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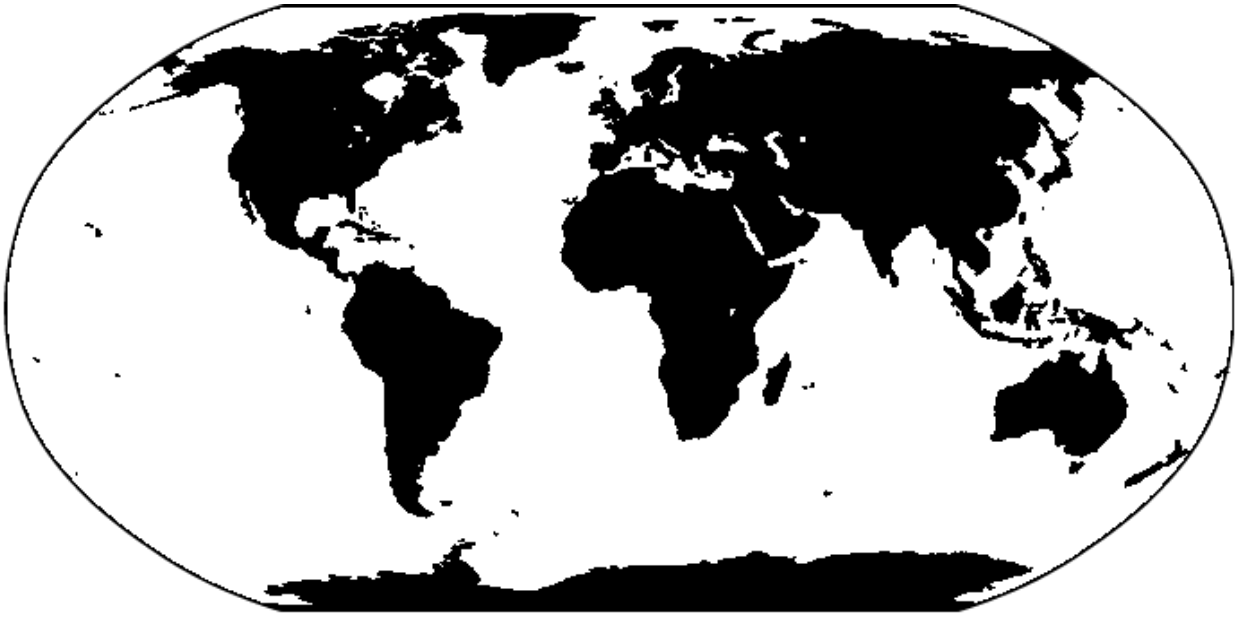

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The *Journal of International Agricultural and Extension Education* (*JIAEE*) is the official refereed publication of the Association for International Agricultural and Extension Education (AIAEE). The purpose of the *JIAEE* is to enhance the research and knowledge base of agricultural and extension education from an international perspective. Acceptance rates for the past 3 volumes are: Volume 18 = 14%, Volume 19 = 20%, Volume 20 = 21%.

Articles intended for publication should focus on international agricultural education and/or international extension education. Articles should relate to current or emerging issues, cite appropriate literature, and develop implications for international agricultural and extension education. **Manuscripts, or portions of manuscripts, must not have been published or be under consideration for publication by another journal**. Three types of articles are solicited for the *JIAEE*: Feature Articles, Tools of the Profession Articles, and Book Reviews.

Feature Articles

Feature articles focus on philosophy, current or emerging issues, and the methodology and practical application of specific research and appropriate technologies, which have implications for developed and developing countries. For publication in the *JIAEE*, feature articles must pass the ***JIAEE's* double blind, referee process**, where peer reviewers evaluate manuscript content and ensure readability. Reviewers are selected from the AIAEE membership. In the double blind, referee process, all references to authors are removed before the manuscript is sent to reviewers. Feature articles may be submitted for peer review a total of three times before they are no longer acceptable for publication in the *JIAEE*. Failure to meet the submission formatting guidelines will result in an automatic first rejection.

Other Article Types

Commentary articles state an opinion, offer a challenge, or present a thought-provoking idea on an issue of concern to international agricultural and extension education, including a published article in the *JIAEE*. These articles are invited by the editors. Tools of the Profession articles report specific techniques, materials, books and technologies that can be useful for agricultural and extension educators in a global context and/or in a country/region. Book Reviews provide insight on current books related to international agricultural education.

Subscriptions

Subscriptions may be acquired online at https://www.aiaee.org/index.php?Itemid=147. The individual membership rate of $70 provides a yearly subscription to the online journal. Domestic and international libraries and subscription agencies may register their IP range for online access for subscribers for $150 per year.

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Editorial Board

The editorial board consists of the editors, the past editor and other members representing regions of the world.

U.S./World Representatives

From the Executive Editor

Have you noticed the new feature of the *Journal of International Agricultural and Extension Education*? If nothing comes to mind, take a minute to visit one of our past issues. You will soon find one of the many improvements that were implemented in the Web redesign of the entire association site was the inclusion of a hit counter for each article. This now makes it possible for you, as authors and readers, to see what topics resonate with your colleagues. My hope is that you will find this feature useful as you consider future contributions to expand the scholarship of our journal.

Periodically, I have received questions about the page length requirements for manuscript submission. Comparable journals allow longer submissions. I recently put our all-inclusive twenty page requirement to our Editorial Board for a vote. The Board is in favor of maintaining our current policy and emphasized the need for authors to value clarity through brevity. As always, we will continue to consider issues that affect the quality of *JIAEE* and your experience as authors and readers.

I need to draw your attention to a related topic. *JIAEE* follows a published set of manuscript guidelines (https://www.aiaee.org/index.php/submission-guidelines). Everyone should review these periodically with a particular focus on understanding *APA* format for tables, in-text citations, and references. Doing so will remind reviewers of the standards to which we hold submissions, and will enable authors to more capably prepare a manuscript likely of being accepted right away. Your attention to these guidelines is appreciated.

Six feature articles are included in the second issue of Volume 21. I am pleased by the diversity represented. Five countries are covered in six articles: Ghana, Uganda, the Philipinnes, Mexico, and Iraq. These articles explore different methods of extension delivery and offer insight as to their success in the examined contexts. The sixth article explores the perceived benefits of AIAEE membership; I'm especially pleased to see the value placed on opportunities to publish in *JIAEE*. I hope you will enjoy reading this issue's articles as much as I have.

Sincerely,

Amy Harder
Executive Editor, *JIAEE*

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Members' Perceived Benefits and Values of the Association for International Agricultural and Extension Education

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Abstract

The Association for International Agricultural and Extension Education (AIAEE) was established to strengthen and advance the knowledge base of agricultural and extension education worldwide. The purpose of this study was to determine perceived benefits of AIAEE membership. The objectives were to assess AIAEE members' perceived organizational benefits; rank the top five perceived benefits; and, assign monetary values to the top five perceived benefits. AIAEE members (N = 161) responded to an online questionnaire. Respondents' perceived organizational benefits included innovative ideas, professional knowledge, collaboration, opportunities to publish in the JIAEE (Journal of International Agricultural and Extension Education), and the importance of recognition awards. Their top five benefits were ranked as (a) journal, (b) conference, (c) networking, (d) professional development, and (e) communications. Lastly, they assigned monetary values to their AIAEE membership benefits. Values were highest for the journal (M = $25.06), followed by the conference (M = $21.94), and communications (M = $9.63). The AIAEE can recruit and retain members more effectively by continually evaluating members' perceived benefits and values derived from membership. The AIAEE should create recruitment and retention plans based on members' benefits and values, highlighting the most valuable and/or important benefits, and seek to strengthen lesser-valued benefits. As the AIAEE's membership base changes, so too might change individual member's perceived benefits and values, causing organizational shifts and/or priorities. For example, future AIAEE members may demand more social media interaction, instead of current communication mediums (i.e., journal, listserv, etc.).

Keywords: Membership Benefits, Values, Conference, Publications, Networking

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Introduction

The Association for International Agricultural and Extension Education (AIAEE) was established in 1984 to strengthen and advance the knowledge base of agricultural and extension education worldwide. AIAEE membership includes university educators, graduate students, extension agents, and members from agri-businesses, international agencies, foundations and financial institutions. The association's objectives, contained within AIAEE's Constitution (https://www.aiaee.org/index.php/constitution, September 2009), are to

1. Initiate, maintain, and improve communication and liaison with those responsible for aspects of development in agricultural and extension education;
2. Foster acquaintance, fellowship, and understanding among members and to serve as a vehicle for exchange of ideas, philosophy, and professional materials to establish international agricultural and extension education as a profession;
3. Articulate more clearly the role of agricultural and extension education in agricultural development;
4. Cooperate with other organizations and groups; and,
5. Further the profession of education through international agricultural and extension education.

Members may join the AIAEE for many reasons; membership benefits may include increased knowledge, networks, and partnerships through organizational contacts. All dues-paying members receive a subscription to the AIAEE journal, e-mail listserv notices, voting rights, and opportunities to present research abstracts, posters, and/or workshops at the annual conference.

Conceptual Framework

Why do professionals and graduate students choose to participate and remain active in professional organizations? Research on affiliation, retention, and selection of membership in professional international agricultural organizations is minimal. In 2007, the Association for Communication Excellence in Agriculture, Natural Resources, and Life and Human Sciences (ACE), commissioned a study (White & Wingenbach, 2007) on membership benefits in professional organizations, in the broader scope of agriculture, which was helpful in establishing this study's framework.

Need Fulfillment and Motivation

Individual needs for membership in professional organizations differ on personal ideals and motivation. An individual's desire to satisfy such needs is to fulfill "a person's conscious wants, desires, or motives" (Baard, Deci, & Ryan, 2004, p. 2046). Social relationships and the need for communication with others are factors affecting professional organization membership (Catchings, 2004); social relationships are formed and maintained as a human's basic need to belong to a larger group (Baumeister & Leary, 1995; Hornsey & Jetten, 2004).

Individuals choose to be involved and remain involved in professional organizations for many reasons (White & Wingenbach, 2007); active participation may increase one's motivation to join an organization. Professional organization benefits can include the ability to attend meetings or conferences, possibilities to publish research, or opportunities for leadership roles. Members in professional organizations typically depend on timely

communication and the ability to participate in the decision-making process of electing officers and conducting business (Mai & Akerson, 2003).

Individual Attributes and Organizational Cultures

Some organizations work hard to recruit new members and retain current members within their groups, therefore addressing an individual member's needs is important to organizational growth. Individuals' perceptions, need fulfillment, and organizational characteristics drive membership (Masterson & Stamper, 2003), while the reason individuals participate or stay in an organization depends more on the individual, rather than on what the organization provides each member (Singer & Singer, 2001). Individuals' needs are different and unique; organizations should not treat all members equally (White & Wingenbach, 2007).

Organizational cultures have basic structures, shared assumptions, values and belief systems (Zheng, Yang, & McLean, 2010). The culture of an organization often gravitates toward members' interests and incorporates need fulfillment strategies (White, 2005). Many members join and become active in professional organizations for personal improvement activities, which is why some organizations provide networking and knowledge sharing sessions, and professional skill building activities to increase voluntary membership (White & Wingenbach, 2007). Additionally, an organization must have a clear identity and attributes including goals, values, culture, and performance (Kreutzer & Jäger, 2011). By properly identifying the organization, members will have a better understanding and more realistic expectations of their organization.

Identification and Commitment

Professional development among university faculty and extension professionals is essential for career advancement. Professional organization membership offers valuable networking opportunities and builds loyalty among members (White & Wingenbach, 2007). Individuals choosing professional organization membership should embrace their organization's purpose, values, leadership, and mission. Members must believe that the organization meets their professional and personal needs, which typically produces loyalty and recruitment of new members (Zuckerman & Kretovics, 2003). Many professional organizations conduct annual conferences that provide venues where graduate students and academic faculty can enhance their knowledge. Conferences serve a variety of professional needs, including scholarly exchange of ideas, professional development, employment-related activities, and student recruitment (Broder, Bergstrom, & Kriesel, 1994).

Hebel (2007) stated "American universities that have long been involved in research and service work abroad are taking a more deliberate and comprehensive approach to where and how they invest their time, money, and talent" (p. 1). International agricultural development is important for the agricultural industry, yet while colleges of agriculture have made internationalizing agriculture important (Alsup & Eggington, 2001), the potential to use a valuable internationalization tool—study abroad—falls short with undergraduates studying international agricultural policies, products, peoples, and cultures (Wingenbach et al., 2003). The authors concluded a lack of international knowledge stemmed from limited international experiences and thus a value system that does not embrace globalization. While other studies have

suggested students have limited knowledge and experience of international opportunities, they were interested in such activities (Irani, Place, Lundy, & Friedel, 2004). High interest levels in international activities related strongly to participation in professional organizations.

Graduate student membership in professional organizations can help students develop leadership, communication and team-building skills, while networking with other professionals (Wachenheim, 2007). Graduate students' membership in professional organizations increases member retention in organizations (Lawver & Lee, 1990). Some graduate students chose not to join professional organizations because they did not grasp the importance of participation or were too busy; however, membership cost was the number one reason students did not join professional organizations (Desmond, 1997). Desmond concluded these factors could be overcome if students were sponsored financially and they were more likely to join if made aware of professional organizations through workshops or peers.

Purpose and Objectives

The purpose of this study was to determine perceived benefits of membership in the AIAEE. The research objectives were to:

1. Determine members' agreement levels with perceived benefits of the AIAEE;
2. Identify the top five self-reported AIAEE membership benefits; and,
3. Assign monetary values to the top five self-reported AIAEE membership benefits.

Methods

A descriptive design (Tuckman, 1999) was used to answer the purpose and objectives of this study. The population of interest (N = 297) for this census study was all AIAEE dues-paying members with viable e-mail addresses in spring 2009. There were two types of AIAEE members: graduate students and professionals. The sample (n = 161) was self-selected by AIAEE members who chose to respond to this study.

AIAEE members' perspectives were measured using a modified instrument (White & Wingenbach, 2007) that was reviewed by a panel of experts for reliability and validity. Modifications were made to the title and all identifying factors from the original to the modified instrument. The research instrument was applicable for this study because it allowed record of participants' perceptions of organizational benefits (e.g., AIAEE and the *JIAEE*), similar to the organizational benefits measured in the Association for Communication Excellence (White & Wingenbach, 2007).

The first section of the research instrument provided a Likert-type four-point scale (*Strong Disagree, Disagree, Agree, Strongly Agree*), where participants recorded their agreement levels for the perceived benefits of (a) AIAEE annual conferences, (b) membership, (c) outreach, and (d) recognition. Twenty-two statements made up the first sub-section, related to the annual conference. A sample statement for the annual conference was "*attending annual conference is a priority for me*;" seven statements were negatively worded to avoid patterned response. The annual conference sub-scale produced a Cronbach's alpha of .80 from analyses of the response set.

The second sub-section, membership, was measured using 10 statements. Sample statements included "*membership dues are reasonable compared to other professional organizations*" and "*the opportunity to host the annual conference is not an important benefit*."

Three of the statements were negatively worded; this sub-section had a Cronbach's alpha of .80.

The third sub-section, relating to outreach, was measured with 11 statements; three statements were negatively worded, which included "*opportunities to publish in the JIAEE are important to my professional development*" and "*I do not check the AIAEE website for announcements*." This sub-section had a Cronbach's alpha of .85.

The final sub-section, recognition, included statements such as "*opportunities to hold office are important to remain a member*" and "*recognition awards are not important to me*." This section contained six statements, three of which were negatively worded; it had a Cronbach's alpha of .85.

Another portion of the research instrument allowed participants to input and rank their top five perceived benefits of AIAEE membership. Respondents considered their annual membership dues ($70, membership plus e-journal; $110, membership plus print journal; life members were asked how they would distribute $100 for all benefits) in reporting their benefits. The final section of the research instrument recorded participants' demographic information.

Online data collection methods were used to decrease response time and cost (Ladner, Wingenbach, & Raven, 2002). Participants were contacted, based on the membership roster of the AIAEE for 2009; the 2009 membership roster constituted the population of interest. Five personalized email contacts (Dillman, Smyth, & Christian, 2009) were sent, every five days, to AIAEE members over four weeks. Descriptive statistics were used to assess the data.

Findings

AIAEE members (n = 161) completed an online survey in spring 2009. Respondents represented 54% of the target population (N = 297). The majority (65%) of respondents were male (f = 105), resided in the Americas (78%), had been AIAEE members for seven or less years (63%), and two-thirds of them had never allowed a lapse in their AIAEE membership (see Table 1).

The first objective was to determine members' agreement levels with perceived benefits of the AIAEE organization. Twenty-two statements derived from the literature (White & Wingenbach, 2007) were used to measure respondents' agreement (*Strong Disagree, Disagree, Agree, Strongly Agree*) for the perceived benefits from participation in the AIAEE annual conference. Respondents' agreement levels varied across all individual statements. A sample of statements (see Table 2) which participants agreed with are "*Professional knowledge gained at annual conference is important*" (M = 3.43, SD = 0.52), "*Professional networking is important to my remaining in the AIAEE*" (M = 3.35, SD = 0.67); while they disagreed with the statement, "*The opportunity to present at annual conference is **not** important to my professional development*" (M = 1.81, SD = 0.73).

For the perceived benefit of organizational membership, respondents reported that they agreed (M = 2.51-3.50) with nine of the statements and disagreed (M = 1.51-2.50) with the other four statements. One statement (see Table 2) that participants agreed with was "*Collaboration with other professionals is important*" (M = 3.50, SD = 0.51).

Table 1

Demographic Profile of AIAEE Member Respondents (n = 161)

Items	Categories	*f* [a]	%
What is your gender?	Male	105	65.2
	Female	56	34.8
How many years have you been a member?	0-3	69	42.9
	4-7	33	20.5
	8-11	25	15.5
	20+	12	7.5
	12-15	11	6.8
	16-19	4	2.5
In which AIAEE region do you reside?	Americas	125	77.6
	Africa	13	8.1
	Asia	11	6.8
	Europe	10	6.2
	Oceania	2	1.2
Have you ever let your membership lapse?	No	107	66.5
	Yes	54	33.5

Note. [a] Frequencies may not total 161 because of missing data.

For the perceived benefit of outreach, respondents agreed (*M* = 2.51-3.50) with eight statements and disagreed (*M* = 1.51-2.50) with the other three statements. A sample of an agreement statement was, "*Published conference proceedings are important*" (*M* = 3.30, *SD* = 0.64).

For the last sub-section, relating to recognition, respondents agreed (*M* = 2.51-3.50) with two statements and disagreed (*M* = 1.51-2.50) with the other four statements (see Table 2). A sample statement from this section is "*Recognition awards are important*" (*M* = 3.03, *SD* = 0.68).

Table 2

Perceived Benefits of the AIAEE (n = 161)

Categories	*M*	*SD*
Annual Conferences		
Professional knowledge gained at annual conference is important.	3.43	0.52
Professional networking is important to my remaining in the AIAEE.	3.35	0.67
Participation in annual conference is an activity that benefits my professional development.	3.34	0.58
The opportunity to present at annual conference is important to my professional development.	3.25	0.67
The opportunity to travel abroad for the annual conference is a professional benefit.	3.22	0.73
Location of the annual conference does **not** affect my membership.	3.22	0.74
Social networking is important to my AIAEE membership.	3.19	0.65
Location of the annual conference impacts my attendance.	3.19	0.81
Attending annual conference is a priority to me.	3.04	0.75
Conference field trips are important to my professional development.	2.90	0.73
Local cultural activities at annual conference are important to my professional development.	2.85	0.75
Conference field trips are **not** important to my professional development.	2.75	0.87
Attending annual conference is important for professional job opportunities.	2.72	0.78
The opportunity for spouses/guests to attend the annual conference is important.	2.54	0.78
The opportunity for spouses/guests to attend the annual conference is **not** important.	2.45	0.86
Attending annual conference is **not** important for professional job opportunities.	2.14	0.77
The opportunity to travel abroad for the annual conference is a personal benefit.	2.04	0.68
Annual conference attendance is **not** important to my professional development.	1.84	0.73
The opportunity to present at annual conference is **not** important to my professional development.	1.81	0.73
Membership		
Collaboration with other professionals is important.	3.50	0.51
Innovative ideas gained at annual conference are important.	3.41	0.52
My membership is based on professional reasons.	3.33	0.56
Membership dues are reasonable compared to other professional organizations.	3.15	0.54
Membership dues are a good value in relationship to the benefits received.	3.10	0.56
My membership is based on personal reasons.	3.06	0.67
Voting rights are an important membership benefit.	2.92	0.71
I choose to be a member because of the breadth of diversity in the AIAEE.	2.61	0.68
The opportunity to host the annual conference is **not** an important benefit.	2.52	0.83

The opportunity to host the annual conference is an important benefit.	2.46	0.86
Voting rights are **not** an important membership benefit.	1.98	0.74
Membership dues are **not** a good value in relationship to the benefits received.	1.82	0.51
Collaboration with other professionals is **not** important.	1.54	0.51
Outreach		
Published conference proceedings are important.	3.30	0.64
Opportunities to publish in the Journal of International Agricultural and Extension Education are important to my professional development.	3.28	0.69
Newsletters are an important benefit.	3.21	0.63
I use the journal for professional development.	3.20	0.60
I do **not** check the AIAEE website for announcements.	3.02	0.48
The AIAEE listserv provides useful information.	2.94	0.56
I check the AIAEE website for announcements.	2.92	0.59
I use the journal for professional reference.	2.75	0.71
Communication from AIAEE leadership is timely.	2.18	0.72
I do **not** use the journal for professional development.	1.84	0.61
Opportunities to publish in the *Journal of International Agricultural and Extension Education* are **not** important to my professional development.	1.69	0.67
Recognition		
Recognition awards are important.	3.03	0.68
Recognition awards are **not** important.	2.77	0.63
Being an officer is **not** important to my professional development.	2.48	0.81
Opportunities to hold office are important to remain a member.	2.34	0.78
Committee leadership is **not** important to my professional development.	2.10	0.69
Committee leadership is important to my professional development.	2.03	0.71

Note. Likert-type scale: 1.00-1.50 = *Strongly Disagree*, 1.51-2.50 = *Disagree*, 2.51-3.50 = *Agree*, 3.51-4.00 = *Strongly Agree*.

The second objective was to identify the top five self-reported AIAEE membership benefits. Respondents identified those benefits as the AIAEE *journal* (*f* = 88), *conference* (*f* = 82), *networking* (*f* = 78), *professional development* (*f* = 56), and *communications* (*f* = 36). Also mentioned, but less frequently, were *career opportunities, committees, cultural awareness, socializing,* and *travel.*

The third objective was to assign monetary values to the top five self-reported AIAEE membership benefits. Respondents were asked to consider their annual membership dues ($70, membership plus e-journal; $110, membership plus print journal; life members were asked how they would distribute $100 for all benefits) as a basis to assign U. S. dollar values to their top five perceived membership benefits. Respondents indicated average values (see Table 3) for the most frequently recorded benefits, including the AIAEE *journal* (*M* = $24.65, *SD* = 15.32), *conference* (*M* = $20.95, *SD* = 12.50), and *professional development* (*M* = $20.00, *SD* = 10.66).

Table 3

Monetary Values for the Top Five Self-Reported AIAEE Membership Benefits

	Monetary Values	
Membership Benefits	*M*	*SD*
JIAEE	24.65	15.32
Conference	20.95	12.50
Professional	20.00	10.66
Networking	18.16	13.30
Communications	9.68	6.73

These findings were consistent with previous research; among the top five benefits ACE members identified were *networking* (*M* = $43.56), *annual conference* (*M* = $37.52), and *journal* (*M* = $26.40) (White & Wingenbach, 2007).

Conclusion

Members may choose to join the AIAEE, or another professional organization (White, 2005) for a variety of reasons; to attract new members and retain recurring members, organizations should seek to understand and address individual's reasons for membership. The AIAEE could recruit new members by examining differences in current members' perceived benefit values, compared by selected demographics, to better promote individual membership benefits. For example, would young members perceive the *JIAEE* to have less monetary value than an interactive social media organizational outlet, if it existed? Research should be conducted to determine if significant differences exist in AIAEE members' perceived benefits, when compared by selected demographic variables. Also, the authors realize these data are aged (i.e., collection occurred in spring 2009), therefore a follow-up study of AIAEE members' perceived versus desired membership benefits is needed to help the AIAEE grow its membership base.

The AIAEE can recruit and retain members more effectively with increased attention to the perceived benefits derived from AIAEE membership. The AIAEE should publicize the value of gaining professional knowledge and innovative ideas at the AIAEE annual conference to encourage greater participation at their conferences. Collaboration was identified as an important benefit. This finding may have increased importance as many universities and development agencies experience budgetary reductions.

Opportunities to publish in the *JIAEE* and in the AIAEE annual conference proceedings were perceived as benefits. These results correspond to previous findings (White & Wingenbach, 2007) as to why members joined organizations for professional reasons. AIAEE leaders should promote publication opportunities beyond the current AIAEE outlets (i.e., *JIAEE* and AIAEE conference proceedings).

Respondents perceived AIAEE awards as important benefits for career advancement. Members did not view opportunities to hold office in the AIAEE as an important benefit. Additional research may help us better understand professional and/or personal benefits that would encourage or explain the lack of motivation for leadership roles within the AIAEE.

Methods for continued and improved networking could be further explored.

AIAEE leaders should exploit membership benefits that are most valued by AIAEE members by creating a proactive strategic plan to increase member recruitment, retention, satisfaction with this professional organization. AIAEE leaders could explore the advantages and disadvantages of combining the AIAEE with other like-minded professional organizations. Are there benefits, value, and/or political strength in joining forces with similar professional organizations in South America, Africa, Asia, and/or other geographic regions? Additional study of this possibility to significantly grow the AIAEE membership is needed in the near future.

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The Ability of Training Approaches to Reduce Agricultural Knowledge Gaps between Men and Women in Rural Uganda

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Abstract

This study explores the effectiveness of three training methods (traditional lecture-field demonstration, lecture and field demonstration + video, and video only) to narrow the gap in knowledge about row bean planting between men and women farmers in Kamuli District, Uganda. Using a pretest-posttest quasi-experimental design, this study found that the method that combined video and lecture/demonstration was significantly more effective in narrowing the gender knowledge gap. Use of video alone improved women's knowledge scores, but did not close the gap.

Keywords: training approaches; ICTs; gender knowledge gap; agricultural extension; row planting of beans; agricultural communication; rural livelihood

Introduction

Although women are by no means invisible farmers (Sachs, 1983), their impact on the agricultural scene has historically been underestimated. According to recent estimates, women comprise 43% of the agricultural labor force worldwide (FAO, IFAD, & ILO, 2010). This percentage, however, masks regional variations and differences across and within countries. For example, in Sub-Saharan Africa and East Asia, they make up 60% of the agricultural labor market (Food and Agriculture Organization [FAO], 2011). In Uganda alone, women constitute 70-80% of the agricultural labor force, typically working without pay on family farms (Mijumbi, 2002).

Despite this, gender parity in terms of access to land, labor, inputs, and human and financial capital remains elusive. The Food and Agriculture Organization (2011) bemoans that "agriculture is underperforming in many developing countries for a number of reasons. Among these is the fact that women lack the resources and opportunities they need to make the most productive use of their time" (p. 3). Women face severe constraints in credit markets that rarely make loans on collateral other than land, which women do not own. They are not able to experiment with and adopt new technologies as quickly as men partly because of their lack of access to information (Butler & Mazur, 2007). In recent decades, development planners have become optimistic that the gender gap can be narrowed with the advent of information and communications technologies (ICTs) that promise to reduce transaction and information costs, but females have yet to benefit equally from their availability (Oudshoorn & Pinch, 2003). Messages and message delivery also have been known to cater almost exclusively to men's needs. Indeed, according to Farrell and Isaacs (2008), "the digital divide in Africa is also a gender divide" (p. 25), and this may exacerbate the pre-existing gap in knowledge between men and women (Huyer & Mitter, 2003).

How can recent innovations in mobile technologies and applications narrow this divide? Studies that test methods of using ICTs to decrease the knowledge gap between genders in developing nations are few and far between. This study attempts to contribute to this nascent field of inquiry by evaluating the impact of videos as a component of training sessions aimed to teach farming techniques to growers regardless of gender. Conducted in Kamuli district in southeast Uganda as part of a livelihood improvement program coordinated by a local non-government organization (NGO) and a Midwestern university, this program placed special emphasis on small-scale women farmer-landholders who were organized in groups of 10 to 30 to receive training. At the district level, the traditional lecture-demonstration method conducted by local extension workers or NGO staff has fallen short of the challenge. Field evaluations show that farmers demand more frequent and high quality training. In many cases, however, it has been difficult to motivate farmers to attend standard lectures. Employing other approaches, such as role playing and field demonstrations, appears to buoy interests. More recently, the project experimented with videos to complement or replace the traditional lecture-demonstration method of presenting information.

The impetus to deploy videos came from evidence that women respond more to visuals rather than to text-heavy materials (Tumwekwase, Kisauzi, & Misiko, 2009). Another push came with the release of durable, portable and battery-powered devices that can be used in the fields. In this study, a small "pico" projector was tested to

train groups of 15-20 farmers at a time. Smaller than a normal projector (the 3MPro150 version is 1 by 2.4 by 5.1 inches and weighs 5.6 ounces) the pico can present training materials stored on a cell phone (Jain, Birnholtz, Cutrell, & Balakrishnan, 2011; Mathur, Ramachandran, Cutrell, & Balakrishnan, 2011). Some have an internal memory or an SD card slot, so they do not need to be connected to a computer or DVD player.

This study compares the ability of stand-alone video and other training approaches in reducing gaps in knowledge about a specific farming practice between men and women. Previous research has emphasized the pathways, patterns, and problems of introducing ICTs in developing countries (e.g., Jackson, Pompe, & Krieshok, 2012), but few studies have attempted to explore the extent to which ICTs outperform traditional training approaches in enhancing women's farming skills. Some scholars have focused on increasing women's farming knowledge within all-female groups (e.g., Zossou, Van Mele, Vodouhe, & Wanvoeke, 2010). However, many agricultural extension programs are implemented in settings where men and women learn together (Davis et al., 2012). The present study addresses gender inequalities in knowledge acquisition within a mixed learning environment.

Literature Review and Theoretical Framework

Over time, African women have taken on more responsibility and heavier workloads on the farm (Damisa & Yohanna, 2007; Ogunlela & Mukhtar, 2009) as men withdraw from the fields in search of employment opportunities in the cities (FAO, 1998; Young, 1993). In Uganda's Kamuli district, women are the ones who grow food crops; both men and women take care of cash crops, such as maize and groundnut (Sseguya, Mazur, & Masinde, 2009). Despite this hefty share of the farming responsibility, men still make the key agricultural management decisions and control the productive resources (Ogunlela & Mukhtar, 2009). Innovations in mobile technologies and applications have not made a dent in enhancing women's contributions to the agricultural enterprise. This is particularly true in Uganda, which ranks 161st among 195 countries on the Gender Inequality Index, a measure of how women and girls are "discriminated against in health, education and the labor market" (UNDP, 2013, para. 70).

Differences in gender access to land, labor, inputs, and financial capital have spawned asset inequality that has been shown to reduce potential gains in yields and output by an estimated 20–30% and 2.5–4%, respectively (FAO, 2011). Abundant evidence shows reducing the barriers that limit women's access to income is important in alleviating the non-monetary dimensions of poverty (Quisumbing, 2003; Smith, Ramakrishnan, Ndiyae, Haddad, & Martorell, 2003).

The Knowledge Gap Hypothesis

The knowledge gap hypothesis states that segments of the population with higher socioeconomic status tend to acquire information at a faster rate than the lower status segments, so that the gap in knowledge between these segments tends to increase rather than decrease with the increasing flow of information on a topic (Tichenor, Donohue, & Olien, 1970). There are forces that may act to widen or narrow this gap. Tichenor et al. (1970) identified formal education as one of them. In this case, because men often receive more formal education, they tend to acquire higher levels of agricultural productivity (Browne & Barrett, 1991; Farrell & Isaacs, 2008).

A second factor is differential access to relevant information (Tichenor et al., 1970). The traditional top-down agricultural extension approach in developing countries has mainly targeted and benefited better-off farmers, often men, who are exposed to more information from both formal and informal channels. Such training has often been poor at reaching women (Vodanovich, Urquhart, & Shakir, 2010).

Third, social norms in many Sub-Saharan countries restrict women's opportunities to communicate outside their families (Zossou et al., 2010), especially with male extensionists. A Mozambique report says, for example, that more than 30% of husbands get angry when male extension workers visit their wives (Salmen, 1999). Social norms also restrict women's mobility to travel to attend training sessions (Huyer & Sikoska, 2003; Zossou et al., 2010). In Uganda, only 27% of women-farmers, compared to 69% of men, have attended demonstrations and training courses (Salmen, 1999).

Fourth, information is often presented in forms that cannot be understood easily by less educated audiences. Because many women have not undergone formal schooling, the use of technical terms in written formats often precludes them from learning from training. The use of videos in their own language could offset this barrier.

Knowledge gap studies since the 1970s have shown that different media channels, depending on how they are used, may widen or narrow existing knowledge gaps (Donohue, Olien, & Tichenor, 1987; Griffin, 1990; Katzman, 1974; Kwak, 1999; Liu & Eveland, 2006). Indeed, the introduction and the application of ICTs to development projects have brought both opportunities and challenges in addressing gender knowledge gap issues (Geldof, 2011; Huyer & Mitter, 2003; Katzman, 1974). On the one hand, ICTs have the potential to narrow the gap by providing greater access to the information-poor, offering understandable and useful content, and fostering a supportive environment for accessing and learning new information (Katzman, 1974; Shingi & Mody, 1976). On the other hand, women's lack of financial resources, higher levels of technological and language illiteracy, norms that discourage women and girls from using technology, and lack of control over and ownership of technology restrict female access to ICTs (FAO, IFAD, & ILO, 2010).

Videos for Training and Gender Knowledge Gap Reduction

Overall, studies have shown video-mediated training has strong potential to overcome information inequalities between gender (Bery, 2003; Lie & Mandler, 2009; Zossou et al., 2010). Approximately 80% of development organizations surveyed by Van Mele (2011) rated videos as quite to very useful in reaching less educated audiences. Heffernan and Nielsen (2007) also concluded visual elements enhanced learning among the poor. Training videos that show successful adoption evidences within a local environment and those that feature actors culturally similar to audiences were rated highly (Chowdhury, Van Mele, & Hauser, 2011; Gandhi, Veeraraghavan, Toyama, & Ramprasad, 2007). Videos have also been known to transcend the literacy barrier (Coldevin, 2003; Gandhi et al., 2007; Lie & Mandler, 2009).

Some scholars have offered evidence that women prefer video-mediated approaches over text materials and are willing to pay more to get video disks (Tumwekwase, Kisauzi, & Misiko, 2009; Van Mele, 2011). In a Bangladesh village, women became increasingly involved in deciding how to spend the family's disposable income after exposure to a training video. Their abilities to explore

sources, bargain for better prices, and manage organizational support were strengthened by training programs that made use of videos (Chowdhury et al., 2011).

Scholars have also documented increased participation in development programs by farmers shown videos in groups of 10 to 30 (David & Asamoah, 2011; Gandhi et al., 2007; Okry, Van Mele, & Houinsou, 2013; Zossou et al., 2010). Videos have been used in the field as a complement to, or a replacement for, traditional training methods such as lectures and farmer-to-farmer extension. Trainings that combine video and traditional methods have produced greater knowledge gains (Shanthy & Thiagarajan, 2011) and higher adoption intentions to adopt recommended practices (Gandhi et al., 2007; Zossou et al., 2009) versus traditional training methods alone. Other studies have shown exposure to exclusive video training was successful in increasing knowledge test scores (David & Asamoah, 2011) and in creating interest in specific technologies than attendance in traditional workshops (Zossou et al., 2010).

Video training that reaches more audiences has been found to be more cost effective than traditional methods (Van Mele, 2006). Until recently, the shortage of electricity and intermittent access to the Internet and other modern technology have limited the adoption of modern training devices such as computers and TV to present videos in rural areas (Jain et al., 2011). The low ICT proficiency of rural training facilitators also dictates the use of simple and user-friendly training devices. Because videos are shown in multiple locations that do not have electricity, low-cost battery-operated devices are a must. The present study tested the small battery powered pico projector to display images suitable for viewing by groups of 15-20 with an extra sound speaker to increase volume.

Given the axioms of the knowledge gap hypothesis and the availability of ICTs and devices that render video-mediated training feasible in rural areas, this study asked:

RQ1: Can gender knowledge gaps be reduced when male and female farmers are provided equal access to training?

RQ2a: Does the combined used of traditional and video training enhance learning by women and reduce gender knowledge gaps?

RQ2b: Can video alone increase women's knowledge about a farm practice and narrow the gap in farming knowledge between gender?

Methods

The Sample

Three hundred twenty-five residents of four parishes (Naibowa, Bugeywa, Butansi and Naluwoli) in Butansi sub-county, Kamuli district who grew beans and were members of a farmers' group participated in this study. Of these, 245 were females. Before the study, they had received training on a number of farm production practices from an NGO that primarily used lectures and demonstrations delivered by community-based trainers (CBTs). The average age of the farmer-participants was 41 years. The average household size was eight (three adults and five children). The participants had an average of 5.81 years of formal education (SD = 3.81), but 6.3% of the men and 22% of the women had never been to school. They grew beans on about 0.54 acres (SD = .41), roughly 14% of the total farmland they own. The female participants had significantly fewer years of formal education (M = .19, t (323) = 5.39, p < .01], farmed fewer bean acres (M = .36, t (323) = 2.24, p < .05), and used fewer information sources for bean production (M = 1.84, t (315) = 2.16, p < .05) compared with their male counterparts (see Table 1).

Table 1

Comparisons of Years of Formal Education, Number of Information Sources for Bean Production, of Bean Planted Between Men and Women

	Women	Men	*t*-value
Years of formal education	5.19	7.73	5.39***
Number of information sources	1.84	2.10	2.16*
Acre of beans	0.36	0.49	2.24*

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Experimental Treatments

Based on residence, farmer-participants were assigned to one of three experimental conditions: (a) lecture and field demonstration (traditional), (b) lecture and field demonstration + video (traditional + video), and (c) video only (see Table 2). Lectures, field demonstrations and videos that explain and illustrate how to plant beans in rows served as the experimental stimuli.

Table 2

The Study's Experimental Design

Treatment	Parish[1]	Training components (in order)	Duration (min.)	*n*	% Women
Traditional lecture/ demonstration only	Naibowa & Bugeywa	1. Traditional lecture and field demonstration	30	111	66.7
		2. Farmer demonstration and group discussion	15		
Traditional lecture/ demonstration + Video	Butansi	1. Traditional lecture and field demonstration	30	103	73.0
		2. Video	8		
		3. Farmer demonstration and group discussion	15		
Video only[2]	Naluwoli	1. Video	8	103	87.4
		2. Farmer demonstration and group discussion	25		
		3. Video	8		

Note. [1] The video was shown twice.

In the group that received the traditional lecture-demonstration, the CBTs first presented the theory underlying the practice of planting beans in rows and then showed a 30-minute demonstration of the process. The traditional + video group received the lecture-demonstration and an eight-minute video in which local residents, using the local language, show how to plant beans in rows. The video group was shown the training video twice with minimal facilitation.

The Experimental Stimulus

Row planting (or planting in lines) requires farmers to plant beans at the

beginning of the rainy season in rows 50 cm (1.5 ft) apart with seeds planted at a distance of 15-20 cm (0.5 ft). Beans of different varieties are planted at least two meters apart so they do not mix. Row planting makes it easier to weed, identify pests and diseases, spray. It helps the plant to access sufficient nutrients. For this process, planters need strings, two 1.5-ft. sticks, and a hoe.

In the video, a local farmer explains the rationale behind row planting, what it involves, the tools needed, and the benefits the can be derived from the practice. Then, he demonstrates how to dig the trench, measure the distance between rows using a pug, and planting. Project specialists and the local extension staff reviewed the video for technical accuracy.

Experimental Design and Procedures

The experimental procedure and the questionnaire were pre-tested in a non-experimental parish. Before each session, the trainees' knowledge of row planting was assessed. After training, the farmers completed a post-test questionnaire. Participants were interviewed individually at the training site immediately before and after the training.

Operational Definition of Knowledge Gap

In this study, knowledge gap was measured by comparing the difference in pretest and post-test knowledge scores between gender**.** The knowledge test was composed of four open-ended questions: (a) What problems in bean production can row planting solve? (b) What are the main steps involved in row planting? (c) What benefits can be derived from row planting? (d) What tools do you need to do row planting? Farmers received a point for each correct answer.

Incorrect and "don't know" answers received no point. For example, a participant who mentioned "higher yields" and "making spraying easier" in answer to the question, "What benefit(s) do you get from row planting?" received two points. The knowledge score was determined by counting the number of earned points. The highest possible score was 15; the lowest was 0.

Results

Gender Knowledge Gap

To answer the first research question, the knowledge scores and knowledge gaps between male and female participants before and after exposure to training were compared. Table 3 and Figure 1 present the mean knowledge scores at pretest (T1) and post-test (T2). The figures reveal that both men and women increased their knowledge of the topic after training. Although their knowledge scores were lower than those of males, women's average score improved from 9.09 at T1 to 13.72 at T2, an increase of 4.63 points. The men, on the other hand, averaged 10.15 at T1 and 14.19 at T2, demonstrating an increase of 4.04 points. However, the change in knowledge scores for women was significantly larger so that the difference in knowledge scores between the two groups decreased from 1.06 to 0.47.

Table 3

Results of t-tests Showing Difference in Time 1 & Time 2 Knowledge Scores (with Standard Deviations) by Gender

Test Time	Women (*SD*)	Men (*SD*)	Difference	*t*-value
Time 1	9.09 (2.8)	10.15 (2.33)	1.06	2.94**
Time 2	13.72 (1.59)	14.19 (1.26)	0.47	2.37**
Gain Score	4.63	4.04	.59	-1.99*

Note. $^{*}p < .05$. $^{**}p < .01$.

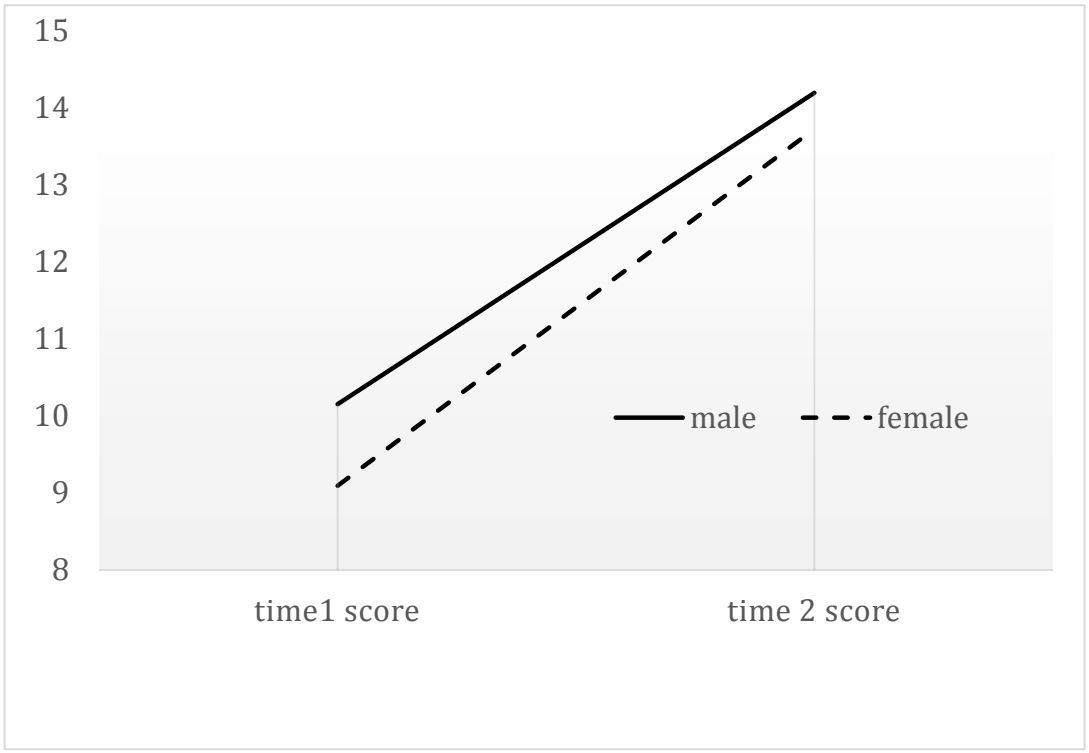

Figure 1. Difference in T1 and T2 mean knowledge scores between males and females.

The results of an independent samples *t*-test show that the differences in knowledge scores were statistically significant at both T1 (t (299) = 2.94, $p < .002$, one-tailed *t*-test) and T2 (t (316) = 2.37, $p < .01$, one-tailed *t*-test). This suggests although a knowledge gap still can be detected after training, women learned more, effectively narrowing the gap (t (295) = -1.99, $p < .025$, one-tailed *t*-test) between male and female training participants.

Video as a Training Tool to Reduce Gender Knowledge Gaps

The second research question asked whether the use of video, both as a complement or a substitute to the traditional lecture-demonstration method, decreases the knowledge gap about bean row planting between men and women. To examine this research question, three independent-samples *t*-tests and a repeated measures analysis of variance (ANOVA) test were

conducted. Table 4 presents the knowledge scores of men and women at T1 and T2 in each experimental group. The results show men and women in all three groups improved their knowledge scores over time. Men had higher knowledge scores before and after training. However, the gender difference in knowledge scores diminished over time. The most reduction was found in the traditional + video group; the least was observed in the video-only group.

In the traditional group, women gained 4.09 points and the men's knowledge score increased to 3.56 after training. Thus, the difference in knowledge scores between the two groups narrowed from 0.63 to 0.1. In the traditional + video group, the women's score increased from 8.17 to 13.81, up by 5.64. Men averaged 9.82 at T1 and 14.21 at T2, an increase of 4.39. In the video-only group, there was only a slight difference in knowledge gain between men (4.45) and women (4.49). Although women learned as much as men in this group, the gender knowledge gap remained.

The *t*-test results (see Table 4) showed the narrowing of the gap was significant for the traditional + video group (men (4.39) and women (5.64); t (96) = -2.10, $p < .02$, one-tailed *t*-test). There was no significant gender difference in knowledge gain detected in both the traditional and the video-only group. The change scores for men in the traditional group were lower than those of the other two groups perhaps because they already had high knowledge scores before training (T1 = 10.44), an indication of a ceiling effect in learning. Participants in the traditional + video group had a lower T1 score, indicating that there is so much more for them to learn.

Table 4

Knowledge Score Means (with Standard Deviations) at Time 1 and Time 2 by Treatment and Gender

		Traditional only		Traditional + Video		Video only	
		Mean	*SD*	Mean	*SD*	Mean	*SD*
Time 1	Women	9.81	.31	8.17	.32	9.24	.29
	Men	10.44	.46	9.82	.50	10.00	.80
Time 2	Women	13.90	.18	13.81	.18	13.73	.17
	Men	14.00	.26	14.21	.28	14.46	.45
Gain	Women	4.09	2.57	5.64	2.83	4.49	2.02
score	Men	3.56	2.55	4.39	2.15	4.45	2.64
	t-value	-1.01		-2.10*		-.04	

Note. * $p < .05$.

The results of the repeated measures ANOVA testing the changes in knowledge scores over time, the differences in knowledge scores between men and women, and differences between treatment groups are shown in Table 5. Across time, there were significant gender differences after controlling for the group effect as indicated by the between-subjects average scores for men and women. These were consistent with the finding that women started with lower scores at T1 (9.09 compared to 10.15 for men), which indicates differences in knowledge about row planting between males and females existed before the training (see Table 4). However, after the

training, the overall gap in knowledge scores between genders decreased. In addition, significant differences between groups (F (2,293) = 3.82) were detected after controlling for the effects of gender.

There were also significant within-subjects differences as indicated in Table 5. The results of the F-test associated with the time of test (F (1, 293) = 611.70) are consistent with the fact that average knowledge scores were always higher at T2 compared with T1. The change in knowledge score was significant for the TestTime x Gender interaction (F(1, 293) = 4, p = .05), which indicates the change in knowledge score is significantly different between men and women. There also was a significant TestTime x Group interaction (F (2, 293) = 6.97), which suggests the change in knowledge scores before and after training between experimental groups was significant.

Table 5

Results of a Repeated Measures ANOVA Testing the Differences in Knowledge Scores at Time1 and Time 2 Using Gender as a Covariate

	df	SS	MS	*F*	*p*
Between subjects					
Group	2	45.09	22.54	3.82*	.02
Gender	1	49.46	49.46	8.38**	.00
Error	293	1730.31	5.91		
Within subject					
TestTime	1	2066.44	2066.44	611.70**	.00
TestTime*Group	2	47.10	23.55	6.97**	.00
TestTime*Gender	1	13.50	13.50	4.00*	.05
Error	293	989.81	3.38		

Note. $^{*}p < .05$. $^{**}p < .01$.

The findings for the second research question suggest the traditional + video method could effectively close knowledge gaps between men and women. The video-only method demonstrated a lesser ability to narrow the gap. It should be noted that men, especially those in the traditional group, already had high scores at T1 (10.44), and therefore did not have much room to improve their knowledge, suggesting a ceiling effect.

Conclusions

This study reports three major findings. First, the results show the knowledge gap can be narrowed when men and women get equal access to quality information. Second, video training, when combined with the traditional lecture/demonstration method, can significantly narrow knowledge gaps. Third, women exposed to the video-only group learned as much as men. Therefore, although the gender knowledge gap did not narrow following this method, it did not widen it either.

Past studies have shown social structural factors are often responsible for gender knowledge gaps (e.g., Geldof, 2011; Hafkin, 2000; Huyer & Sikoska, 2003). Knowledge gap researchers argue people with lower SES have lower exposure to information sources (Tichenor et al., 1970), which results in less knowledge compared to

those with higher SES (e.g., Liu & Eveland, 2006; Shingi & Mody, 1976). The women in the current sample had significantly lower educational experience, smaller farm size, and used fewer agricultural information sources than men. After exposure to quality training, however, women increased their knowledge about a bean production practice significantly. Overall, the gender knowledge gap decreased, although women still showed lower knowledge scores. This finding suggests the magnitude of the gap could be decreased by increasing female access to information, which is consistent with the propositions of Donohue et al. (1987).

The effectiveness of video as a complement and a substitute to the traditional lecture/demonstration method in decreasing the gender knowledge gap was evaluated. The results show the combination of video and traditional lecture/demonstration significantly decreased the gender knowledge gap. The traditional-only method narrowed the gender knowledge gap, but not significantly. This demonstrates women with lower SES can gain significant knowledge, but they need both methods to boost learning.

In the video only group, women learned as much as men, but no significant narrowing of the knowledge gap was observed after training. This result demonstrates video as a stand-alone training method can benefit both men and women even though it did not narrow the gender knowledge gap.

The findings add support to the contention that ICTs can decrease existing economic, political and social inequalities in gender-biased societies (Hafkin, 2000; Tichenor et al., 1970). In this study, the gender gap-narrowing abilities of the method that combined ICTs and conventional training produced the most desired results, supporting the findings of Van Mele (2008) who observed video can be integrated with other learning approaches. Recently, the cost of ICTs such as the portable pico video projector has fallen dramatically. Thus, they could be exploited by local instructors who need to conduct training in remote areas with poor roads and limited electricity. For farmers with less education and skills, the multiple reinforcing channels can improve understanding and recall of concepts and applications (Coldevin, 2003; Lie & Mandle, 2009).

The results indicate the video-only method is most appropriate when the number of trainers is too small to meet farmers' demand. Sseguya et al. (2012) found fewer than 30% of households in Kamuli district are covered by reliable information sources (i.e., the local NGOs). The use of videos alone can therefore expand training reach and frequency. Videos also enable instant replay and repetition, which can aid in the deeper processing of information (Chowdhury et al., 2011). Repetition has also been shown to assist in the building of confidence to try out recommended practices (Gandhi et al., 2007).

Study Limitations and Directions for Future Work

There are several study limitations that curtail the generalizability of these findings. First, the participants were not randomly assigned to the three experimental groups because the training sessions were held based on parish. Although there were no significant differences in age ($F(2, 317) = 2.71$, $p = .07$) and farmland owned ($F(2, 314) = 1.21$, $p = .30$) among the three groups, the results of a Least Significant Difference (LSD) *post hoc* test suggest members of the traditional lecture/demonstration group (from Naibowa and Bugeywa parishes) had significantly higher education than the video only group (from Naluwoli), and planted significantly more beans during the 2011

growing season than those from Butansi (traditional + video) and Naluwoli. Farmers from Naibowa and Bugeywa also saved more beans for seeds, suggesting they relied less on outside seed sources. These differences, which could have been controlled through random assignment, may have influenced the experimental outcomes. Second, the farmer-participants had already been trained about the bean row planting before the experiment. Their familiarity with the topic, therefore, may explain the high pretest scores, especially among men. Future studies should verify the present results using new agricultural practices. Third, training impact could have been gauged in terms of actual bean yield to provide a stronger evidence of the application of concepts and skills learned. Although the majority of the participants said they intended to plant beans using the recommended procedures, the trainers did not check if they actually did so. Fourth, the video only group received ten more minutes of group demonstration and discussion. This study did not test whether that group's longer exposure to demos and discussions had a bearing on the finding that men in the video only group gained the most.

Future studies could explore other factors, such as educational levels and information sources, to explain gender knowledge gaps and to test how the influence of these factors can be reduced by the deployment of ICTs. The cost-effectiveness of training using ICTs could also be evaluated and compared with that of traditional approaches for both small-scale and large-scale training efforts. Finally, more studies that examine appropriate devices that can expand video training in rural areas are in order.

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The Potential of Farmer Field School in Cocoa Extension Delivery: A Ghanaian Case Study

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Abstract

The potential of Farmer Field School (FFS) as an extension approach in Africa is still evolving, with limited empirical evidence. Cocoa FFSs have been introduced in Ghana by the Ministry of Food and Agriculture and Ghana Cocoa Board (COCOBOD) since 2006, and are still being experimented with by COCOBOD and NGOs. But, little is known about its effects on farmers to inform COCOBOD's quest to mainstream and support it. This study, therefore, ascertains the potential of the FFS in terms of its effectiveness and impact on livelihoods of cocoa farmers in Ghana. Using a retrospective comparison design, a survey was conducted on beneficiaries of cocoa FFS in the Mpohor Wassa East District of the Western Region of Ghana. The case study found that the FFS was effective in facilitating farmers' acquisition of knowledge in all cocoa technologies practiced under the FFS. The participant farmers perceived their yields to have increased significantly up to 79%, and their household livelihoods improved due to the FFS. It was also perceived to have improved all capital assets of the farmers, with human capital being the most affected. The best predictors of impact on the livelihoods of the cocoa farmers in FFS were mirid control practices (40.7%), followed by training and extension methods (7.4%). It can be concluded from this case study that FFS can be an effective tool for cocoa extension in Ghana based on the confidence the study farmers have shown regarding its ability to improve farmer competence, yields, and household livelihoods.

Key Words: Extension, Cocoa, Farmer Field School, Impact, Livelihoods, Ghana

Introduction

In developing countries, the main source of the people's livelihoods is the agricultural sector. Livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living (Chambers & Conway, 1991). In Ghana, cocoa is a major economic crop contributing about 40% of agricultural exports, 12% of gross domestic product and provides livelihood to over 800,000 farmers and their dependants (Frempong, Asase, & Yelibora, 2007). The crop is reported to contribute about 70 – 100% of annual household income to farm families and some 60% to the national agricultural labor force (Ntiamoah & Afrane, 2008). Interestingly, the productivity of the cocoa sector is low compared to competitors such as Cote d'Ivoire, Indonesia, and Malaysia. The low productivity has been attributed to a myriad of constraints including low producer prices, poor agricultural extension support, low technology adoption, poor farm maintenance, declining soil fertility, mirid (capsid) attack, black pod disease infection, and bad weather (Adomako, 2007). According to Adeyemi (2000) the crop is performing far below its high yield potential. Being mindful of the situation, the government of Ghana has adopted several approaches and interventions to sustain the cocoa sector over the years. A notable among these interventions is the collaboration of COCOBOD and Ministry of Food and Agriculture with Sustainable Tree Crops Program (STCP) to promote Farmer Field School (FFS) as an extension approach in cocoa extension delivery to improve the capacity of cocoa farmers for higher and sustainable cocoa production in Ghana.

Having been implemented for the first time by the Food and Agriculture Organization of the United Nations in 1989, to control a widespread rice pest out-breaks in Indonesia, the concept of FFS gained some credence in the 1990s (Pontius, 2002). The concept is described as a participatory training approach, group extension method, and a form of adult education whereby farmers of similar interest (25- 30 in number) who meet regularly during the course of a growing season to experiment as a group with new production management options are given opportunity to make choices in the methods of production through discovery based approach (Adisa & Adeloye, 2002).

Since the Indonesia experience in 1989, the FFS has become one of the agricultural extension approaches for facilitating knowledge acquisition and skills development by farmers to solve their farming problems. As an experiential and a group-based approach, the FFS uses participatory methods coupled with hands-on experience sharing to help farmers acquire knowledge and skills. These knowledge and skills enable farmers to grow healthy crops, conserve natural enemies, and conduct regular field observations to improve farm productivity in a sustainable manner. The FFS approach was adopted in Ghana in 1995, but its major experimentation in the cocoa sector by the Ministry of Food and Agriculture in partnership with the Sustainable Tree Crops Program started in the Western Region in 2006. Since 2006, cocoa farmers in the Mpohor Wassa East District of the Western Region of Ghana had been trained through the FFS extension approach to build their capacities to improve cocoa production. Although anecdotal evidences indicate that the FFS is beneficial to cocoa farmers, there is limited empirical evidence on the effectiveness of the approach, its components (cultural practices, mirid control practices, black pod disease control practices, cocoa quality maintenance practices and the extension methods), and the impact on livelihoods of beneficiaries. As argued by Davis et al. (2010), much is still unknown about the FFS as an extension approach and its relationship with poverty reduction

(livelihood improvement), sustainability, participation, and financing in Africa.

Research Objectives

Given the background provided, this research was designed to determine the potential of the FFS with respect to its effectiveness and impact on livelihoods of cocoa farmers based on a Ghanaian case study of cocoa FFS in the Mpohor Wassa East District in the Western Region of Ghana. The specific objectives were to:

1. Assess the level of effectiveness of the key components of the cocoa FFS training
2. Determine the effect of FFS on the yields of cocoa farmers
3. Examine the levels of impact of FFS on cocoa farmers' livelihoods
4. Ascertain the extent to which the key components of the cocoa FFS can contribute to enhance farmers' livelihood.

Theoretical Framework and Context of the Research

From the Bennett's hierarchy for program evaluation (Bennett, 1979), a suitable extension program evaluation framework should provide information on levels of practice of improved technologies, yields and the livelihoods of beneficiaries. The Bennett impact evaluation framework was considered appropriate for the research given that the research sought to assess the perceived effectiveness and impact of the FFS on livelihoods of cocoa farmers. The FFS as an extension approach requires (a) inputs, (b) activities, (c) people's involvements, (d) reactions and (e) some behavioural change, which fit well with Bennett's hierarchy for program evaluation. Inputs in terms of time and staff are required for the implementation of the FFS. In this case study, cocoa community representatives were trained as facilitators, while Sustainable Tree Crops Program Master Trainers and Cocoa Research staff served as resource persons. The farmers were trained using various training materials for a period of ten months. Over the period, several activities were performed by the FFS participants. These included data collection from test cocoa trees, data analysis and presentation of findings by the participants in small groups. Farm visits and field days were also organised for the FFS stakeholders and facilitators to receive feedback on the cocoa production technologies propagated through the FFS. Theoretically, the FFS is expected to involve people (i.e. participants), but without compulsion, with the understanding that people have different interests, likes and dislikes. The issue of participation in farmer field schools has not been discussed much in the literature as posited by Davis (2006). For this particular case study, cocoa farmers who participated in the FFS programs did that on their own volition – an indication of their interest in the program.

The FFS participants were trained in key cocoa FFS Components. These were: (a) cultural practices (timely weeding, removal of mistletoes, shade tree management, and removal of chupons), (b) mirid control practices (mirid damage threshold level to decide spraying time, improved spraying practice for mirid control, pesticide screening, and mirid damage symptom identification), (c) black pod disease control practices (Sanitary harvesting, rational fungicide spraying, cocoa tree pruning, reduction of shade to reduce humidity), and (d) cocoa quality maintenance practices (timely harvesting of cocoa pod, timely breaking of pod, adequate fermentation of cocoa beans, and turning of fermentation heap).

Having gone through the FFS, it is expected that the farmers' capacity in cocoa production will improve and consequently, will affect the level of their livelihood assets (capitals). The indicators of the livelihood assets involve: (a) natural capital (household food, cocoa farm size, cocoa yield, quality of cocoa beans), (b) human capital (knowledge, self-skilled

labour, healthcare, ability to pay medical bill), (c) social capital (access to information, payment of : children's school fees, development levy, and funeral dues), (d) financial capital (income, savings, debt level, collateral insurance) and (e) physical capital (renovation of housing, building of housing, spraying machine, cutlass).

Methodology

A descriptive correlational survey design was used for the study in order to determine the type and degree of relationships that existed among the key variables of the study. Also, being an impact evaluation study, a retrospective (reflexive) comparison design was adopted to compare the FFS program participants to themselves, before (pre-test) and after (post-test) the intervention. Retrospective pre-test/post-test evaluations have been shown to be useful for documenting self-assessed changes that occur as a result of the particular intervention, as they tend to be more sensitive to participants' own feeling of change (Skeff, Bergen, & Stratos, 1992). Pratt, McGuigan, and Katzev (2000) described the design as better than the traditional pre-test/post-test methods if participants' perceived knowledge of a subject is based on incorrect information, a situation that may only be illuminated after they have participated in the program.

A total of 215 cocoa FFS participants, who were trained in 2006 in seven cocoa communities in the Mpohor Wassa East District in the Western Region of Ghana, formed the study population. From the population, 140 farmers were sampled using the lottery method, and based on Sarantakos' (1998) sample size determination table. Multiple sources of data collection were used. Oral administration of questionnaire through face-to-face interviews was the primary source of data. Documents from the FFS project, and observations made also provided useful information first, in the preparation the questionnaire and, the validation of responses provided by the research participants as means of triangulation. From the project documents (reports) the key objectives and components of the cocoa FFS training were defined. The face-to-face interviews offer the opportunity for some physical observations to validate a number of questions on the physical assets of respondents. A reliability test on the Likert-type scale questions in the questionnaire gave Cronbach's alpha reliability coefficients of 0.71 – 0.89, which from the literature (Pallant, 2001), is good for internal consistency.

Taking cognizance of the fact that impact of a training program may be affected by many other factors (Imbens & Wooldridge 2008), the purpose of the study was carefully explained to the study participants, and they were asked to reflect and give their candid opinion on how the intervention had affected their livelihoods. The main data were collected between March, 2011 and November 2012, and analyzed with the help of the Predictive Analytics Software version 15. Relevant statistics used included frequencies, percentages, means, standard deviations, *t*-test, *F*-test, and Pearson product-moment correlation coefficient.

Findings

The participants studied were male dominated (76%), which supports the belief that the cocoa sector in Ghana demands strenuous work, and thus, is more suitable for men who by nature are physically stronger than women. Their mean age was 50 years, with most (79%) of them between 41 to 80 years – a sign of aging farming population. The majority (78%) of them had had some level of education, with most (67%) up to Junior High or Middle School level. They had an average farming experience of 18 years with most (64%) of them with experience ranging between 11 to 50 years, and farm holdings ranging from 0.4 to 4 hectares.

Perceived effectiveness of the components of the cocoa FFS

FFS was effective in facilitating farmers' acquisition of knowledge in cocoa technologies, especially when famers perceived the knowledge as responsive to local concerns or needs. A key part of the cocoa FFS was that the farmers were trained in four need-based areas of cocoa husbandry namely, general cultural practices, black pod disease control, cocoa quality maintenance, and mirid control practices. Assessment of the training content and methods shows the farmers perceived all aspects of the cocoa FFS as 'effective' (*M* of *M* = 4.25) in improving cocoa production, with the cultural practice component as the most effective (*M* = 4.38; see Table 1).

Table 1

One–Way ANOVA of levels of Perceived Effectiveness of the Cocoa FFS Components

Key FFS Components	*M*	*SD*	*F*-ratio	Sig.
Cultural practices	4.38	0.54	7.06	0.00*
Black pod disease control practices	4.34	0.58		
Cocoa quality maintenance practices	4.28	0.57		
Training and extension methods	4.16	0.45		
Mirid control practices	4.08	0.62		
Mean of means (*M* of *M*)	4.25	0.56		

Note. Scale: 1 = *Very Ineffective*, 2 = *Ineffective*, 3 = *Moderately Effective*, 4 = *Effective*, 5= *Very Effective*; *$p < 0.05$; N =140. Sources: Survey data, March 2011.

Mirid control, comparably, was the least effective practice among the training components of the cocoa FFS. This is consistent with the Kenyan studies where the FFS was found to have assisted farmers to acquire more knowledge and to adopt more improved agricultural technologies (Bunyatta, Mureithi, Onyango, & Ngesa, 2005).

Effect of FFS on cocoa yields

As expected, the facilitation and adoption of improved techniques in cocoa production through FFS improve yields of cocoa for farmers. The results revealed that, before the FFS (i.e. 2005), about 79% of the cocoa FFS participants harvested less than 320 kg/ha of cocoa, while nearly 21% of the FFS participants had yields ranging from 320kg/ha to 960 kg/ha (see Table 2). On the average, about 209 kg/ha of cocoa was recorded with the range being about 27kg/ha to 800 kg/ha. After the cocoa FFS in 2009, the majority (66%) of the FFS participants had cocoa yields varying from 320kg/ha to 960 kg/ha, with the mean yield of about 375 kg/ha. The difference in mean yields before and after the FFS was significant and attributable to the FFS (see Table 2).

Table 2

Yield of Cocoa FFS Participants Before and After the FFS

	Before FFS (2005)		After FFS (2009)		
Yield (kg / ha)	*f* (%)	*M*(kg / ha)	*f* (%)	*M*(kg / ha)	Sig
Less than 320	96 (79.3)	209.2	42 (34.7)	375.2	0.000*
320 – 640	24 (19.9)		70 (57.9)		
641 – 960	1 (0.8)		9 (7.4)		
Total	121(100)		121(100)		

Note. M Difference = 165.96 kg/ha; t-ratio =13.82; *$p < 0.05$(2-tailed); Source: Survey data, March 2011.

The results show an average increase of 166 kg/ha, representing about 79 % increase in yield over the 2005 yield of 209.2kg/ha. Fafo (2006) reported an average yield of cocoa in Ghana as 300 kg/ha as against 1,000 kg/ha produced in Malaysia. As such, the finding suggests that with a good cocoa FFS program, cocoa famers in Ghana can have comparable yields (960 kg/ha) to their counterparts in Malaysia. This is consistent with the findings of Godtland, Sadoulet, de Janvry, Murgai, and Ortiz (2003) that FFSs have positive impact on knowledge and productivity of farmers.

Perceived impact of FFS on cocoa farmers' livelihoods

The findings indicate that besides the adoption of introduced techniques in cocoa production with resultant increases in yields, FFS can have positive social and economic impact on farmers, as have also been reported in some studies (Mwagi, Onyango, Mureithi, & Mungai, 2003). Mwagi et al. (2003) found much higher adoption of technologies and greater cohesiveness among FFS groups. Not surprising, farmers from the study perceived their livelihoods to have significantly improved (*M* = 2.21 to 3.90) after going through the FFS (see Table 3). Livelihood here refers to the means by which the farmers obtain and maintain access to essential resources to ensure their immediate and long-term needs. In this case, the livelihood resources included the farmers' natural, human, social, financial and physical capitals. This suggests FFS can improve assets of famers. Reddy and Suryamani (2005) and Godtland et al. (2003) have both reported FFS improves human capital by improving farmers' knowledge. Similarly, van den Berg (2004) and Simpson and Owen (2002) found FFS to have improved famers' financial capital through the reduction of their cost of production and increase in their profit. Notwithstanding, the work of Feder, Murgai, and Quizon (2004) in Indonesia found no significant impact of FFS on economic performance, environmental and health situations of famers. For in-depth understanding, the impact of the FFS on the components of the farmers' livelihood assets – natural, human, social, financial and physical capitals, have been discussed in the following sections.

Table 3

Dependent (paired) Sample t-test of Perceived Levels of Livelihoods of Cocoa FFS Participants Before and After the FFS

Perceived Impact on Livelihoods	*N*	*M*	*SD*	*M* Diff.	*t*-test	Sig.
Before FFS	140	2.21	0.65			
After FFS	140	3.90	0.67	1.68	26.18	0.000*

Note. Scale: 1 = *Very Low*, 2 = *Low*, 3 = *Moderate*, 4 = *High*, 5 = *Very High*; *$p < 0.05$; Source: Survey data, March 2011.

Impact on livelihood assets of cocoa farmers

The study shows cocoa FFS can have positive impact on cocoa farmers' natural capital – the natural assets (e.g. farmland and its productivity) available to them for sustainable economic activity and livelihood security. The famers perceived their natural assets to have improved from low to high (*M* = 2.37 to 3.93) after the FFS program (see Table 4). Improvement in the quality of cocoa beans was perceived to be 'high' (*M* = 4.16), and the best rated among the natural capital assets after the FFS. Although the farm size was perceived to have been highly increased (*M* = 3.75) as a result of the FFS, it was the least affected by the FFS program compared with other natural assets including cocoa yield and household food increase.

The research shows that FFS can increase human capital of cocoa farmers. The results show an increase in human capital from low (*M* = 2.22) before the FFS, to high (*M* = 4.13) after the FFS. As expected from a successful training, increase in knowledge and access to self-skilled labour were perceived as the most improved of the human capital assets (*M* = 4.29). Ability to pay additional medical bills' was perceived to have received the least improvement though it was also perceived to have highly increased (*M* = 3.94).

Similar to the other findings, FFS provides some social capital gains for farmers. From the study, the FFS participants perceived their social capital to have improved from low (*M* = 2.32) to high (*M* = 3.93) after the FFS program. More specifically, payment of children's school fees, development levy, funeral dues, and access to information were all perceived by the famers to have highly improved due to the FFS program. Payment of funeral dues was however, the most improved (*M* = 4.00) among the social capital livelihood assets.

The study also shows FFS can improve financial capital livelihood assets of cocoa farmers. From the study, the farmers who participated in the FFS perceived their financial capital to have improved from low (*M* = 2.12) to high (*M* = 3.79) after the FFS in 2009. Aspects of the financial capital, including increase in income from cocoa, increase in savings, decrease in debt level, and increase in collateral insurance were all perceived to have highly improved after the FFS. These findings were expected on the basis that the FFS improved cocoa yields as a result of improved knowledge of farmers and their use of introduced techniques.

Table 4

Mean Impact of Cocoa FFS on Livelihood Assets Before and After the FFS

Livelihood Assets	Before FFS		After FFS	
	M	*SD*	*M*	*SD*
Natural Capital				
Improved quality of cocoa beans	2.39	0.86	4.16	0.82
Increase in cocoa yield per unit area	2.17	0.76	3.99	0.78
Increase in the quantity of household food	2.44	0.94	3.81	0.80
Increase in cocoa farm size	2.49	0.81	3.75	0.83
Sub Mean	*2.37*	*0.84*	*3.93*	*0.81*
Human Capital				
Increase in knowledge	2.14	0.81	4.29	0.73
Access to self-skilled labour	2.11	0.81	4.29	0.73
Ability to register household on National Health Insurance Scheme	2.29	0.94	3.99	0.93
Ability to pay additional medical bills	2.33	0.98	3.94	0.85
Sub Mean	*2.22*	*0.89*	*4.13*	*0.81*
Social Capital				
Payment of funeral dues	2.50	1.00	4.00	0.87
Payment of development levy	2.44	0.95	3.97	0.86
Payment of children's school fees	2.32	0.99	3.94	0.90
Access to information	2.01	0.91	3.79	0.85
Sub Mean	*2.32*	*0.96*	*3.93*	*0.87*
Financial Capital				
Increase in cocoa farm income	2.13	0.78	3.91	0.80
Increase in collateral insurance	2.09	0.92	3.81	0.86
Decrease in debt level	2.20	0.88	.79	0.83
Increase in savings	2.06	0.94	3.65	0.86
Sub Mean	*2.12*	*0.88*	*3.79*	*0.84*
Physical Capital				
Acquisition of simple farm tools (e.g. cutlass)	2.33	0.99	4.07	0.92
Acquisition of spraying machines	1.86	0.84	3.70	0.97
Renovation of housing	2.07	0.94	3.69	0.92
Building of new housing	1.91	0.97	3.64	1.17
Sub Mean	*2.04*	*0.94*	*3.78*	*0.99*
Overall Mean	**2.21**	**0.65**	**3.90**	**0.67**

Note. Scale: 1 = *Very Low*, 2 = *Low*, 3 = *Moderate*, 4 = *High*, 5 = *Very High*; *n* =140. Source: Survey data, March 2011.

The study shows FFS can have significant impact on the physical capital of cocoa farmers. Generally, the FFS participants perceived their physical capital to have improved from low (*M* = 2.04) to high (*M* = 3.78) after the FFS. Renovation of housing, acquisition of cutlass, building of new housing, and acquisition of spraying machine were all improved after the FFS. The farmers indicated they could purchase and own the necessary simple farm tools such as cutlasses (*M* = 4.07), spraying machines (*M* = 4.07) and renovate or build new houses after the FFS. This ascription is expected based on the finding that FFS can

improve cocoa yields (see Table 2) and consequently farm income.

Contribution of the key components of the FFS to cocoa farmers' livelihood

The Pearson product-moment correlation coefficient (*r*) indicates a relationship exists between perceived impact of the cocoa FFS and the perceived effectiveness of the five key FFS components (cultural practices, mirid control practices, black pod disease control practices, cocoa quality maintenance practices and, training and extension methods) as presented in Table 5.

Table 5

Pearson Correlation Matrix of Perceived Impact on Livelihood and the Effectiveness of the Five Key Components of the Cocoa FFS

Variables	Y	X_1	X_2	X_3	X_4	X_5
Y	-					
X_1	0.516*	-				
X_2	0.641*	0.573*	-			
X_3	0.571*	0.757*	0.698*	-		
X_4	0.519*	0.615*	0.562*	0.752*	-	
X_5	0.525*	0.518*	0.427*	0.558*	0.511*	-

Note. *$p < 0.05$ (2- tailed); $n = 140$. Y = Perceived Impact on Livelihoods, X_1= Cultural Practices, X_2 = Mirid Control Practices, X_3 = Black Pod Disease Control Practices, X_4 = Cocoa Quality Maintenance Practices, X_5 = Training and Extension Methods. Source: Survey data, March 2011.

Interpretation of the results using Davis' (1971) conversion implies there is a positive and substantial significant relationship between impact on livelihoods and effectiveness of each of the five key components of the cocoa FFS: cultural practice component ($r = 0.516$); mirid control practice component ($r = 0.641$); black pod disease control practice component ($r = 0.571$); cocoa quality maintenance practice component ($r = 0.519$); and lastly, training and extension methods component ($r = 0.525$).

The relationships identified suggest each of the five key cocoa technology components was essential in improving the livelihoods of the FFS participants. David (2008) noted black pod disease causes about 50 % or more of cocoa pod losses. It is therefore not surprising that the effectiveness of black pod disease control practices was perceived by the FFS participants to have contributed significantly to their livelihoods. The positive relationship between impact on livelihoods and effectiveness of cocoa quality maintenance can be attributed to the fact that farmers will not have their cocoa beans rejected as a result of poor quality by the licensed buying companies. It was also observed that the impact of FFS training on farmers' human capital such as knowledge and skills enables them to make cost-effective (financial capital) and environmentally (natural capital) friendly decisions (Reddy & Suryamani, 2005). Therefore, the significant contribution of the training and extension methods to livelihoods as perceived by the cocoa FFS participants cannot be overemphasized.

A stepwise multiple regression of the perceived impact of the effectiveness of the key cocoa FFS components on livelihoods is shown in Table 6. The results show two out of the five

independent variables used in the model significantly explained the participants' perceived impact of the cocoa FFS on their livelihoods. The two best predictor variables were FFS participants' perceived effectiveness of (a) mirid control practice component and (b) training and extension methods component of the FFS program.

Table 6

Stepwise Multiple Regression of Perceived Impact of the Key Components of Cocoa FFS on Participants' Livelihoods

Predictor(s)	Step of Entry	Beta (standar-dised)	R^2	Adj. R^2	Adj. R^2 Chan ge	S.E.E	*F* Reg.	*F*.Sig
X_2	1	.51	.41	.41	.41	.52	96.29	.00*
X_5	2	.31	.49	.48	.07	.49	65.33	.00*

Note. *$p < 0.05$ (2- tailed); $n = 140$. Source: Survey data, March 2011

The regression analysis provide variables which were statistically significant at 0.05 alpha level, so the following equation was formulated to estimate the cocoa FFS participants' perceived impact of the cocoa FFS on their livelihoods.

$$Y = a + \beta X_2 + \beta X_5,$$
$$Y = - 0.279 + 0.557X_2 + 0.457X_5$$
$$Y = - 0.279 \quad \text{if} \quad \beta_2 = \beta_5 = 0$$

Where: Dependent variable (Y) = Perceived Impact on Livelihoods

a = constant; β = unstandardized Beta

X_2 = Mirid Control Practices

X_5 = Training/Extension Methods

The results show the two components together explained 48% of the variance in the perceived impact of the cocoa FFS on participants' livelihoods (Adjusted $R^2 = 0.48$, see Table 6). Whilst the first component (mirid control practices) made 41% contribution (Adjusted R^2 change = 0.41), the second component (training/extension methods) contributed 7 % (Adjusted R^2 change = 0.07) towards the explanation of the cocoa FFS participants' perceived impact of the cocoa FFS on their livelihoods. The values of the Standard Error of Estimate (S.E.E) allow us to determine the limits of the confidence that we can exhibit in the prediction from the regression equation Bryman & Cramer, 2008). For instance, for "mirid control practice component," it can be 95% certain that the population regression coefficient (0.56) was between $0.56 + (1.96 \times 0.52)$ and $0.56 – (1.96 \times .52)$. The implications of these results are that any unit increase in the quantity of any of the independent variables (mirid control practices, training and extension methods) will increase impact by the value of their estimated coefficients. This means that improvement in mirid control practices, training and extension methods in FFS can uniquely have significant and positive impact on cocoa farmers' livelihoods in Ghana.

Mirid control (the best predictor) has been one of the major concerns of the Ghana Government and COCOBOD for many years. Thus, in 2001 the government launched a Cocoa Diseases and Pest Control Program (CODAPEC) popularly known as "Mass Spraying" to assist all cocoa farmers in the country to combat mirid and the black pod disease. According to David (2008), mirid infestation causes about 30% or more of bean losses if not controlled. It is therefore unsurprising that the mirid control practice component was perceived to have

contributed significantly (41%) to improve FFS participants' livelihoods.

The second variable in the step of entry was ''perceived effectiveness of training and extension methods component.'' This component accounted for 7% in the prediction, and has been the pivot of the cocoa FFS program. This is because after using Training and Visit (T&V) approach in cocoa extension for some years in Ghana, it was found to be inadequate to change farmers' practices as it pays little attention to farmer knowledge and experience sharing (David et al., 2005). Cocoa extension was therefore turned over to Ministry of Food and Agriculture (MOFA) in 2000 with the aim of providing a more cost effective extension services to farmers (Amezah & Hesse, 2002). Since the inception of the cocoa FFS program, stakeholders have been eager to know the level of contribution of the cocoa FFS to livelihoods.

Conclusions and Implications

Based on the findings of the study, the following conclusions were drawn. Technology transfer through FFS has the potential of improving small-holder cocoa farmers' knowledge, adoption and yields. FFS training programs can lead to improvement of livelihood assets of small-holder cocoa farmers in Ghana, if the farmers perceive key training components of the FFS to be effective. The study suggests a positive and substantial significant relationship can exist between perceived effectiveness of the key components of the cocoa FFS and its perceived impact on farmers' livelihoods. The level of effectiveness of mirid control practices and training and extension methods can predict the impact in FFS training program on small-holder farmers' livelihoods. A key implication of the findings is that positive outcomes can be realized from FFS as an extension delivery approach with small-holder cocoa producers, if responsible institutions including the COCOBOD and NGOs pay special attention to mirid control, training and extension methods used in cocoa FFS programs.

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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.

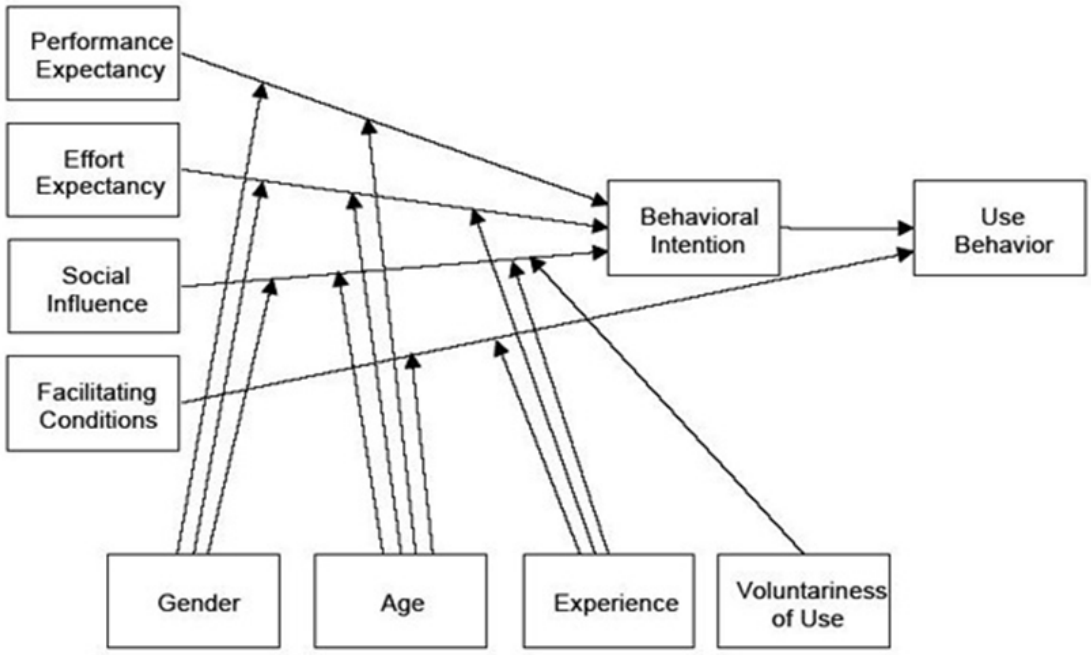

Figure 1. Venkatesh et al.'s (2003) unified theory of the acceptance and use of technology (UTAUT).

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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Does Technology Transfer Work? Assessing the Outcomes and Impact of the USAID-*Inma* Agribusiness Program

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Abstract

After years of conflict, Iraq has become unable to facilitate the development of the agricultural and business development sectors (USDA, 2010). Using the principles of technology transfer the USAID Inma Agribusiness Program (Inma) was designed to focus on agricultural development of the private sector in all 18 provinces in Iraq (USAID-Inma, 2010a; 2010b). The overall goals of Inma were to increase agricultural sales, create jobs, and assist in the adoption of new agricultural technologies. Inma invested millions of dollars in educational programs designed to strengthen the business management skills of agricultural producers and to create employment opportunities. A quantitative survey study encompassing 556 participants and a qualitative focus group study was implemented to examine the impacts of a large agricultural development effort. The study indicated participant incomes increased, farmers and business owners implemented the use of formal business plans, created stronger market linkages, new employment opportunities and sustainability. Additionally, farmers, agribusiness owners, and village elders indicated a need for additional technical and business management training programs for operating their businesses successfully.

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Introduction

After years of conflict, Iraq has become unable to facilitate the development of the agricultural and business development sectors (United States Department of Agriculture (USDA), 2010). Such strife has had a devastating effect on production in all sectors of the agricultural industry. According to the Food and Agriculture Organization (FAO) (FAO, 2008) the role for agriculture is to build a proper environment that increases agricultural production, improve food security, and strengthen agricultural services while improving rural areas of Iraq.

The United States Agency for International Development (USAID) *Inma* Agribusiness Program was designed to focus on the development of the private sector in all 18 provinces in Iraq. A key component of the program was the creation of fully-integrated value chains and educational programs designed to strengthen production and management skills of local farmers (USAID-*Inma*, 2010-2011a). The primary focus of the project was to teach beneficiaries how to use new technology, analyze financial and market information for business decisions, and identify and pursue profitable agricultural opportunities.

The program provided opportunities through the establishment of quality technical assistance; quick impact activities; attention to infrastructure; assistance to private sector entities via associations, entrepreneurs, businesses; and partnering with Provincial Development Councils, Provincial Reconstruction Teams, (PRTs) and community elders (USAID-*Inma*, 2010-2011b). Technical assistance provides a practical way to create knowledge transfer and increases incomes of producers (Kock, Harder & Saisi, 2010; Swanson & Rajalahti, 2010). USAID (2007) and the United States Department of State (USDOS, 2010) indicate the agriculture sector continues to play an extremely important role in the economic and social development in the country, and is one of the largest sectors for employment. The *Inma* program began in June 2007 and since inception has responded to multiple needs of USAID, the United States Government (USG), the U.S. Department of Defense (DOD), Iraqi farmers, and related strategic goals in Iraq. Such needs included DOD counter-insurgency activities as points of intervention which could increase production of domestic agriculture in the country.

Conceptual Framework

The foundation of the USAID-*Inma* Agribusiness Program was built on the framework of technology transfer, via classroom instruction, Farmer-Field-Schools (FFS), and extension field work. Technology transfer is well established in agriculture; Seaman Knapp promoted the concept of technology transfer in the early 1900s. Knapp applied research (technology) to solve practical problems. Rogers (2003) indicated the most successful model for securing the adoption or transfer of new technologies is the agricultural extension service. Bozeman (2000) stated technology transfer is "the movement of know-how, technical knowledge, or technology from one organizational setting to another" (p. 629). This was the major overall objective of the USAID-*Inma* Agribusiness Program, to enhance the agricultural sector in Iraq through the use of new technology (USAID-*Inma* Agribusiness Program, 2010a).

Rogers (2003) indicated the relative advantage of a new technology enhances the adoption. If farmers can see an advantage of the technology there is a greater likelihood for adoption. Hafer (2010) opined Maslow's (year) Hierarchy of Need is fundamentally universal yet very poignant in grounding and facilitating the awareness for basic human

needs; especially in dire, post conflict communities. In addition, Hafer (2010) postulated Roger's Diffusion of Innovation Theory serves as a beacon to help guide the effective practice and effective use of opinion leaders and their application in gaining and guiding popular opinion. Such applications are paramount in helping provide conflicted communities with newer, more efficient, and productive agronomic efforts and practices via awareness and guided opinion.

Erbaugh, Donnermeyer, Amujal and Kidoido (2010) avowed inadequate methods of technology transfer have limited effect on dissemination and adoption of new agricultural and business management technologies. Erbaugh et al. (2010) also suggested proper methods such as the Farmer-Field-Schools (FFS) enhance the adoption of new technologies. The research conducted by Erbaugh et al. was supported by Rogers (2003), who indicated trialability of a new technology is positively related to the rate of adoption. FFS programs developed with cooperating farmers provided other producers the opportunity to see firsthand what the new technology offered. This training program allowed farmers the opportunity to learn through group observation, an aspect of social learning and important component of adoption. Additional work in Afghanistan conducted by the Citizens Network for Foreign Affairs (CNFA) found the adoption of underground potato storage increased in rural areas as farmers experienced the economic advantage of storing produce for a few months after harvest before reaching the market (CNFA, 2007).

These findings are supported by Rogers (2003), in that the innovation (technology) needs to produce a relative advantage, either economically or socially, for the adoption of the new technology. Rogers also indicated many small-scale farmers in developing countries put greater value on social approval and less on financial return. However, Miller and Cox (2006) opined the adoption of new technology is often the key to a profitable farming operation.

Purpose and Objectives

The purpose and objectives of this research were approved by the USAID Contracts Officer, the Contract Officer's Technical Representative overseeing the *Inma* program, the Chief of Party, and the Deputy Chief of Party who managed the project. The study was designed to evaluate the activities/farmer assistance of the USAID-*Inma* program to allow the management team of the USAID-*Inma* Agribusiness and funding agency officials to understand how farmers (direct beneficiaries) and community members (indirect beneficiaries) viewed past assistance provided by the *Inma* program as well as the adoption of related technologies.

Over the course of the first three years, evaluations were conducted regarding the operations aspect (fiscal and personnel) of the project, but not on the programmatic field activities. Those earlier evaluations warranted the management team and USAID to evaluate the programmatic aspect of the project. The USAID-*Inma* program invested millions of dollars in the development of Iraqi agribusiness through horticulture and livestock producer grants and training programs designed to enhance production and business management. These activities were designed to strengthen the ability of producers and businesses to create employment opportunities in Iraq. Therefore, the funding agency and project management wanted to measure if past activities reached the Performance and Monitoring Plan (PMP) indicators for the project.

Methodology

This study employed a telecommunication pre/post survey investigating specific program indicators, as requested by the project funding agency, USAID. The program indicators sought to increase sales, create jobs, and increase adoption of new technologies. Two populations were used for the collection of data. Recipients of *Inma* aid (direct beneficiaries) and a purposive sample of village elders (indirect beneficiaries) in three locations (southern, central and northern Iraq) where *Inma* concentrated work efforts were included in this study. The data collection instruments were designed to be self-coding; however they were read to each recipient via cellular telephone conversations. Descriptive statistics were utilized to determine if the outcome and impact indicators were reached in the project. To achieve the research objectives the researchers designed three instruments: (a) a pre-post agribusiness (reflective analysis) instrument containing a four-point summated scale, (b) a five-point summated scale instrument assessing the training programs of each of the value chains (livestock, horticulture and business development), and (c) a fifteen question instrument for focus group data collection.

Design

The methodology used for this study was a survey research design (Shavelson, 1996). To address the lack of physical addresses for recipients, minimize survey expense issues, and maximize a short timeframe for data collection, the instruments were designed for telecommunications use. The purpose of the descriptive comparative analysis was to describe and compare pre-*Inma* assistance data to post-*Inma* assistance data for direct and indirect aid recipients.

Procedures for Determining Survey Population

The population for this study consisted of 10,000 aid recipients (farmers/businesses) and three villages where prior work had been concentrated. All participants were beneficiaries of *Inma* aid over the last three years and were village elders (groups, 3-7 people each), residing in areas where *Inma* concentrated their efforts. These elders spoke on behalf of the community.

Researchers randomly selected 1,000 participants from the population of 10,000 farmers and business owners who were recipients of *Inma* project aid. Of those 1,000 farmers and business owners, 556 completed the pre/post-harvest questionnaires. Bartlett, Kotrlik, and Higgins (2001) indicated a sample size of 500 would be sufficient representation of the population of beneficiaries, thus allowing for generalizability to the population. The researchers attempted to ensure proportionate representations of farmers from each province were selected as study participants. For example, approximately 3,700 farmers from the Baghdad Province participated in the *Inma* program, representing 37% of the total participant population. Therefore, 37% of the farmers selected to participate in this study came from the Baghdad Province.

The same selection procedure was followed for each of the participating provinces. The researchers also embraced the same methodology per value chain, making sure equal representation existed for each of the training sectors. In facilitating adequate response rates with first time responders, especially those that indicated a schedule which promoted insufficient time to complete the survey, a follow-up phone call was placed to arrange a more conducive time to complete the survey.

Instrumentation

Instruments used for this study were designed to follow the outcome and impact indicators requested by USAID. The instruments were examined by a panel of experts consisting of USAID-*Inma* project management (U.S. expatriates and host country nationals), university faculty from Iraq and the United States, and USAID officials. Instruments were initially written in English and translated to Arabic, the primary language of Iraq, before being utilized with participating farmers. Due to the exorbitant cost factor, timeliness, and potential violence which made travel difficult for data collection, the research was conducted via telephone by project staff members who were fluent in both Arabic and English. According to Braunsberger, Wybenga, and Gates (2007) telephone-based surveys are viable and reliable means for collecting information. The data were analyzed by personnel employed on the *Inma* project who were trained in data analysis and the results were printed in English and shared with the researchers.

Using a four and five-point summated rating scale respectively, farmers were asked to complete two questionnaires regarding their current production operation and related economic conditions. Questions contained in the instruments covered such topics as: (a) I am able to track sales and profits more easily because of the new management forms; (b) before USAID-*Inma* assistance did you have the skills to increase production and profitability in your operation; and (c) my yields increased because of the new production practices I implemented on my farm. To qualify the data received through the surveys, the study's facilitators conducted focus group interviews with village elders in three communities (southern, central and northern Iraq) where *Inma* had a concentrated work effort. The group interviews were recorded in Arabic and transcribed into English. The questions asked of the focus groups dealt with how they (elders) perceived the assistance provided to farmers: (a) are farmers sharing new technologies with others in the community; (b) do you think community members are better able to provide for the families now than before USAID-*Inma* assistance; (c) has the community benefited financially from USAID-*Inma's* involvement in the area? These types of questions were asked with additional follow up questions.

Content Validity

Content validity of instruments was assured by a panel of experts (both Iraqi and U.S. expatriate or third-country nationals) familiar with the outcome and impact indicators of the *Inma* project and the cultural appropriateness of the Iraqi audience. Content validity indicates the answers make sense and allow the researchers to draw conclusions regarding the population being investigated (Creswell, 2005).

Face Validity

Face validity was addressed in the initial pilot study. It was determined the instrument needed to include both English and Arabic versions in order for individuals implementing the questionnaires to fully understand the intent of the questions.

Instrument Development — Reliability Pilot Test

A pilot study of the instrument was completed to establish reliability. The pilot group consisted of 20 *Inma* aquaculture aid recipients throughout Iraq. These recipients represented small, medium and large-scale producers. Based on feedback from those who implemented the survey, the instrument was revised to include content in both Arabic and English languages.

Reliability

The instrument reliability co-efficient indicators for this study are represented in Table 1. Garson (2010) indicated an endpoint of .60 is not uncommon for exploratory research. All reported Cronbach's alpha co-efficents exceeded the .90 benchmark for meaningful internal consistency and accuracy. Research conducted by Brown (2002), George and Mallery (2003), and Gliem and Gliem (2003) indicated scores greater than .90 identifies excellent internal consistency and reliability.

Table 1

Reliability Coefficients for Constructs

Construct	α
Pre-Post Survey	.959
Business Development	.934
Horticulture	.934
Livestock	.932

Data Collection

Data were collected from 556 respondents of the 1000 sampled during the months of November and December 2010. A response rate of 56 percent was achieved. However, 39 surveys were not complete and eliminated from the study. Five hundred seventeen of those sampled answered the reflective analysis instrument completely; moreover, only those that received specific training in horticulture (n = 249), livestock (n = 148), and business management (n = 205) answered the individual training questionnaires pertaining to the related subjects. Additional data collection consisted of qualitative data (focus group interviews) used to triangulate the quantitative data. Three focus group (3 – 7 people in each group) interviews were conducted with village elders where *Inma* had a prior concentrated effort of work. These elders were nonelected officials who represented the communities/villages.

Data Analysis

Microsoft Excel was used to analyze the descriptive data, allowing researchers to compare pre- and post-*Inma* data results. Descriptive statistics were utilized to determine the percentage of recipients regarding the outcomes and impact indicators desired by USAID. The results from the focus groups interviews (discussions with elders) were categorized into themes and included in the research. According to Stake (1995), using data gathered from multiple sources constitutes triangulation; it increases the truthfulness of the findings.

Findings

Base-line (Reflective Analysis) Data

USAID-*Inma* assistance was beneficial for recipients; it increased incomes. According to the data about 52% of yearly incomes increased from 5,000 USD or below to 5,000-7,000 USD, while 20% indicated their incomes increased to above 10,000 USD after assistance from USAID-*Inma* (see Figure 1). It was also evident participants were using business plans; 60% of those sampled indicated the use of a formal business plan upon receiving assistance from USAID-*Inma*, whereas prior

to assistance, 70% reported not utilizing a business plan.

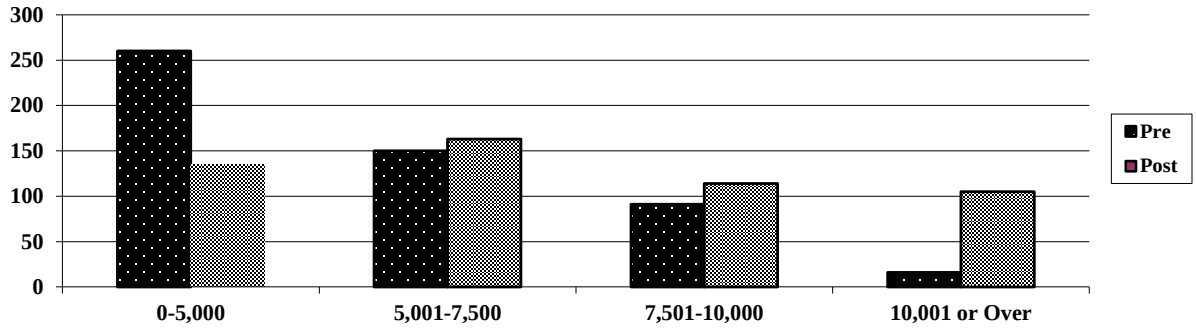

Figure 1. Family income before and after Inma assistance.

Data derived from the study indicated support from USAID-*Inma* assisted recipients in forming stronger ties to both input and output market linkages. Sixty-three percent of those sampled indicated stronger linkages to both input and output markets. More recipients invested personal income in their operation after assistance from USAID-*Inma*. Data indicated 48% of respondents invested over 25,000 USD in their operations. As for skills needed to increase yields and profitability, 62% of those sampled indicated they now possessed the skills to increase both yields and profits.

Data also revealed positive changes in the number of employees per recipient; before USAID-*Inma* assistance, 65% indicated they employed between 0-5 employees, whereas after assistance, data indicated more farmers employed 6-10 employees. Moreover, there was a mild positive change in number of farmers who employed 11-15 people and 16 people or more, indicating more recipients increased their employee numbers upon receiving aid from the USAID-*Inma* program. Producers also employed approximately 50% of their staff in fulltime positions, as compared to before USAID-*Inma* assistance when less than 45% were employed fulltime. Before assistance, an overwhelming number (98%) of producers indicated a need for technical and business management assistance in operating their businesses.

To create a clearer picture of the number of people affected by the assistance, the *Inma* program sought to inquire about family. When asked how assistance from USAID-*Inma* benefited families, 28% of respondents indicated a stronger community image while 70% indicated an increase in family yearly income as a result of assistance. Data also revealed the average size household for respondents was 6-10 people and their children were enrolled in school. Before assistance from USAID-*Inma*, less than 20% of the respondents reported consuming any meat protein during the week, yet after receiving assistance, 82% reported consuming meat at least three times per week. When asked about the sustainability of their operations, over 50% of respondents suggested they perceived their businesses were sustainable for the next five years, while 45% indicated six years or more of sustainability.

The study also investigated the value of USAID-*Inma* programs in communities. Those sampled indicated they agreed or strongly agreed USAID-*Inma* aid was beneficial to their communities. Lastly, to

understand the progression of the program and the timeframe beneficiaries had the use of the new technologies, researchers postulated it would be useful to understand when the recipients received assistance. Data indicted a large portion of those sampled received assistance during the 2010 calendar year.

Livestock Training Data

Data derived from the study indicated the majority (95%) of the respondents who attended livestock trainings either agreed of strongly agreed the trainings were valuable, and applied the new technologies they were taught to their operation. The majority of those sampled also indicated the cultural identity of those providing the training had no impact on the training. Data indicated 90% of those sampled agreed or strongly agreed the production methods taught in class were useful for solving production problems. When asked, respondents indicated feeds and feeding methods were the most valuable, followed by animal health and production methods. Forty-six percent of respondents strongly agreed they worked fewer hours upon applying the new methods. Data also indicated 59% of those sampled strongly agreed their livestock grew faster and were healthier upon applying the new production practices. However, data also indicated approximately 7% of respondents were neutral and 2% disagreed that applying new technologies allowed their animals to grow faster and were healthier.

It was also clear the majority of respondents, 89%, either agreed or strongly agreed their incomes would increase by using new technologies, while 11% were either neutral or disagreed with the statement. Moreover, no respondents strongly disagreed. As for willingness to diffuse new information with others, 55% were willing while the remainder of respondents were not willing. Lastly, slightly more than half (52%) strongly agreed, 41% agreed, 5% were neutral, and 2% disagreed USAID-*Inma* technologies were helpful to their operations. Data also exposed the largest percentage of livestock trainings were conducted during the 2009 calendar year.

Horticulture Training Data

The Horticulture sector contained multiple aspects including irrigation, open field, and greenhouse production. For reporting purposes in this study these areas were combined. Data revealed 45% of the respondents agreed training was valuable, while 43% indicated they strongly agreed. Data also indicated 6% were neutral and 6% disagreed with the statement trainings were valuable to them.

Findings indicated 50% of respondents received or built tools/implements needed for production agriculture following USAID-*Inma* assistance and the remainder did not. As for applying new crop production methods, 51% of the respondents agreed, 35% strongly agreed, and 14% indicated they were neutral to applying the new methods taught in classes. The respondents were neutral regarding if the cultural identity of those providing their trainings was important. When asked the usefulness of new production methods, an astounding percentage (96%) indicated they agreed or strongly agreed the methods were useful, while 4% indicated neutral. Regarding the most important aspects of the horticulture training program, greenhouse trainees indicated business management, open-field recipients indicated crop production methods, and irrigation training recipients stated irrigation applications.

Data also indicated 85% of respondents perceived working fewer hours after applying new technologies, and

increased individual yields by applying new methods. Of those sampled, 85% also believed their incomes would increase while 15% indicated a neutral position through the application of new production methods. When asked about the willingness to diffuse the new technology, over half (78%) of respondents either agreed or strongly agreed. However, 13% did not plan to disseminate the information, while 8% remained neutral. Data also showed 90% of the sample indicated that USAID-*Inma* technologies and staff were very helpful during their growing season and the remainder of respondents was either neutral or disagreed. The majority of horticulture activities were conducted during the 2010 calendar year.

Business Development Training Data

Data from the sample indicated the majority (55%) of respondents hired more staff after receiving assistance from USAID-*Inma* and 40% plan to in the future. Of the participants in this group, 85% agreed or strongly agreed the training they received as valuable, 10% indicated neutral, and 5% disagreed. As for applying the new methods taught in class, 79% either agreed or strongly agreed they applied the methods they were taught in the training sessions, 15% remained neutral, 4% disagreed, and 2% strongly disagreed. The respondents agreed the nationality of trainers was not important and the majority of respondents also perceived the courses were useful for solving problems in their businesses. Of those sampled 40% perceived that understanding business administration was the most important aspect of the training courses, while 2% said financial, 10% sales, and 40% indicated other.

The majority of respondents (62%) indicated their businesses became more efficient through the application of new techniques, 34% were neutral, and 4% either disagreed or strongly disagreed. As for whether new management forms they received through the trainings made tracking sales and profits easier, 59% either agreed or strongly agreed, 35% indicated neutral and 6% either disagreed or strongly disagreed. Over three quarters of those queried (78%) either agreed or strongly agreed to share new technology with others, while 17% indicated neutral, and 5% either disagreed or strongly disagreed. Data indicated over half (57%) of respondents agreed and 25% strongly agreed USAID-*Inma* staff and technologies were helpful, while 12% indicated neutral, and 6% either disagreed or strongly disagreed. A strong majority (93%) of respondents indicated more business trainings were needed in the coming years.

Focus Group Interviews Data

Three focus group interviews were conducted in different villages (southern, central, and northern geographic areas) throughout Iraq; these locations represented areas where USAID-*Inma* concentrated aid programs with area farmers/businesses. Results from the Village Elders or *Kabir Al Kria* interviews (Indirect Beneficiaries) concluded farmers were increasing their yields, applying the new methods, diffusing new technologies, and spending more disposable income in the villages. During open discussion about perceived benefits for the villages, one focus group participant in the central Iraq stated "It's not about just finance; it is about the experience because knowledge and the new agricultural techniques represents the real value behind USAID-*Inma's* support." A common theme of the focus group interviews was the application of new technologies provided by USAID-*Inma* experts. Elders in all three locations perceived a continual need for these services and additional help in the areas of mechanized agriculture.

A continual theme expressed by the elders in southern Iraq was that they were

seeing positive indicators of the assistance received from USAID-*Inma*. Village elders stated "150 more people became employed in the community, including young people, who were not employed prior to *Inma* assistance." When asked about community plans, elders indicated they were planning for added capacity in their agriculture system, but foresaw other needs that must first be addressed. The elders from the northern group indicated a strong need for machinery rental agencies where farmers and villagers could rent the needed equipment and buy supplies in order to enhance their livelihoods while increasing the incomes of their communities. Elders from all three locations opined a brighter future for their communities and agriculture plays a very large role.

Conclusions and Recommendations

The USAID-*Inma* Agribusiness Program had a positive impact in Iraq. During the first three and half years, USAID-*Inma* programs helped farmers and businesses increase yields and incomes, and offered new methods for operating their livelihoods via business development, horticulture and livestock production training programs. The results of this study showcase the outcomes and impacts of the project. However, there were a small percentage of respondents who remained neutral or disagreed on the benefit of some activities implemented during that time period. A few of the respondents from the livestock sector indicated new technologies did not produce faster growing and healthier animals, while some of the horticulture recipients did not believe the trainings were valuable, and the business training recipients indicated less willingness to adopt and share new technologies.

Overall, the USAID-*Inma* program assistance was beneficial for recipients to increase incomes; larger numbers of those respondents surveyed increased their yearly incomes from less than 5,000 USD to 5,000 - 7,000 USD per year, while some expressed that they increased their incomes beyond 10,000 USD per year. More business owners and farmers were beginning to use and understand the value of formal business plans. Over 55% of the respondents indicated they now use formal plans in their operations, whereas before assistance less than half used them. Stronger ties to markets were evident; both data sources revealed producers now have stronger connections to input and output markets. Of those sampled, 63% indicated stronger linkages to both input and output markets.

The majority of farmers in the study indicated they shared or are willing to share new technologies with others. This finding is supported by research conducted by Miller and Cox (2006), who found farmers created positive interaction with other producers and gain satisfaction by sharing new technologies and experiences. Rogers (2003) indicated potential adopters ask for guidance from early adopters, as they are the catalyst for adoption. However, in the three areas of assistance (livestock, horticulture and business), livestock respondents were less willing to diffuse new technologies to others; only 55% of the respondents indicated they have or are willing.

The value of the USAID-*Inma* program was evident through the investment farmers and businesses made using their own money, 48% indicated they invested over 25,000 USD which is a substantial amount in rural Iraq. An overwhelming majority, 62% of those sampled, indicated they now had the skills needed to increase their yields and profits. This was supported by the USAID-*Inma* Work Plan (2010a) which suggested more farmers agreed that after attending trainings, they acquired the knowledge to increase yields and incomes. Farmers in the livestock sector also

concurred with the statement, leading the researchers to deduce programs actually taught by USAID-*Inma* experts likely were a benefit to the end user. Erbaugh et al. (2010) found proper teaching methods increase use of technology.

Both businesses and farmers employed more people after receiving assistance, assuring USAID-*Inma* has reached at least one of the outcome targets, which was to increase employment opportunities for Iraqis. Before USAID-*Inma* assistance, 65% indicated they employed between 0-5 employees, however after assistance, a majority indicated they employed six or more people. This finding was supported by qualitative data. One group of village elders indicated 150 people are now employed in their village who were not employed before *Inma* assistance. More recipients increased their employee numbers after receiving aid from the USAID-*Inma* program. Moreover, recipients of aid requested additional training. Almost all (98%) of respondents indicated they favor continued technical and business management assistance in operating their businesses. Beneficiaries of USAID-*Inma* aid agreed or strongly agreed the training they received was valuable to them. A surprising result of this study reflected how assistance benefited their families; 28% indicated their community image increased while 70% indicated an increase in income as a result of assistance.

Data suggested the average size family ranged from 6 to 10 people, increasing the multiplier effect of the *Inma* program. However, increase in income did not result in recipients sending their children to school. Ninety-five percent of the respondents' children were already enrolled in school. A startling finding of this study dealt with meat protein consumption. Before assistance from USAID-*Inma*, less than 20% of respondents consumed any meat during the week, yet after receiving assistance 82% consumed meat at least three times per week. According to research by FAO (1992), meat consumption increases as incomes rise. As families' disposable incomes increase their eating patterns change (USDA 2008). This could have indicated that USAID-*Inma* programs created not only outcomes but impact in Iraq. This is an indirect positive indicator of change. Farmers also perceived their operations were sustainable; over 50% suggested their businesses were sustainable for the next five years, while 45% indicated six years or more of sustainability. Again, the authors point out not all recipients indicated they benefited from all *Inma* technical assistance activities.

The study also investigated the value of USAID-*Inma* programs on the communities. Of those sampled the majority indicated they agreed or strongly agreed that USAID-*Inma* aid was beneficial to their communities. Those findings were supported by qualitative data derived during the focus group discussions with Village Elders. Community elders overwhelmingly stated that USAID-*Inma* assistance was having a positive impact on their communities. According to Fuhrman and Rohs (2011), focus groups are a viable way to collect qualitative data about people's opinions and perceptions on a variety of topics.

Lastly, to understand the progression of the program researchers postulated it would be a benefit to understand when recipients receive assistance. Livestock sector beneficiaries received the majority of assistance from USAID-*Inma* during the 2009 calendar year, while business development and horticulture were provided more assistance in 2010. During the first two years of the project (2007 & 2008), limited activities were implemented because of the increased violence during the U.S. military

push to stop the insurgents. It leads the researchers to speculate, had the beneficiaries received assistance earlier in the project, would the researchers have found even greater adoption of technology or technology abandonment?

Implications

Research indicated agricultural development programs that combine aid inputs (seed/feed/equipment etc.) and technical training for producers may lead to positive outcomes and possibility of a greater potential for sustainable impacts. Many farmers in developing countries cannot afford or implement many of the new technologies available, yet, may adopt them if they are taught how the technologies work and the possible benefits. The researchers suggest a follow up assessment of Iraqi agriculture be implemented in three to five years to measure the long-term benefits of the new technologies. According to Kock, Lamm, and Turnbull (2012), when development projects conclude the long-term success becomes the responsibility of the beneficiaries. Only time will tell if the transfer of technology throughout the agricultural sector in Iraq will benefit future generations, the next generation of farmers are still in school.

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Rice Sufficiency Officers' Role Perception and Job Satisfaction as Agricultural Research and Extension Workers

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Abstract

The study determined how the Rice Sufficiency Officers (RSOs) perceived their role and their level of job satisfaction when working as agents of PhilRice to promote and deliver rice technologies as a strategy to attain rice self-sufficiency for the country. Data for the study were collected using online survey to which 77 RSOs responded. Results of the study showed the RSOs perceived their role as very important, particularly the extension tasks they fulfilled. Their level of job satisfaction was very high, especially with their working relationships with supervisors and the farmers. However, their status of employment caused some degree of dissatisfaction. Results shed light on issues concerning development programs of the institute.

Keywords: Job Satisfaction, Role Perception, Rice, RSO, Likert Scale

Introduction

The Philippine Rice Masterplan for 2009-2013 was crafted to tackle the challenge of attaining rice self-sufficiency for the country by 2013 (Miranda, 2010). To beat the challenge, the government needed to increase the national yield level by 14 cavans per hectare. One of the strategies of the Rice Masterplan to achieve better yield is to improve the country's technology promotion and delivery system so that more farmers will use improved rice technologies. Thus, the Philippine Rice Research Institute (PhilRice), of the government devised a novel system – the deployment of Rice Sufficiency Officers (RSOs) in strategic production areas.

The RSOs were young, agriculture graduates who completed the 4-month Rice Specialists' Training Course to master the package of proven rice technologies and practices. The deployed RSOs were to perform three major roles based on their Terms of Reference (TOR): research, technology promotion, and forging partnerships. The development of location-specific technologies based on major technology platforms was their research role that constituted 50% of their total workload. This research role distinguished RSOs from the Agricultural Extension Workers (AEWs) that the Philippine government had long employed. The AEWs are purely providers of general agricultural extension services to farm individuals who live and work in villages (Tenorio & Aganon, 2006). The technology promotion role (20% of workload) of the RSOs consisted of conducting farmer field schools, providing technical assistance to extension workers in response to rice farmers' problems, promoting the Open Academy for Philippine Agriculture (OpAPA) services, and pushing the use of yield-enhancing and cost-effective technologies. In forging partnerships (15% of workload), they helped develop provincial or municipal agricultural plans by recommending appropriate programs and strategies, and represented PhilRice in meetings and workshops related to its major rice programs within their area of responsibility. The rest of their workload was minor activities (15%). To enable them to work better, most of the RSOs were provided with laptops, cellular phones, and motorcycles.

From 2008 to 2011, more than 200 RSOs had been deployed in various areas of the country. They were like soldiers sent to the battlefield to win the fight for rice self-sufficiency right in the farmers' fields (Frediles, 2010). PhilRice estimates the cost of training per RSO from USD 4,761.90 (PhP 200,000) to as high as USD 23,809.52 (PhP 1,000,000) (Tanchuling, 2011).

Considering the critical role the RSOs played in achieving the rice self-sufficiency goal, it is important to determine how they perceived their role and their level of job satisfaction as these most likely affected their work performance. After several years and now that the deployment has ended, how did the RSOs see their role as new agents of change in the rice communities? How important did they view the role they played in achieving rice self-sufficiency? How satisfied were they with the support, training, and work that were given to them? The answers to these questions will enhance ways on how to manage and address issues concerning similar research and extension programs.

Purpose and Objectives

The objectives of the study were to determine: (a) the RSOs' perception of their role, and (b) their level of job satisfaction as agricultural research and extension workers.

Methods

Of the 229 RSOs who were emailed and contacted through text messages several

times, 77 (34%) responded and they served as the samples of the study. A pre-tested e-questionnaire was used for data gathering, which had four major parts: socio-economic characteristics of the RSOs, scope of assignment of the RSOs, role perception, and job satisfaction. Using Likert scales, the respondents rated the items of two major topics, namely the importance of their various roles as an RSO in achieving rice self-sufficiency (Role Perception Index or RPI) and their level of job satisfaction (Job Satisfaction Index or JSI). The RPI items were based on the RSOs' TOR and adapted from the index developed by Ibrahim et al. (2008). The RPI used a 3-point Likert scale where 3 was considered *very important* (VI), 2 as *slightly important* (SI), and 1 for *not important* (NI). The JSI was composed of 27 items and were measured based on a 5-point Likert scale. A score of 5 indicated *very satisfied* (VS), 4 for *satisfied* (S), 3 for *neutral* (N), 2 for *dissatisfied* (D) and 1 for *very dissatisfied* (VD). The JSI was divided into five categories, namely: general working conditions, pay and promotional potential, work activities, work relationships, and use of skills and abilities. The categories were based on the job satisfaction questionnaire developed by Salisbury University (2012). Reliability analysis was performed for the two indexes to check for internal consistency of the items. The RPI had a Cronbach's Alpha of 0.951; and the JSI had 0.905.

For both indexes, a total score for each role/item was derived by summing the Likert-scores given by the respondents. The mean scores for each RSO role and for each job satisfaction item were calculated by dividing the total scores by the number of respondents. The total mean score for job satisfaction was determined by dividing the sum of the mean scores of all job satisfaction items by the number of items.

Three focus group discussions (FGD) were done with randomly selected RSOs after processing the survey results. Each FGD had 5 to 12 participants who were chosen based on draw lots.The FGD clarified and gave more details on the responses of the respondents.

The data were processed and analyzed using ranking, frequency, mean scores, graphs, and comparison of similarities and differences The FGD data were analyzed by grouping them in themes.

Results

Socio-economic Characteristics of the RSOs

As shown in Table 1, more than half (58%) of the RSOs were female (58%) and were less than 27 years old (56%). They were young and fresh out of college, hence were expected to be very active and highly motivated. This was an element of the extension strategy to neutralize the apprehension that most government extension personnel were almost in their retirement age. All of the RSO-respondents were college graduates, mostly in agriculture. The majority of them were single (82%).

The majority of respondents (86%) confided they received a traveling allowance (86%) and Internet/prepaid cellphone load (79%) as part of their RSO benefits. A few of them availed themselves of the offered laptop (22%) and motorcycle (10%) loans. These benefits were deducted from the USD119 (PhP 5000) monthly allowance they received (on top of their regular salary). Though the RSOs were not required to have their own laptop, most of them needed it for report-writing and Internet purposes, especially those who were assigned in very rural places. They received their salary (73%) and benefits (49%) regularly. Less than a quarter (22%) of respondents were provided free lodging in their area of

assignment, hence the majority of them either rented a place or their family house was nearby. Most of the free accommodations were provided by the local government unit (LGU) or by a farmer-beneficiary.

Table 1

Socio-economic Characteristics of the RSOs (*N* = 77)

Characteristic	Category	*f*	%
Sex	Male	32	42
	Female	45	58
Age (year)[1,2]	Less than 27 years old	43	56
	27 years old and above	34	44
Civil Status	Single	63	82
	Married	14	18
Educational Attainment[3]	College Graduate	77	100
Benefits received/availed of by the RSOs*	Traveling allowance	66	86
	Internet/prepaid load allowance	61	79
	Laptop loan	17	22
	Motorcycle loan	8	10
	Other benefits	2	3
Received salary regularly		56	73
Received benefits regularly		38	49
Received free accommodation		17	22

Note. [1]*SD* = 3.46. [*]Multiple responses. [2]*M* = 27. [3]*M* = 14.

Scope of Work of the RSOs

Table 2 shows the RSOs were assigned an average of three sites per season, except during the 2010 dry season (DS). An RSO handled 25 farmers per site during the DS; 24 to 26 farmers per site during wet season (WS).

Table 2

Scope of work of the RSOs per season, WS and DS, 2009-2011

Scope of Work	2009		2010		2011	
	DS	WS	DS	WS	DS	WS
Average number of sites handled	3	3	4	3	3	3
Average number of farmers per site	25	26	25	26	25	24

Role perception of RSOs

Table 3 enumerates the 15 major roles of the RSOs as stipulated in their TOR. Based on survey results, nine roles had been rated very important by at least 90% of the RSO-respondents, of which two major extension roles had the highest mean scores. These roles were: “teaching and

demonstrating rice technologies to farmers" (*M* = 3.00) and "guiding farmers to adopt farm practices" (*M* = 2.97). Ranked third and fourth were research roles, namely: "setting up and developing location-specific technology" (*M* = 2.96) and "studying village situation as part of problem identification and site selection" (*M* = 2.95). Fifth and sixth in ranking were extension roles: "providing technical and problem-solving assistance" (*M* = 2.95) and "organizing farmers/trainings" (*M* = 2.93). Forging partnerships was ranked eighth with a mean score of 2.92. During the FGD, some respondents underscored that forging partnerships should be the most important as it will ensure the sustainability of the RSO system.

Other very important research as seen by the majority got lower mean scores: "gathering of data and keeping records" (*M* = 2.89); and "conducting FGDs and baseline survey" (*M* = 2.82).

The rest of the roles were characterized by majority of the respondents as very important too although many respondents cited these roles as only somewhat important: "submitting written reports to PhilRice" (13%); "organizing cross visits and farmers field day" (17%); "helping farmers to prepare a farm plan" (27%); "promoting OpAPA services" (34%); and "teaching or demonstrating rice technologies to other stakeholders" (40%). RSOs asserted preference should be accorded to farmers rather than other stakeholders.

Table 3

Role Perception of RSOs (*N*=77)

RSO Role	Response (%)				*M*
	VI (3)	SI (2)	NI (1)	NR	
Teaching or demonstrating rice technologies to farmers	99	*	*	1	3.00
Guiding farmers to adopt improved farm practices	96	3	*	1	2.97
Setting up and developing location-specific technology	95	4	*	1	2.96
Studying village situation	94	5	*	1	2.95
Providing technical and problem-solving assistance	94	5	*	1	2.95
Organizing farmers/trainings	94	4	1	1	2.93
Feedbacking farm/farmer problems to researchers	91	8	*	1	2.92
Forging partnerships with institutions and linking farmers with them	90	8	*	3	2.92
Gathering of data and keeping records (Ex. KeyCheck monitoring form, farm records)	90	8	1	1	2.89
Conducting FGD and baseline survey	81	18	*	1	2.82
Submitting written reports to PhilRice	83	13	3	1	2.82
Organizing cross visits and farmers' field days	77	17	1	5	2.79

Helping farmers to prepare farm plan	70	27	1	1	2.70
Promoting OpAPA services	62	34	1	3	2.63
Teaching or demonstrating rice technologies to other stakeholders	57	40	1	1	2.57

Note. VI = *very important as an RSO role,* SI = *somewhat important,* NI = *not important,* NR = *no response.* *Value is less than one.

Job Satisfaction of the RSOs

General working conditions of the RSOs.

Among the items under working conditions, RSOs were most satisfied with their "working hours", having a mean score of 4.25 (see Table 5). This might be so as they had flexible working hours, not using a daily time record. However, majority of the RSOs chose not to rate this as "very satisfactory" because, based on the FGDs, time of work adjusted to the farmers' availability. Thus, there were times they needed to be in the field before sunrise or even during weekends.

Table 5

Job Satisfaction on the General Working Conditions of the RSOs (*N* = 77)

General Working Conditions	Response (%)					*M*
	VS (5)	S (4)	N (3)	D (2)	VD (1)	
Working hours	38	51	10	1	-	4.25
Availability of local accommodation	21	45	25	8	1	3.77
Environmental condition in the area	18	48	26	6	1	3.75
Availability of technical help/assistance	18	47	17	12	5	3.62
Access to research findings	13	49	27	5	5	3.60
Availability of extension facilities	14	44	22	19	*	3.53
Continuity of the project-system	19	38	23	10	9	3.48
Availability of office supplies	16	43	19	14	6	3.47
Availability of operations' fund	8	34	36	14	8	3.19
Total Mean Score						3.62

Note. *VS*=Very Satisfied, *S*=Satisfied, *N*=Neutral, *DS*=Dissatisfied, *VD*=Very Dissatisfied. *Value is less than one.

With regard availability of local accommodation, almost half (45%) of the RSOs were satisfied and 21% were very satisfied. Again, this reflected the fact that most of them were not given free lodging in their area. Others mentioned during the FGD that it was not easy to find a place to live at because there were no rooms or houses to rent in the first place.

Availability of other resources (office supplies, technical help/assistance and administrative support from the branch stations/project, extension facilities, research findings, and operations' funds) was also considered "satisfactory" only by most of the RSOs. Some 17% to 36% of them rated these items as "neutral" and 5% to 19% maintained that they were dissatisfied. This result reflected the reality that once the RSOs were already in the field, they had to make do with what resources they had. During the FGD, some of them explained that in most cases they bought materials needed using their own money and reimbursement took some time. Some of these resources could have been provided by the local partners but they did not. "Environmental condition in the area" was only rated "satisfactory" (48%) by the respondents, and 26% even said they were "neutral." Though all the sites were considered safe by the system, the RSOs lamented during the FGD that some areas were very rural.

Not surprisingly, most of the respondents were only "satisfied" (38%) with the continuity of the system-project; 23% were "neutral" and 19% were "dissatisfied." This result attested to the fact that the system did not signal a stable future for the RSOs. By and large, results revealed the respondents were barely satisfied in terms of their general working conditions as the total mean score was only 3.62.

Pay and promotional potential of the RSOs.

Among the five categories under the JSI, the "pay and promotional potentials" category received the lowest mean score at 3.27 (see Table 6). This result is parallel with the study conducted by Agunga, Djomo and Na (1997), which indicated the job as a district extension officer may not be economically satisfying but generally attractive. Two items under this category also got the lowest mean scores: "opportunity to advance education/scholarship" (M = 2.78), and "status of employment" (M = 2.76).

In terms of salary, the survey showed that the RSOs were generally "satisfied" (57%), followed by "very satisfied" (31%). The basic monthly salary of an RSO ranged from USD 333.33 (PhP 14,000) to USD 404.76 (PhP 17,000). The amount varied as it was affected by the salary increases given by the government from 2009-2011. During the FGD, an RSO commented that the salary was okay for those who were not yet married. The majority (82%) of the respondents were single.

The rest of the items under the pay and promotional potentials category had a mean score of 3.47 or below. This result indicated the RSOs were basically "neutral" on the other items, specifically: "benefits," "upgrading," "opportunity to advance education/scholarship," and "status of employment."

In terms of "opportunity to advance education/scholarship", almost half (42%) of the respondents chose to be "neutral" and 32% were "dissatisfied." This may be due to the fact that the RSOs were service contractors and as such, their benefits did not include an educational scholarship. A few exemptions were allowed by the management. Two RSOs were sent for further studies, but it was not clear why this was done. This situation may have aggravated the perception of the RSOs.

Status of employment had the lowest mean score (M = 2.76) and almost one-third (29%) of the respondents were "neutral" about it. This was probably due to the sudden termination of the work contracts of the RSOs in January 2012. Those who rated the item as "satisfactory" (23%) were mostly those absorbed by PhilRice in its various projects.

Table 6

Job Satisfaction on the Pay and Promotional Potentials of the RSOs (*N* = 77)

Pay and Promotional Potentials	Response (%)					*M*
	VS (5)	S (4)	N (3)	D (2)	VD (1)	
Salary	31	57	8	4	-	4.16
Benefits (motorcycle/laptop allowance)	27	26	21	18	8	3.47
Upgrading (salary grade)	18	32	29	13	5	3.47
Status of employment	5	23	29	26	16	2.76
Opportunity to advance education/scholarship	4	17	42	19	13	2.78
Total Mean Score						3.27

Note. VS = *Very Satisfied,* S = *Satisfied,* N = *Neutral,* DS = *Dissatisfied,* VD = *Very Dissatisfied*.

Work activities of the RSOs.

Based on the mean score (*M* = 4.04), the respondents were satisfied with their work activities as an RSO (see Table 7). They were satisfied with "work independence" having the highest mean score of 4.32. This was probably because the RSOs had the autonomy to make decisions when they set up and conducted their FFS. The majority of the RSOs were also satisfied with their "research and development loads," "number of farmers and sites handled," and "involvement in other projects."

Table 7

Job Satisfaction on the Work Activities of the RSOs (*N* = 77)

Work Activities	Response (%)					*M*
	VS (5)	S (4)	N (3)	D (2)	VD (1)	
Work independence (i.e. decision making)	42	51	6	1	-	4.32
Number of farmers & sites handled	21	66	9	3	1	4.03
Research & development loads	23	58	16	1	1	4.01
Involvement in other projects	14	58	23	3	-	3.86
Total Mean Score						4.04

Note. VS = *Very Satisfied,* S = *Satisfied,* N = *Neutral,* DS = *Dissatisfied,* VD = *Very Dissatisfied*.

Work relationships of the RSOs.

All told, results revealed the RSOs were satisfied with their work relationships, with a mean score of 4.25 (see Table 8).

Working relationship with farmers got the highest mean score (4.51) under this category where 56% of the RSOs rated it as "very satisfied." The FGD revealed the

RSOs enjoyed working with rice farmers who listened to them, attended and participated in the FFS, and even considered the RSOs as "the answer" to their farm problems. The RSOs added that with the rice farmers, simple things were well-appreciated.

More than half (53%) of the respondents were "very satisfied" and 38% were "satisfied" with their working relationship with other RSOs. This positive assessment may be attributed to the good camaraderie that was established when the RSOs had their four to six months in-house training. A testament to this good relationship is even if their contracts had been terminated already, most of the RSOs kept in touch with each other.

The working relationship of the RSOs with other stakeholders (LGU, Agricultural Training Institute, Regional Field Unit, and others) (52%) and with their PhilRice supervisors (48%) were both rated as "satisfactory" by most of the respondents. Some13% of the respondents rated these items as "neutral," and 4% to 9% even gave them "dissatisfactory" ratings. When probed into during the FGD, some RSOs reported their local partners left them alone during project implementation or did not provide any form of assistance.

Table 8

Job Satisfaction on the Work Relationships of the RSOs (*N* = 77)

Work Relationships	Response (%)					*M*
	VS (5)	S (4)	N (3)	D (2)	VD (1)	
Working relationship with farmers	56	40	3	1	-	4.51
Working relationship with co-RSOs	53	38	9	-	-	4.44
Working relationship with other stakeholders	31	52	13	3	1	4.09
Working relationship with supervisors at PhilRice	30	48	13	8	1	3.97
Total Mean Score						4.25

Note. VS = *Very Satisfied,* S = *Satisfied,* N = *Neutral,* DS = *Dissatisfied,* VD = *Very Dissatisfied*.

Use of skills and abilities of the RSOs

Table 9 presents five items on the use of various skills and abilities of the RSOs. In general, the respondents gave this category a satisfied rating with a mean score of 4.22. Two items were considered by more than half of them as "satisfactory," namely "opportunity to utilize skills and talents" (53%) and "in-service training, technical briefing, technology demonstration" (55%). Two other items had almost equal ratings of "very satisfactory" and "satisfactory," namely "involvement in decision-making/solving field problems," and "opportunity to learn new skills." "Mentoring (of supervisors)" was generally perceived as satisfactory (43%) but almost a quarter (21%) considered it "neutral," and a handful (8%) rated it "dissatisfactory," which may be explained by the minimum supervision given to the RSOs when they were setting up projects in farmers' fields.

Table 9

Job Satisfaction on the Use of Skills and Abilities of the RSOs (*N* = 77)

Use of Skills and Abilities	Response (%)					*M*
	VS (5)	S (4)	N (3)	D (2)	VD (1)	
Involvement in decision-making/solving field problems	43	48	6	-	-	4.37
Opportunity to utilize skills and talents	40	53	6	-	-	4.34
Opportunity to learn new skills	44	47	6	1	1	4.31
In-service training, technical briefing, technology demonstration	38	55	6	1	-	4.29
Mentoring (of supervisor/s)	29	43	21	8	-	3.92
Total Mean Score						4.22

Note. VS = *Very Satisfied,* S = *Satisfied,* N = *Neutral,* DS = *Dissatisfied,* VD = *Very Dissatisfied.*

In summary, Tables 5-9 illustrate that only one of the 27 items was rated "very satisfactory," and 19 items were seen as "satisfactory." For all 27 items, there was no mean score lower than 2.76. Based on the total mean score, Figure 1 shows the RSOs were satisfied with their work relationships (*M* = 4.25), use of skills and abilities (*M* = 4.22) and work activities (*M* = 4.04). On the other hand, respondents were neutral on their pay and promotional potentials (*M* = 3.27).

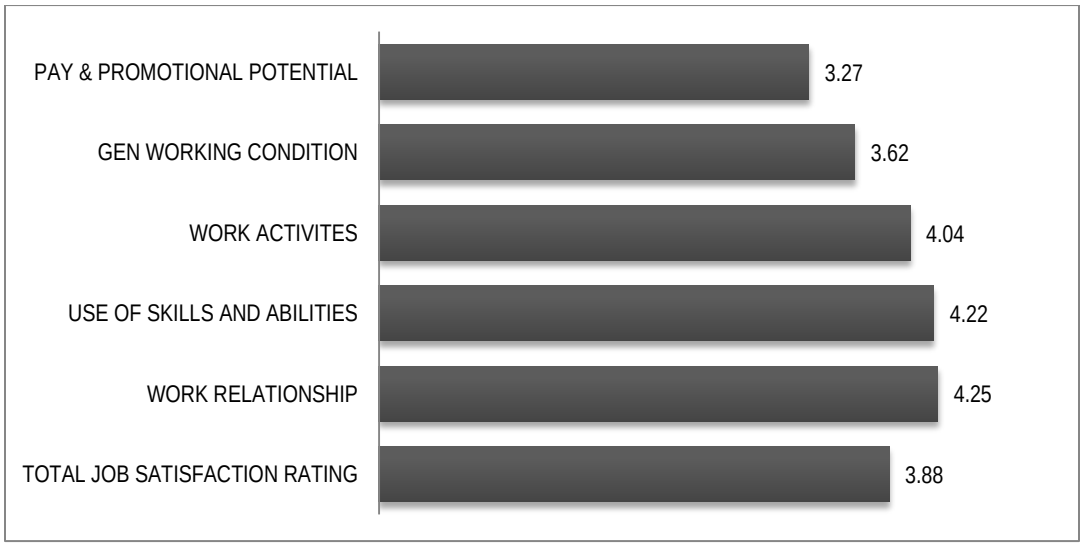

Figure 1. RSOs' total job satisfaction mean score, by category.

Conclusion and Recommendations

The RSOs were collectively young, single, and fresh out of college, with slightly more females than males. These basic demographic characteristics, except for the sex, made the RSOs almost the exact opposite of the current AEWs in the Philippine government. These characteristics of the RSOs were advantageous to the system as they were highly motivated and active regardless of the scope of their work (area and number of farmers handled).

The RSOs by and large perceived their work as very important in achieving rice self-sufficiency. Extension roles were given more importance than their research and forging partnerships roles. This is despite the fact that the RSOs' TOR clearly showed their research role had more weight. This suggests the RSOs considered themselves more as extension agents rather than researchers. It is recommended then that in similar research and development programs, a thorough discussion of the roles of personnel be done to avoid role confusion. It is also suggested capacity enhancement be more focused on the major role of the trainees to hone their needed skills for the expected work.

The major sources of job satisfaction for the RSOs were their working relationships, particularly with the farmers and their co-RSOs. This suggests the RSOs were relatively satisfied with the engagement they had established with their farmers – even if they were handling as many as 50 farmers per site. This also somehow reflected that the farmers appreciated the accessibility of the RSOs, and their youthfulness did not erode their credibility. The months of in-house training proved to be crucial in the development of camaraderie and team spirit among the RSOs. Though this was not deliberately part of the strategy, that such good relationships with their co-RSOs led to high job satisfaction is consistent with the literature (Scott, Swortzel, & Taylor, 2005). On the other hand, pay and promotional potentials were given the lowest marks, specifically status of employment and opportunity to advance education/scholarship. This tells us that it was not clear to the RSOs that their being under a contractual basis of employment limited their benefits. Regrettably, the scholarship opportunities granted to two RSOs could have added to the confusion of the possible benefits of the RSO job. It is recommended then that these two factors be assimilated in similar programs to achieve high job satisfaction, and possibly mitigate personnel turn-over and inspire loyalty.

With regards to forging partnerships, the survey and FGD results showed not all local partners lived up to the tasks expected of them. The partners, even PhilRice, failed at times to give the necessary support needed by the RSOs. This created disappointment and frustration among the RSOs. It is recommended then that a memorandum of agreement is made, clearly stating the roles of each stakeholder, when partnerships are expected to contribute to the success of similar projects.

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