology					

Planning issues

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I have no idea what should I do on Facebook					
Lack of strategic planning for getting information on Facebook					
Lack of strategic planning for marketing on Facebook					
Lack of planned opportunities for farmers to learn about the benefit of using Facebook					
Lack of identified (perceived or real) need for using Facebook					

Lack of strategic planning for marketing from online to offline					
Lack of strategic planning for connecting potential customersonFacebook					

Concerns about technology

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Lack of adequate Internet connection speed					
Lack of appropriate equipment for accessing Facebook (e.g., smart phone, desktop)					
Concern of legal issue (e.g., computer crime, hackers, copyright)					
Lack of knowledge is a barrier for me to use Facebook					
Lack of training programs for me to learn how to use Facebook™					

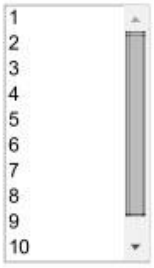
Other concerns: If you have other concerns about using Facebook, please tell us what the concerns are.

Personal Information

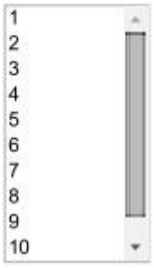
Are you a member of any Production and Marketing Teams?

- Yes. My team is_____ (Please fill up the name of your production and marketing team in the blank bar.
- No

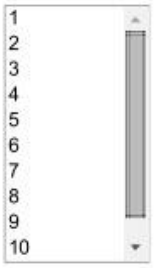
How many kinds of vegetable are you growing currently?



How many kinds of fruits are you growing currently?



How many kinds of flower are you growing currently?



The size of your farmland is about (unit: hectare):

For how long have you been a farmer?

Less than 1 year

- 1-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- Over 25 years

Your gender is _____

- Male
- Female

Your age is _____

Your highest education level is _____

- Element school
- Junior high school
- High school
- Bachelor's degree
- Master's degree
- PhD degree

Please indicate which statement is appropriate to describe your situation

- The income from farming is my only income (including government subsides)
- The income from farming is my main income. I have other income from non-farming business
- I have income from farming, but my main income is from non-farming business

Do you have any comment about Facebook? If yes, please write it down in the following column.

APPENDIX B

在開始填寫問卷之前，請先閱讀以下資訊並確認同意書:

親愛的農友，您好：

我是張家瑋，美國德州農工大學農業發展所博士班候選人。目前正在進行一項『小農使用Facebook(臉書)接受訊息及傳佈訊息之行為』研究，目的在於了解社群媒體對於台灣小農的行銷及訊息傳播的影響。本研究成果應用於社群媒體對於農業訊息的傳遞影響，並改善台灣農業推廣教育，因此您的參與對本研究是非常重要的。

本研究不會帶來任何危險，如果您同意參與本研究，請您花費約需 15 分鐘完成填寫此份問卷內容，並交還給研究團隊人員。填寫此份問卷完全是自願的，不涉及任何利益關係，您有絕對的權力決定是否要參與本研究，如果您不願意參加、或中途決定退出，您可以隨時停止完成這份問卷。這並不會替您帶來任何問題。您可在任何時間告知研究人員，我們將尊重您的決定。若有任何疑問時請盡量提出，研究人員將會為您說明並回答相關問題，直到無任何疑問為止。

您的名字及所有相關資料我們將絕對保密，且絕不做其他用途。

同意書: 我已閱讀並了解以上資訊，現場工作人員能夠回答我對於此問卷的疑慮。我同意參與這項研究。我了解如果我對於這項研究有疑問，我可以向美國德州農工大學 Human Subjects Protection Program 詢問 (電話: +1-979-458-4067)。我也可以隨時以電子信件向張家瑋聯繫 (chiaweiwei@tamu.edu).

我同意填寫此問卷:

☐ 我同意
☐ 我不同意

請指出以下哪一種是你最喜歡的社群媒體:

Google+ ☐ facebook ☐ twitter ☐ LINE ☐ 其他 ☐

對於 Facebook 的涉入程度

1. 有一個社群媒體叫做 Facebook(臉書)，這個社群媒體成立於 2004 年。請指出你對 Facebook(臉書)的涉入程度:
   - ☐ 我沒聽過 Facebook
   - ☐ 我聽過 Facebook，不過我還沒決定我喜不喜歡這個社群媒體
   - ☐ 我已經決定我喜不喜歡 Facebook
   - ☐ 我已經決定我要不要使用 Facebook
   - ☐ 我目前有在使用 Facebook
   - ☐ 我使用 Facebook 的時間已經足夠讓我評估要不要使用 Facebook 來幫助我的職業

Facebook 的使用狀況

2. 您有 Facebook 的個人帳號嗎?
   - ☐ 有
   - ☐ 沒有 (如果您選擇此選項，請跳答第 9 題)

3. 請問您在 Facebook 上大約有多少位朋友呢?
   - ☐ 少於 100 位
   - ☐ 101-200 位
   - ☐ 201-300 位
   - ☐ 301-400 位
   - ☐ 401-500 位
   - ☐ 超過 500 位

4. 請問您大約設立 Facebook 帳號多久了?

   - ☐ 少於 1 年
   - ☐ 1-3 年
   - ☐ 4-6 年
   - ☐ 7-9 年
   - ☐ 超過 9 年

5. 請問您每周登入 Facebook 大約幾次?

   _____次

6. 請問您一週更新您的 Facebook 大約幾次? (例如: 更新動態、上傳照片、或分享文章等)

   _____次

7. 請問您一週內會和您在 Facebook 的朋友互動大約幾次? (例如: 在他人的文章或照片上按"讚"、留言、或與他人傳訊息聊天等)

_____次

8. 我用 Facebook 來: (可複選)

☐ 和我的家人保持聯繫
☐ 和我的朋友保持聯繫
☐ 閱讀新聞及日常生活資訊
☐ 獲得農業相關資訊
☐ 與他人分享農業專業知識
☐ 與他人分享日常生活故事
☐ 組織/約定開會
☐ 發展我的農業領域人脈
☐ 行銷我的農場
☐ 其他: _____(請註明)

以下列表群為可能影響小農使用 Facebook 的原因，請仔細閱讀每個選項，並在您認同的選項上打勾

9. Facebook 的相對優勢:

與傳統方式相比，	強烈不同意	不同意	中立	同意	強烈同意
使用 Facebook 讓我和其他農業從事人員互動變得更容易	☐	☐	☐	☐	☐
使用 Facebook 分享我的農場故事變得更容易	☐	☐	☐	☐	☐
使用 Facebook 行銷農產品更節省成本	☐	☐	☐	☐	☐
使用 Facebook 來行銷農產品變得更容易	☐	☐	☐	☐	☐
使用 Facebook 收集農業資訊更容易	☐	☐	☐	☐	☐
使用 Facebook 收集日常生活資訊更容易	☐	☐	☐	☐	☐
使用 Facebook 來獲得資訊更節省時間	☐	☐	☐	☐	☐
使用 Facebook 和我的顧客互動變得更容易	☐	☐	☐	☐	☐

10. Facebook 的相容性:

	強烈不同意	不同意	中立	同意	強烈同意
使用 Facebook 有滿足我的行銷需求	☐	☐	☐	☐	☐
使用 Facebook 有滿足我與他人溝通的需求	☐	☐	☐	☐	☐
透過 Facebook，我可以和我的顧客建立信賴關係	☐	☐	☐	☐	☐
使用 Facebook 來行銷我的農產品是必要的	☐	☐	☐	☐	☐
透過 Facebook，我可以獲得潛在的顧客	☐	☐	☐	☐	☐
使用 Facebook，我可以獲得來自政府及農會的最新訊息	☐	☐	☐	☐	☐
使用 Facebook，我可以獲得日常生活資訊	☐	☐	☐	☐	☐

11. Facebook 的複雜性:

	強烈不同意	不同意	中立	同意	強烈同意
Facebook 有人性化的介面，是方便使用的	□	□	□	□	□
使用 Facebook 似乎是簡單的	□	□	□	□	□
使用 Facebook 來獲得訊息對我來說是簡單的	□	□	□	□	□
Facebook 對我來說是個好的通溝管道	□	□	□	□	□
對於使用 Facebook，我感到很有自信	□	□	□	□	□

12. Facebook 的可試用性:

	強烈不同意	不同意	中立	同意	強烈同意
我會上傳照片 Facebook	□	□	□	□	□
我會在 Facebook 上發表文字訊息	□	□	□	□	□
我會使用 Facebook 的聊天功能	□	□	□	□	□
我會在 Facebook 按"讚"	□	□	□	□	□
我會在 Facebook 上回覆朋友的訊息	□	□	□	□	□
我會使用 Facebook 的"分享"功能	□	□	□	□	□
使用 Facebook 是免費的	□	□	□	□	□

13. Facebook 的可觀察性:

	強烈不同意	不同意	中立	同意	強烈同意
Facebook 是非常公開的	□	□	□	□	□
Facebook 是個被高度關注的社群媒體	□	□	□	□	□
我有很多朋友使用 Facebook	□	□	□	□	□
我朋友曾經邀請我在他們的 Facebook 頁面上按讚	□	□	□	□	□
我可以很容易地觀察到我朋友在 Facebook 上的活動	□	□	□	□	□
我知道我的農夫朋友們使用 Facebook 來行銷農產品	□	□	□	□	□

透過 Facebook 來行銷農產品

14. 請問您有使用 Facebook 來行銷您的農場或是農產品嗎?

□ 有

□ 沒有(如果您選擇此選項，請跳答第 20 題)

15. 請問您一週在 Facebook 上發表與農場相關的訊息大約幾次?

_____次

16. 當您發表與農場有關的訊息時，請問您是發表在:

☐ 您的 Facebook 農場專頁上
☐ 您個人的 Facebook 頁面上
☐ 以上兩者都有

17. 請問您有替您的農場創立一個 Facebook 專頁嗎?

☐ 有
☐ 沒有(如果您選擇此選項，請跳答第 21 題)

18. 如果您有為您的農場創立 Facebook 專頁，請問這個專頁已創立大約多久了?

☐ 少於 1 年
☐ 1-3 年
☐ 4-6 年
☐ 7-9 年
☐ 超過 9 年

19. 請問大約有多少位粉絲在您的農場專頁上按"讚"?

☐ 100 人之內
☐ 101-250 人
☐ 251-500 人
☐ 501-750 人
☐ 751-1000 人
☐ 1000 人以上

20. 請問您曾經在 Facebook 上購買過廣告嗎?

☐ 是
☐ 否

影響 Facebook 使用的潛在阻礙: 以下列表群為可能影響小農使用 Facebook 的原因，請仔細閱讀每個選項，並在您認同的選項上打勾

21. 經濟考量:

	強烈不同意	不同意	中立	同意	強烈同意
缺乏經濟補助來購買使用 Facebook 的相關設備 (例如: 智慧型手機、平板電腦或筆記型電腦)	☐	☐	☐	☐	☐
缺乏經濟補助來幫助我在實體世界裡宣傳有農場訊息的 Facebook 頁面 (例如: 文宣或實體廣告)	☐	☐	☐	☐	☐
購買使用 Facebook 相關設備的費用對我來說是負擔	☐	☐	☐	☐	☐
每個月的網路費用對我來說是負擔	☐	☐	☐	☐	☐
在 Facebook 上買廣告對我來說是負擔	☐	☐	☐	☐	☐

22. 時間考量:

	強烈不同意	不同意	中立	同意	強烈同意
我沒時間學習如何使用 Facebook	☐	☐	☐	☐	☐
我農務繁忙，沒時間使用 Facebook	☐	☐	☐	☐	☐
我還有兼職工作，沒時間使用 Facebook	☐	☐	☐	☐	☐
我沒時間即時回應在 Facebook 上的訊息	☐	☐	☐	☐	☐
我沒時間準備在 Facebook 上行銷農產品的宣傳內容	☐	☐	☐	☐	☐

23. 動機考量:

	強烈不同意	不同意	中立	同意	強烈同意
傳統的溝通交流方式對我來說已足夠，我不需要使用 Facebook	☐	☐	☐	☐	☐
政府農業相關單位缺乏參與，降低我使用 Facebook 的意願	☐	☐	☐	☐	☐
我的家人和朋友都不使用 Facebook，這讓我也不想使用 Facebook	☐	☐	☐	☐	☐
我不覺得使用 Facebook 可以幫助我接觸到更多的購買者	☐	☐	☐	☐	☐
我不覺得可以在 Facebook 上獲得有用的資訊	☐	☐	☐	☐	☐
使用 Facebook 沒辦法幫助我獲得任何獎勵	☐	☐	☐	☐	☐
在 Facebook 行銷農產品沒辦法增加我的銷售量	☐	☐	☐	☐	☐
我對使用新科技有恐懼的心態	☐	☐	☐	☐	☐

24. 計畫使用考量:

	強烈不同意	不同意	中立	同意	強烈同意
我不知道該使用 Facebook 來做什麼	☐	☐	☐	☐	☐
我不知道如何在 Facebook 上有效地獲得有用資訊	☐	☐	☐	☐	☐
我不知道如何在 Facebook 上有策略地行銷我的農產品	☐	☐	☐	☐	☐
農友們缺乏機會學習使用 Facebook 可以獲得的好處	☐	☐	☐	☐	☐
我不覺得我有使用 Facebook 的需求	☐	☐	☐	☐	☐
缺乏策略性的計畫來整合 Facebook 行銷和實體行銷	☐	☐	☐	☐	☐
缺乏策略性的計畫來和潛在的消費者接觸	☐	☐	☐	☐	☐

25. 科技考量:

	強烈不同意	不同意	中立	同意	強烈同意
我使用的網路速度不夠快	☐	☐	☐	☐	☐
我沒有適合的設備上 Facebook (例如:智慧型手機、電腦)	☐	☐	☐	☐	☐
我擔心法律問題(電腦犯罪、駭客問題、著作權)	☐	☐	☐	☐	☐
我不知道如何使用 Facebook	☐	☐	☐	☐	☐
缺乏適合的教育訓練來教我怎麼使用 Facebook	☐	☐	☐	☐	☐

26. 其他考量: 請問還有哪些原因會降低您使用 Facebook 的意願呢?
請在以下空欄中描述您的疑慮及考量

個人資訊

27. 請問您是否有加入產銷班?
☐ 是，我加入的產銷班是 _____產銷班
☐ 否

28. 請問您目前種植_____種蔬菜?

29. 請問您目前種植_____種水果?

30. 請問您目前種植_____種花卉?

31. 請問您工作的農地範圍面積大約有幾公頃?

_____

32. 請問您從事農務工作幾年?

☐ 1 年內
☐ 1-5 年
☐ 6-10 年
☐ 11-15 年
☐ 16-20 年
☐ 20-25 年
☐ 超過 25 年

33. 您的性別為:
☐ 男
☐ 女

34. 請問您今年_____歲

35. 您最高學歷為:
☐ 小學
☐ 初中
☐ 高中職
☐ 大專院校
☐ 碩士
☐ 博士

36. 請問以下哪一個選項最能描述您目前的收入狀況?
☐ 來自務農的收入(包含政府補助)是我唯一的收入
☐ 來自務農的收入是我的主要收入，我還有來自非農業的收入
☐ 我有來自務農的收入，但我的主要收入是來自非農業的收入

37. 請問您對於使用 Facebook 有任何評論嗎?如果有的話，請在以下空欄中描述您的意見

----------本問卷到此結束，謝謝您的合作----------