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Mexican Banks' Acceptance and Use of Twitter to Assist in Evaluating Farm Loan Applications: Exploring the Role of Agricultural Loans on Food Security

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Abstract

Food security issues are a global concern of countless citizens irrespective of professional vocation or individual residence. Literature indicated numerous factors affect food security and researchers should continue examining elements that may influence food insecurity. The lack of acquiring finance can prohibit farmers from planting and harvesting crops, and thus, is a cause of food insecurity. Mexican banks receive economic agricultural forecasts from the Ministry of Agriculture. This study sought to describe Mexican banks' degree of acceptance and use of the Ministry's information on Twitter. Fourteen (N = 14) agricultural loan administrators from Mexican banks were examined to address this study's research objectives. Agricultural loan administrators were interviewed to determine their acceptance and use of the Ministry's statistics on Twitter. Participants reported the dissemination of agricultural statistics on Twitter saved banks time by providing a source that delivered specific crop forecasts and not all crop outlooks simultaneously. Twitter can be used to let a bank know the particular value of a commodity in real time thus being able to inform not only their financial decisions but notify farmers pursuing loans. The Ministry of Agriculture's Twitter feeds increased performance and communication while requiring little effort due to the pervasive nature of the technology. The use of information disseminated on Twitter allowed farmers to receive funds faster thus enabling them to plant and harvest crops in order to aid in the battle against food insecurity.

Keywords: Food Security, Agricultural Loans, Twitter, UTAUT, Banks, Ministries of Agriculture

Introduction

The United States Agency for International Development (2010) indicated the global population will be approximately 9 billion by 2050 and the necessity for food will escalate by 50% in 20 years. The majority of hungry citizens across the globe reside in developing countries (United Nations Food and Agriculture Organization, 2010). Food insecurity is not automatically an outcome of a food shortage but a convoluted mixture of diverging factors (Thurow & Kilman, 2009). The United Nations Food and Agriculture Organization (2010) identified food insecurity as an indicator of undernourishment.

Coates et al. (2006) found eleven areas of food insecurity across cultures. One of the eleven elements, planting and harvest challenges, can cause less food to be available to feed people. The majority of financing for safety net programs comes from financial development assistance, grants, and loans (Alderman & Yemtsov, 2012). The inability for farmers to secure agricultural loans in a timely manner can lead to food insecurity in communities (Battisti & Naylor, 2009). The failure to quickly get credit hindered the capacity of women farmers in Africa to plant during the planting season (Gladwin, Thomson, Peterson, & Anderson, 2001). Cash transfers that put money directly in the hands of women have increased women's status within the household (Saurez et al., 2006) and promoted their economic empowerment. Extension programs that focus on disseminating food security policy with existing credit programs are needed for farmers to better learn what financing options are available (Dorosh, 2008).

International agricultural and extension education researchers have explored numerous factors that contributed to food security. Owolade and Kayode (2012) studied farmers' use of information to achieve food security in Nigeria. Tobin, Bruening, Brennan, and Olson (2012) investigated farmers' perceptions of land reform programs to mitigate food insecurity in South Africa. Ali-Olubandwa, Odero-Wanga, Kathuri, and Shivoga (2010) examined the adoption of maize production practices in order to address local food security issues in a province of Kenya. Anandajayasekeram, Davis, and Workneh (2007) examined the role of farmer field schools in mitigating food insecurity concerns in Eastern and Southern Africa. Adopted soil and water conservation practices led to food security improvements in Bolivia, Ecuador, and Peru (Ruddell, Ochoa, & Ochoa, 1996). Further research is needed as knowledge gaps exist as to the aggregate causes of food insecurity (Webb et al., 2006).

The role of food is a key component in Mexicans' identity and culture (Dooley, Dooley, & Carranza, 2008). Nearly 75 percent of Mexican families in rural areas experience food insecurity throughout the year (Rosas et al., 2009). Mexican banks have the responsibility to assess and disperse loans, in a timely manner, to farmers in order to assist in feeding the local community (Bátiz-Lazo & Wood, 2001). The Mexican Ministry of Agriculture provides Mexican banks with agricultural statistics in order to assist banks in evaluating, processing, and distributing agricultural loans to farmers.

The Secretaría De Agricultura, Ganadería, Desarrollo Rural, Pesca Y Alimentación (SAGARPA) is the Mexican Ministry of Agriculture. SAGARPA (2011) reported the goal of the Ministry is to supply the nation with food from agricultural operations. The Mexican Ministry of Agriculture furnishes agricultural statistics to banks with the purpose of helping farmers attain financing. Chang (2009) suggested

credit is essential for Mexican farmers to manage their production.

Inaccessible financing leads to problems for farmers in Mexico. Acquiring agricultural loans is a challenge for Mexican farmers (Tetreault, 2010). Arjona, Bueno, and Salazar (2001) indicated farmers needed loans from Mexican banks to purchase the necessary machinery to harvest sugarcane. Mexican farmers did not receive financing from banks in time to purchase seed and fertilizer to plant crops (Gravel, 2007). Mexico's Progresa/Oportunidades programme found a positive return to helping secure food security through creating economic loans (Grosh, del Ninno, Tesliuc, & Ouerghi, 2008). David, Dirven, and Vogelgesang (2000) reported specific Mexican property once designated for agricultural use is now used for nonagricultural use due to the lack of accessible financing.

We propose the Mexican Ministry of Agriculture use social media tools like Twitter to more rapidly distribute commodity projections to banks (Strong, 2012). Hughes and Palen (2009) suggested Twitter is a micro-blogging service that allows users to post messages in order to communicate with like-minded individuals and groups. Twitter is a tool that provides electronic word-of-mouth to an audience (Jansen, Zhang, Sobel, & Chowdury, 2009). Using Twitter to receive information can influence an individual's or group's decision (Bollen, Mao, & Zeng, 2011). The Mexican Ministry of Agriculture began utilizing Twitter to disseminate agricultural statistics, and Strong and Dooley (2012) recommended examining the use of Twitter to disseminate agricultural information to Mexican banks to better understand a factor that may influence food security.

Theoretical Framework

The technology acceptance model was developed as a theory to predict individuals' acceptance and use of technology (Davis, 1989). Venkatesh, Morris, Davis, and Davis (2003) developed the unified theory of acceptance and use of technology (UTAUT) from the technology acceptance model. The UTAUT helps to describe an individual's perceptions of the extent a technological system may improve job performance, the system's ease of use, the level of importance versus other systems, and the infrastructure needed to utilize the respective technological system. Venkatesh et al. (2003) indicated the UTAUT describes individuals' behavioral intentions to use technology. Behavioral intention is the level of predictability that individuals will use the technology to accomplish individual or organizational goals.

Performance expectancy, effort expectancy, social influence, and facilitating conditions are the four constructs in the UTAUT. Venkatesh et al. (2003) postulated performance expectancy is the measure an individual perceives using the technology will improve job performance. Effort expectancy is the assessment of ease connected with the use of a technology. Performance and effort expectancy are the primary indicators of an individual's behavioral intention to use a respective technology. Social influence is the extent the user understands the merit of using the technology from other sources. Venkatesh et al. (2003) identified facilitating conditions as the degree a user considers that the essential infrastructure is present to use the technology.

Members of the Association for International Agricultural and Extension Education have employed the UTAUT in studies with U.S. students. Murphrey, Rutherford, Doerfert, Edgar, and Edgar

(2012) used the UTAUT to frame a study examining the technology acceptance of Second Life™, social networking, Twitter, and content management systems with agricultural education students. Irby and Strong (2013) implemented the UTAUT to investigate agricultural leadership students' acceptance and use of mobile technology.

The UTAUT is illustrated in Figure 1. Further research is needed to develop an understanding of the extent to which the UTAUT can explain an individual's acceptance of technology at for-profit businesses (Straub, 2009). The UTAUT can assist researchers in ascertaining the level of individuals' acceptance and usage of technology respective of context (Garfield, 2005). Stockwell (2008) indicated individual acceptance evolves at different speeds with new technology. Venkatesh (2006) recommended researchers should continue to investigate the function of participant acceptance and usage of technology.

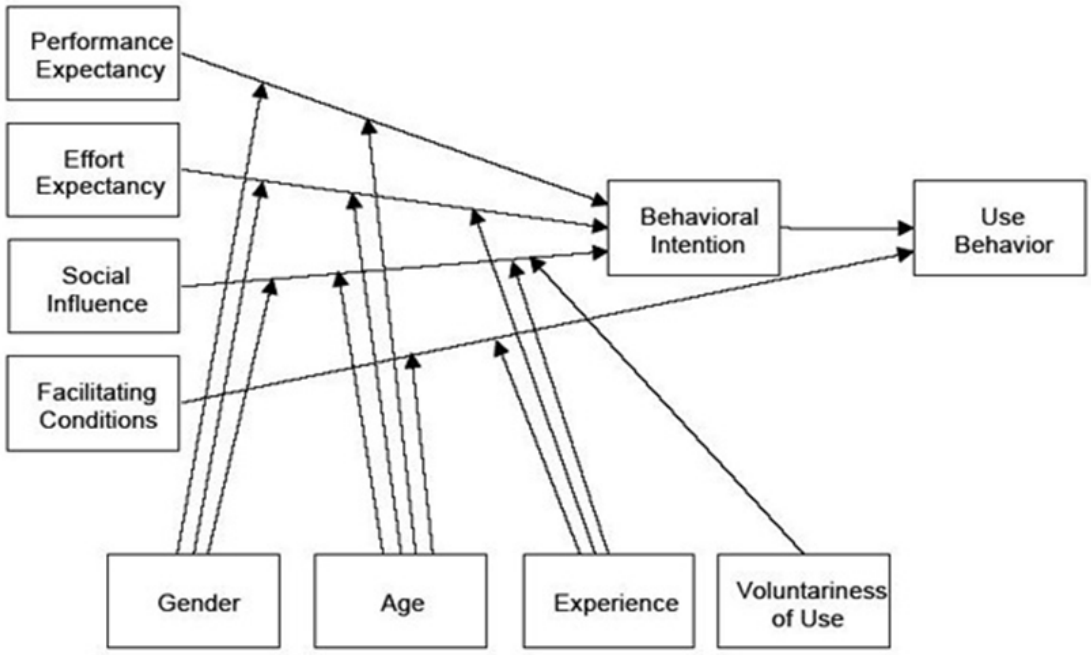

Figure 1. Venkatesh et al.'s (2003) unified theory of the acceptance and use of technology (UTAUT).

Purpose and Objectives

This study was a part of a larger study to understand the adoption and diffusion of the Mexican Ministry of Agriculture's statistics by Mexican banks. The purpose of this study was to assess the acceptance and usage of the Mexican Ministry of Agriculture's Twitter information by Mexican banks to assist with the efficiency of processing and distribution of agricultural loans. More specifically, the study sought to:

1. Describe Mexican banks' degree of performance expectancy with the Ministry's information on Twitter;
2. Describe Mexican banks' degree of effort expectancy with the Ministry's information on Twitter; and
3. Describe Mexican banks' degree of behavioral intention and current use

of the Ministry's information on Twitter.

Methods

This study employed a qualitative research design in order to address the research objectives. The fourteen (N = 14) agricultural loan administrators of the primary Mexican banks were purposively selected for this study. Lincoln and Guba (1985) reported that purposive sampling enables researchers to expand the meaning of data assimilated from the study's context. Each of the loan administrators were purposively sampled due to their employment at the largest banks in Mexico that evaluated farm loan applications and distributed financial credit to qualifying farmers. All of the loan administrators provided credit to farmers for fruit and vegetable, livestock, and crop production.

All of the respondents were fluent in English. The researchers employed a semi-structured interview guide to address the research objectives. A semi-structured interview offers researchers opportunities to ask questions related to the objectives and provide respondents time to share information that may unearth elements the researchers have yet to contemplate (Denzin & Lincoln, 2008). Interviews took place between August and September of 2012 and lasted approximately 45 to 60 minutes over Skype™. The researchers used handwritten notes and audio recordings to document the interview data.

Lincoln and Guba (1985) recommended researchers should triangulate the data from interviews and observations to produce trustworthiness. Dooley (2007) identified trustworthiness as the level of confidence that the findings are indicative of the respondents and the context of the study. Data obtained from interviews was triangulated to achieve trustworthiness (Lincoln & Guba, 1985). The credibility, dependability, transferability, and confirmability of data to the study's context and population generate trustworthiness (Lincoln & Guba, 1985). Three researchers triangulated the data from each of the fourteen respondent interviews and individual member checks to accomplish trustworthiness. Triangulation and member checks are approaches to procure trustworthiness (Denzin & Lincoln, 2008).

Member checking is an approach to review data acquired from respondents and receive respondent's confirmation of the data they supplied (Denzin & Lincoln, 2008). The researchers implemented member checks as each participant was emailed a transcription of their remarks for confirmation. Each participant (N = 14) provided written and verbal confirmation of the data they provided to the researchers.

The researchers employed an audit trail to combine, link, and discern meaningful themes from the data. In qualitative research, an audit trail is a chain of records obtained during data collection (Denzin & Lincoln, 2008). An audit trail can enhance the trustworthiness of a qualitative dataset (Dooley, 2007). Audit trails classify, connect, and underscore the primary themes in the data (Merriam, 2009). Audio recordings, field notes, survey notes, and videotapes can be examples of records contained in an audit trail (Dooley, 2007). The audit trail in this study was composed of electronically recorded data and field notes.

The constant comparative method was utilized to analyze the data. Glaser (2002) indicated the constant comparative method was the qualitative research analysis to identify units of data that produce categories for posited themes. The researchers implemented selective coding to distinguish analogous findings and communal themes. Glaser (2002) reported that selective coding is habitually utilized in the constant comparative method to discern

dataset categories. Selective coding is an approach to distinguish the central grouping and to confirm the grouping's connection to current categories (Glaser, 2002). Comparable results and mutual themes were revealed from selective coding by using the constant comparative method. The resulting themes were delineated in the findings of the manuscript in order to present the qualitative data per the APA 6th edition publication manual.

Due to the qualitative nature of the study, the findings should not be generalized to Ministries of Agriculture and lending institutions' acceptance and use of Twitter in other countries. The results do provide international agricultural and extension educators' discernment on one approach to mitigate a factor in the holistic domain of food insecurity.

Results

All fourteen participants (100%) had used the Ministry's Twitter feed. Central results arose from this study with Mexican banks' agricultural loan administrators. Data were described based upon the research objectives. Findings from the first objective were explained per the performance expectancy construct and results from the second objective were detailed per the effort expectancy construct. Results from the third objective were conveyed per the behavioral intention construct in (Venkatesh et al.'s, 2003) UTAUT to articulate loan administrators' current use of the Ministry's Twitter feed.

The first objective was to describe Mexican banks' degree of performance expectancy with the Ministry's information on Twitter. Twelve of the fourteen participants believed the Twitter feed increased their job performance. R1, R4, R9, and R14 indicated the Ministry's tweets assisted in acquiring agricultural statistics faster and decreased the time banks spent evaluating and processing agricultural loans. R6 added, "Farmers acquired loans quicker and planted and harvested crops to sell in local Mexican communities because of our ability to acquire and evaluate loan applications more advantageously because of the Twitter feed." R10 stated, "It seems a great piece of technology for organizations that want to deliver a concise message to a broad group at minimal costs." R13 added, "The Ministry's Twitter information saved us time in identifying the most accurate price expectations. That saved us time too during loan appraisals, and hopefully, helped farmers do their job." R2 included:

> Using the Ministry's information from Twitter saved us money because it saved us time. We receive thousands of loan applications from farmers across the country as we provide funds to regional and local banks. Not only are farmers relying on us but so are community leaders, consumers, seed and farm equipment companies, bank stakeholders, and many other individuals. The stakes are high because if we cannot get money to farmers, then Mexican citizens will struggle. We have to make money but we have an obligation to help Mexicans. Twitter's role in accessing agricultural predictions helped usto do a better job.

R5 added, "My job productivity has improved because I can evaluate loan applications faster because we can more quickly interpret the Ministry's agricultural statistics." R7 included, "Our professional production has increased due to following the Ministry's Twitter feed. The concise forecasts enable us to make faster and more educated decisions when assessing loans." R12 said, "The use of Twitter by us and the

Ministry of Agriculture helped our bank gauge and distribute loans more rapidly. Farmers do not have to wait as long as they did to receive money to farm." R11 described the circumstances further:

> As with any lending institution, we provide thousands of loans annually with the hopes that we will be repaid. We strive to do the best we can in acquiring all of the factual and credible information we can to make decision on whether to approve an individual's loan. Sometimes reasons beyond the market projections cause someone not to repay their loan. We cannot control that but we can control the decisions we make based on the crop forecasts we have. We have needed quicker access to credible data with sifting through hundreds of pages of spreadsheets to find the one crop outlook that we need. The Ministry's information on Twitter has met our need. The information has enhanced how we perform our job because the information is concise but informative about respective crops grown by our clients. We can process loans more expediently for clients and this has proven to be a win-win all the way around.

The second objective of the study was to describe Mexican banks' effort expectancy of the Ministry's information on Twitter. Ten participants believed the Ministry's Twitter feed took little effort to understand and was practical to use. R8 said, "The Twitter feed is easier to access and to get what you want. They have hundreds of pages of statistical data. The links on Twitter give you what you want." R3 added, "Accessing the Ministry's Twitter feed is simple. You just open the APP or website and follow the Ministry. You can choose to read and open any supplemental information they provide." R12 indicated, "We (the bank) have found it much easier to get the Ministry's statistics. Twitter is now a part of our everyday business." R4 shared "Twitter is easy to use and to get information. I have the ability to read further if I am interested in the information." R5 added:

> The ease of use factor is the biggest reason we follow the Ministry's Twitter account. When we need precise crop estimates, the stats we receive from their tweets helps us answer our questions and allows us to more quickly process the applications. We believe this new practice assists farmers grow food quicker for us. When I go to the market in my community and I see empty shelves, I wonder if it is because we (the bank) did not get funds to farmers to feed us. Twitter serves an easy tool to improve our role.

R1 stated, "The easiness of following Twitter led us to use the approach to help us do our job." R10 added, "Twitter is simple to use both for followers and messengers." R7 included, "I like the Twitter information best because it does not require much time to acquire and analyze the data." R13 summarized the findings, "The simplicity of Twitter is its greatest strength. It is easy to post and read information. The inclusion of a maximum of 140 characters adds to conciseness for tweeters and followers."

The third objective of the study was to describe Mexican banks behavioral intention or current use of the Ministry's information on Twitter. The majority of participants (n = 12) indicated they followed the Ministry's Twitter feed routinely. R11 said, "I view the Ministry's information on

Twitter whenever I see it." R4 added, "I have gotten accustomed to following the Ministry's Twitter account on a daily basis." R9 included, "The Ministry's feed is something I notice each morning and evening that I open my Twitter account." R12 added:

> I or someone on my staff follows the Ministry of Agriculture's Twitter feed every day. The concise commodity forecast that their Twitter account provides helps us to assess farmer's credit application more quickly without sacrificing our judicial protocol. I have lead this division in our bank for over twenty years, and I believe we are able to processloans and provide farmer's money to run their business better than ever. If we can provide funds for farmers faster, then our country can be fed and our bank can get repaid. Everyone wins. The Ministry's Twitter account has played a large role in us being able to do this, and therefore, we follow the feed regularly.

R1 said, "Experiencing the benefit of the Ministry's information on Twitter has made me a regular follower of the Ministry's account." R10 added, "I was skeptical at first but I use Twitter often and using it to learn about commodity outlooks is easy and innovative to do." R5 provided a synopsis of the behavioral intention theme, "The Ministry's Twitter feed is just another example of something I follow on Twitter. Just as I receive news, weather, and sports daily, I receive commodity outlooks. It is a regular routine." R4, R10, and R14 reported they believed the Twitter information helped them help farmers provide more food to feed people. R14 detailed further:

> Our country has had some unflattering times recently but we are still a proud people. It is our duty as a citizen leader and business person to take care of our people and provide them any means we can to enhance their lives. I use the information from the Ministry's Twitter account because it has helped me help my fellow citizens' plant crops quicker to feed our nation. I see Twitter as a link that can help Mexicans help Mexico. That is why I use it for information…for Mexico.

Conclusions

The Ministry of Agriculture used Twitter to quickly disseminate commodity information to banks. Banks utilized the information to determine the approval and value of loans paid to farmers in a timely manner. The Ministry of Agriculture's Twitter feeds of agricultural statistics were accepted and used by agricultural loan administrators. The readiness of information (Stockwell, 2008) has increased the performance of loan administrators as they now can make more informed decisions regarding loans to farmers. Moreover, the use of Twitter has allowed the workflow of the Mexican bankers to be enhanced. This, in turn, has cut the time for the loan decision to the farmer and therefore is placing the funds in the farmer's hands quicker which will allow the farmer to deliver the products to market in a much shorter amount of time. It follows then, that the bankers will be able to process a much greater load of loan applications than before. Twitter provided an innovative approach in the ongoing fight to enhance food security in Mexico.

Not only did using Twitter streamline the decision-making process of the loan officers but in doing so, this turned around the loan faster which meant the

producer was receiving the funds quicker which will provide the produce to the markets faster. A slow loan decision could mean missing a planting season or not. This will also allow the bankers to review and send to loan committee a much larger load of applications.

Implications

Incorporating the UTAUT did assist researchers and practitioners in determining the degree of Mexican banks' acceptance and usage of Twitter in the loan appraisal process (Garfield, 2005). The Ministry of Agriculture utilized Twitter to create an accessible and effortless information conduit (Venkatesh et al., 2003) for bankers using technology. The Ministry of Agriculture's Twitter feeds improved performance and communication and while requiring little effort due to the ubiquitous nature of the information and the technology medium which drove use (Strong & Dooley, 2012). Individuals are more likely to use a technological tool when they perceive the technology enhances their current profession (Venkatesh et al., 2003).

According to loan administrators, accessing and using Twitter proved to require minimal effort, and thus, motivated loan administrators to continuing using the tool to assist with organizational functions. As effort expectancy goes down, technology use and acceptance goes up (Venkatesh et al., 2003). Incorporating technology that is easier to use as compared to competing technologies (Jansen et al., 2009), can assist in lessening food insecurity across Mexico (Bátiz-Lazo & Wood, 2001). The data suggested the use of Twitter by Mexican bankers in this study demonstrated how powerful Twitter can be to move information faster.

Loan administrators' routine subsequent use of the Ministry's Twitter account indicated an increased behavioral intention to use the technology for information. Users that report a consistent behavior to utilize a technology tool have adopted the respective technology as a part of their business culture (Venkatesh et al., 2003). The knowledge that Mexican banks are using the Ministry of Agriculture's Twitter account routinely to access agricultural price projections should better assist Ministry staff in understanding the function of the Ministry and assist farmers in growing food for the nation (Gravel, 2007; Tetreault, 2010). Based on the level performance and effort expectancy indicated by agricultural loan administrators, using the Ministry of Agriculture's Twitter information will be a recurrent behavior of Mexican banks (Venkatesh et al., 2003).

Recommendations

Ministries of Agriculture can assist banks in more efficiently disseminating loans to farmers through the inclusion of Twitter as another communication tool. Twitter can be used to let a bank know the particular value of a commodity in real time (Bollen et al., 2011) thus being able to inform not only their financial decisions but inform farmers seeking loans. Expanding collaborations with Ministries of Agriculture and lending institutions across the globe can assist our profession in enhancing international agricultural and extension education food security impacts and outcomes. Loan administrators may be interested to learn the default rate of the increased amount of loans due to the use of the technology. Assisting Ministries of Agriculture and banks in mitigating food insecurity by ensuring farmers acquire loans quickly could be a potential area of study and practice for international agricultural and extension educators.

Agricultural economic extension specialists and officers can enhance existing or develop innovative programs to assist

farmers in learning about potential loans for their respective operation (Dorosh, 2008). The inclusion of extension programs to alleviate communication challenges between banks, farmers, and the Ministry of Agriculture could help farmers produce more food to mitigate potential food insecurity issues in Mexico. Assisting farmers in receiving credit in a rapid manner can ensure the local community does not experience food insecurity (Battisti & Naylor, 2009).

Tetreault (2010) indicated Mexican farmers experience difficulties in securing loans to produce food. Extension can simultaneously help farmers, the goals of the Ministry, and banks by teaching farmers about the loans available and the various loan processes; be the change agent for the Ministry to ensure the nation is producing food for the people; and enhance relationships between farmers and bank loan officers. Thus, repaying banks on-time and creating a climate that would better assist farmers in receiving future loans (Bátiz-Lazo & Wood, 2001). Extension educators should recognize how this phenomenon not only has an opportunity to change banking in Mexico but has the potential to indirectly put food on the table faster.

The adoption and diffusion of commodity predictions, and the acceptance and use of contemporary communication tools, are two areas of inquiry that could be expanded respective to the context of food security. The acceptance and use of Twitter to disseminate agricultural information to mitigate food security in other countries should be studied. The information could expand the understanding of Ministries of Agriculture striving to distribute crop predictions to lending institutions and the knowledge base and potential collaborations for Association for International Agricultural and Extension Education members. Additional research is needed to identify how agricultural and extension education researchers can better assist and collaborate with for-profit and non-profit businesses or agencies to combat global food security issues (Webb et al., 2006). Because food security is comprised of heterogeneous issues (Thurow & Kilman, 2009), developing a set of best practices to tackle food security concerns respective of context is needed for academics and practitioners.

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