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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.

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A Feature Article should 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. Conceptual/Theoretical and Methodological manuscripts are also encouraged as submission for feature articles. If applicable, a feature article should report the findings from a fully investigated study. Feature articles are *no longer than 20 double-spaced pages, excluding references.*

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A Research Note is a concise but complete description of a limited investigation that will not be included in a later manuscript. It serves one of the following purposes: (1) presents initial proof-of-concept results on new ideas or program evaluations, timely issues, or innovative approaches; (2) reports replications or extensions of previously published research that does not merit another full-length manuscript yet provides results that contribute to a greater understanding of the phenomena under study. Research Notes are *no longer than 10 double-spaced pages, excluding references.*
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From the Executive Editor

As we once again come upon the holidays, for many of us the focus is on the hustle and bustle of the season. Within academe, there is a different type of “hustle and bustle.” As instructors, we are trying to finish up final grading for courses, graduate seniors and Masters’ students, and tie up all of the loose ends of the semester. For those of us out in the field, “hustle and bustle” may translate into finishing up final programs before taking a much-needed break or taking upon new service projects to help those in need during this special time. Whatever this hectic time translates into for you, I think that it could still be said time moves differently within this season of celebration.

While doing a little online shopping on the Internet the other day, I stumbled upon an insightful quote:

**Christmas gives us the opportunity to pause and reflect on the important things around us.**

- *David Cameron (former UK Prime Minister)*

Sometimes each of us are so busy with the activities of our respective professions, that we may not take the time to reflect on WHY we do what we do. Education has been proven over and over to be a catalyst for change – to improve and progress society – to make the quality of life better for communities around the world. At its inception, education was a way of translating traditions, culture and life skills to the next generation; while it still serves this purpose, today education is also used as a process to empower a disadvantaged population – to move individuals out of poverty – or to encourage people into a new stage in life. What we often forget in all of the “hustle and bustle” of everyday life is that, for each of us, there are those few to whom we make THAT difference. Their life is changed because they interacted with us. And the difference we make to those individuals is something we shouldn’t take lightly. It’s one that most people don’t get to experience while working in their everyday lives.
For many of you, this time of the year will allow for more time to do things you deem fun – to spend time with family and friends, to continue working on a hobby, or perhaps doing a little light reading. Why not use some of this time to read the current JIAEE issue? Contained in the December 2018 issue of JIAEE you will find a wide variety of topics. Entrepreneurial Education (EE) makes its JIAEE debut in this issue, with an interesting discussion on the impact it is currently making and how to improve future applications. There are a couple of articles with a more traditional student focus – salient components that make up a Global Food Security Graduate certificate at Texas Tech University, as well as what student competency looks like from a Haitian faculty perspective.

Considering things from a more administrative perspective, there is an article that explores personal-dimension variables that may help explain why faculty lead study aboard experiences, and a study that looks at where the future of international programming needs to grow to address student needs. In all of these examples, effective research has been done to give us insight “behind the scenes” which then allows for better curricula and program development.

There are also several articles focused on education through the eyes of those in the field – the significance of extension agent knowledge regarding professionalization in South West Nigeria, extension through the eyes of agents in Rural Pakistan and the implications behind innovation characteristics when introducing water and input saving technology into the Jordan Valley. Within each of these articles, you get a good reading on what is currently happening in the field, and the importance of continuing to push ourselves to offer the most innovative and thorough community education we can.

As I have expressed previously, the importance of education around the world cannot be overstated – no matter who your audience is. During this busy time of the year, take a little time to pat both yourself and other educators on the back. The work that we all do is so important; especially when focusing on the impact that is made in society. We should all be honored to play an essential role in this very important field.

Warm Regards & Happy Holidays,

Kristina D. Hains

Kristina D. Hains
Executive Editor, JIAEE
Entrepreneurial Education in Middle-Level Tertiary Colleges in the Rift Valley of Kenya

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Abstract
This study adds to the knowledge base of Entrepreneurial Education (EE) in selected technical training institutes in Kenya. Using qualitative research inquiry, semi-structured interviews were conducted with a question guidebook and follow-up questioning. Data were collected from students, instructors, and administrators selected through purposive sampling. Open and axial coding was used to categorize the transcribed interview responses. Peer review was used to ensure credibility and confirmability. The results reveals that the learning institutions prepared students as entrepreneurs through coursework, mandatory field internships, internal projects, participation in agricultural and business fairs, and providing startup capital for cooperative shops. EE delivery faces numerous constraints including inadequate start-up capital, inadequate access to land, and output and input market resulting from poor infrastructure, competition, lack of marketing skills, and exam-oriented curricula. Dairy, horticulture, poultry, and apiculture enterprises were identified as the most promising and viable enterprises for graduates of middle-level tertiary institutions. In conclusion, EE was being offered in these institutions as certificate courses or integrated as a topic in their existing curricula. In order to improve upon the delivery of the programs, the institutions needed to upgrade learning facilities, incorporating ICT in the curricula, enhance practical learning, conduct rigorous follow-up evaluations of graduates, and establish business incubators for providing start-up capital to graduates.

Keywords: Africa, entrepreneurship education, planning and evaluation, curriculum models
Introduction
Entrepreneurship Education (EE) arose as a response to failures of school-to-work and Technical and Vocational Education and Training (TVET) programs in securing employment for those who graduate (DeJaeghere & Baxter, 2014). Recently, there has been a rapid growth in EE among tertiary education institutions around the world (Kuratko, 2005). This growth arises from the fact that entrepreneurs are catalysts to the attainment of economic and social development goals (Valerio, Parton, & Robb, 2014). According to the American Council on Education (2015), EE has enhanced growth in small and medium business enterprises, particularly in developing countries. This growth is partly associated with EE growth in middle-level tertiary institutions (Omidyar Network, 2014) which is a catalyst for the enhancement of entrepreneurial innovations (World Bank, 2010).

Mwangi (2012) argued that EE encourages higher learning institutions to think outside old-fashioned pedagogical methods and classroom teaching. The scope of EE has been expanded to cover varied audiences, goals, topics, and pedagogical methods (Fayolle, Gailly & Lassas-Clerc, 2006). Most EE institutions have introduced development of a business plan and compulsory work internship to provide learners with practical entrepreneurial skills (Mwangi, 2012). Although a variety of higher learning institutions prepare entrepreneurs in Sub-Saharan Africa (Baker, 2015), EE programs have many challenges. These challenges include shortage of highly-qualified staff, un-incentivized faculty, inadequate faculty development, inadequate levels of instructional resources (Baker, Bassey, Jimoh, & Akande, 2015; HRDC, 2013), inadequate curricula (Simpeh, 2011; HRDC, 2014). Other challenges include low levels of understanding and interest by existing students (Nteere, Namusonge, & Mukulu, 2012), limited experiences for practical learning (Arogundade, 2011; HRDC, 2014), limited levels of support from the business sector (HRDC, 2013), a non-existent evaluation system for tracking graduates’ progress (HRDC, 2013; Gichana, 2011), and lack of flexibility in the current overly-subscribed curricula (Katz, 2007).

In addition, there is a paucity of government-supported incubation programs and private-sector support programs in developing countries (Omidyar Network, 2014). Empirical studies have suggested a vast array of methods for delivering EE which include lectures, team teaching, group assignments, field tours, business plan development, case studies, problem-based learning, use of role models/success stories, attachments, internships, consulting assignments, actual running of a small business, and research projects (Jones & English, 2004; Frederick, 2007; Gatchalian, 2010; Mansor & Othman, 2011). In order to tackle these challenges, Arogundade (2011) suggested improvement of the basic education from which EE stems, development of public awareness on the need for vocational EE, and private-public sector partnerships. Gewer (2013) recommended inclusion of pedagogical experiential approaches. Baker (2015) suggested immersion of short-term experiences and distance learning technologies for training and retraining college faculty.

Formal EE in Kenya began in the early 1990’s (Bwisa, 2011), with Kenya being among the first African countries to introduce components of EE into its education curricula (Simiyu, 2010). Partnership programs such as the Kenya Youth Business Trust, Women’s Fund, and Youth Enterprise Development Fund (Gichana, 2011) have played crucial roles in
encouraging young people to acquire entrepreneurial skills by taking advantage of government financial support and entrepreneurship training (GoK, 2011; Omidyar Network, 2014). Kenya has witnessed an increase in EE programs not only in middle-level colleges but also in other institutions of higher education. Notably, numerous management-oriented training programs such as accounting, marketing and finance do not necessarily constitute EE programs. The skills and knowledge domains of small business management (SBM) can be quite different from knowledge domains and skills needed for entrepreneurs (Bawuah, Buame, & Hinson, 2006). Klatt, (1988) makes a distinction between the two by stating that EE programs are those that focuses on innovations and business startup whereas SBM education entails the actual operation of a business after it has been initiated. According to Haan (2006), EE programs develop attitudes suitable to starting a business and provide practical skills for managing it. Limited research has been conducted that documents how EE programs are delivered in middle-level tertiary colleges, bottlenecks in their execution, and a plan of action, all of which are addressed in this study.

**Theoretical Framework**

This study is grounded on cultural entrepreneurship theory that argues that propensity for an individual to start a business venture is largely influenced by the prevailing culture (Simpeh, 2011; Gichana, 2011). Herrington, Kew and Kew (2010) contend that entrepreneurship can reveal the latent potential of the South African economy. Entrepreneurship roles can be culturally and experientially acquired. Regional entrepreneurship is enhanced by training and education interventions so that there is a growing acceptance that components of entrepreneurship can be delivered and learned. The entrepreneurial culture is key to motivating young people to take up business-related programs in middle-level tertiary colleges (Herrington et al., 2010) and primarily consists of training through hands-on skills (Simpeh, 2011). Cultural practices lead to entrepreneurial attitudes such as innovations that also lead to venture creation behavior (Gichana, 2011). In general, the characteristics of an entrepreneurial culture include innovation, foresightedness and persistence, among others.

What’s more, EE is one of the best ways of promoting it (Afriyie & Boohene, 2014). Ngosiane (2010), demonstrated that EE can promote entrepreneurial culture by encouraging students to form clubs in their education institutions. In order to achieve the economic and other benefits associated with entrepreneurship development, a myriad of training programs in Kenya must integrate self-employment and entrepreneurship into the curricula at all levels of education (Gichana, 2011). Empirical studies have demonstrated that entrepreneurship knowledge, skills, and practices can be learned through formal EE programming (Kuratko, 2005). Entrepreneurial Education programs must promote certain attitudes towards taking risks. Thus, there is a need to have a clearer understanding of EE programs in middle-level tertiary institutions in developing countries.

**Purpose & Objectives**

This study was intended to gather information on the status of middle-level tertiary EE programs in the Rift Valley of Kenya. The study objectives were to:

1. Determine existing preparation of students for entrepreneurship;
2. Ascertain constraints facing implementation of EE programs;
3. Identify promising enterprises for graduates, and
4. Disclose strategies for improvement.

Methods
The study focused on agricultural middle-level tertiary colleges located in the Rift Valley of Kenya, namely Baraka Agriculture College (BAC), Eldoret Polytechnic (EP), Sangalo Institute of Science and Technology (SIST), and the Rift Valley Institute of Science and Technology (RVIST) training institutes. EP is located in Eldoret town and has an enrollment of 4,339 students at its home campus and branch campuses in Entebbe and Turkana North. RVIST is located in Nakuru and has a student enrollment of over 5,000 students on two campuses offering both full-time and part-time programs in a wide range of academic majors in its higher diploma, diploma, and certificate programs. SIST is located near Bungoma town and its enrollment is about 1,400 students. BAC is a faith-based middle-level tertiary institution affiliated with the Catholic Church that educates and trains farmers. Its enrollment is around 300 students and it offers short courses, certificate and diploma programs in agriculture. The study was conducted between November 9th and 14th in 2015.

The study employed a case study as a blue print for the collection and analysis of data. Ary, Jacobs, Razavieh, and Sorensen (2006) defines a case study as an in-depth study of a single unit, such as one individual, a group, one organization, one program and so on. Data were collected from twelve students, four instructors, and four administrators where three students, one administrator and an instructor were recruited from each of the four institutes. The selection of the institutes and participants for this study was through purposive sampling. Both certificate (those taking a one year program) and diploma students (those taking a three year program), administrators and instructors involved in teaching of EE courses were selected to attain a clear understanding of the programs. The student participants were class representatives (class leaders), instructors were agriculture teachers, and administrators comprised of either the principals or deputy principals. These were deemed to be the most appropriate group to provide insights that would facilitate the description of the status EE program in the institutes.

Creswell and Plano Clark (2011) posit that purposive sampling calls for a selection of individuals or groups who have knowledge about the phenomenon being studied. Three authors were involved in data collection and the research was conducted in English, a language spoken by both researchers and participants. Data were collected by use of semi-structured interviews using a guidebook of questions and follow-up questioning. The guide covered the meaning of entrepreneurship, students’ preparation for entrepreneurship, promising enterprises for graduates, program accreditation, teaching and mentoring, and associated constraints.

Semi-structured interviews were preferred to allow room for the researcher to explore the answer to one question and permit flexibility for the researcher to ask other questions which are not necessarily in the interview guidebook (Goodall, 2008). During interviews, discussions were audio recorded and notes were taken. The recordings were transcribed and notes were compared with transcriptions. The research team used open and axial coding to categorize the transcribed interview responses. Research rigor was achieved through credibility, transferability, dependability and confirmability (Creswell, 1998). The context, methods and procedures are well described, logical and clearly
documented to ensure that the findings were dependable and transferable (Tobin & Begley, 2004). Three levels of participants were involved; students, administrators and instructors to ensure data triangulation. Observations were made by the researchers in the processes of data gathering to gain an understanding of variables under study. Coding, analysis and interpretation of the data involved three researchers to ensure investigator triangulation. Peer review, field notes and brochures describing the courses offered at the institutes were used to achieve credibility and confirmability while study context ensured transferability (Tobin & Begley, 2004). The data were clustered and categorized based on the concepts and themes that emerged.

Results

Twenty participants were interviewed including four administrators and four instructors. Among the participants, 14 were male while six were female. Five key themes emerged and were coded as follows: (1) students’ knowledge of entrepreneurship; (2) students’ preparation for entrepreneurship; (3) constraints facing entrepreneurship education; (4) promising enterprises for graduates; and (5) strategies for improvement.

Students’ Knowledge of Entrepreneurship

In an effort to assess the students’ knowledge of entrepreneurship, the participants were asked to give the meaning of the term entrepreneurship. Most of the students had knowledge of the concept. For instance, a student from RVIST defined it as “the process of scanning the environment to identify of entrepreneurial opportunities.” Another student from SIST stated that entrepreneurship is “the act of scanning the business environment i.e. looking for the opportunities around you, gathering the resources, start a business idea/innovation that can help you earn a living.” Implicit in these definitions is the identification of an idea and putting it into an action which all of the formal definitions of entrepreneurship agree with. Their definitions captures three elements, identifying an idea, looking for resources and implementing the idea. Formal definitions consider entrepreneurship as the practice of coming up with new ways of combining resources (Sobel, 2008). Nafukho and Muyia (2010) believe EE is a catalyst for business startup, it educates students how to start and manage enterprises. These definitions emphasize the realization of individuals’ potentials and maximizing opportunities for business growth. Fayolle and Gailly (2008) argued that the varying definitions of entrepreneurship results from variations in pedagogical methods in EE.

When asked to distinguish small business from entrepreneurship, most of the students could distinguish the two. A student stated that “entrepreneurship is a practice that involves risk-taking in launching a new venture. While small business is a limited scale enterprise which involves a small capital to start.” A number of students noted that “small business is a form of entrepreneurship but entrepreneurship involves higher risk taking and innovation.” However, a few students had difficulties explaining the difference between the two concepts, some of whom argued the two are the same. The two terms are often confused and used interchangeably. While most entrepreneurial ventures begin as a small business, not all small businesses are entrepreneurship as pointed out by Julien (1997). The key difference between small business are entrepreneurial enterprises, as a small business is a limited-scale enterprise owned and operated by person or group of persons whereas an entrepreneurial enterprise is the practice of designing,
implementing and managing a new business, which begins as a small business.

**Students’ Preparation for Entrepreneurship**

The first objective sought to describe how students were prepared as entrepreneurs in these diploma-granting colleges. According to the majority of students, the institutions provided knowledge and skills to students through theoretical principles taught in class, exposing them to practical experiences such as forming business clubs and compulsory field attachment. A student at RVIST taking a certificate course said “I will take class work for one year followed by a three months industrial internship.” Another student stated “in addition to classwork and internship, we are allocated farming plots in groups to produce crops for sale.” Further, the diploma students pointed out that they were required to develop business plans in their third year of study. The students were motivated to develop business-oriented research projects. During the programs, students are mentored from inception to the end of their projects. Instructors and administrators noted that institutions had integrated EE in the curriculum, provided practical skills for students through field attachment and internal projects, exposed students to agricultural and business fairs, and provided startup capital for cooperative shops. This would help promote entrepreneurship culture among the students as promoted by Ngosiane (2010).

However, this was not the case in all instances. While emphasizing the importance of practical learning one of the instructors said that “the institutes have not succeeded in providing sufficient hands-on experiences due to our theory courses that do not require practical experiences and lack of adequate attention to the students’ business plans.” Research has shown that entrepreneurs learn at varied paces and differently from one another (Gatchalian, 2010). They require concrete pedagogical approaches which incorporates the deep learning of theory, process, and the practice of entrepreneurship (Frederick, 2007).

In an effort to expose students to practical experiences some institutions such as BAC encouraged students to form and run business clubs as argued by Ngosiane (2010). BAC students initiated small businesses such as salons, barbershops, and grocery stores, and students were required to keep and maintain business records that were used from time-to-time by the instructors in classroom teaching. BAC also provided seed capital in the form of soft loans and grants (on the needs-based system) to help its students start for-profit clubs as business centers. An instructor from BAC stated: “students operate different forms of business enterprises and are obliged to maintain business records. They divide their shares and dividends equitable upon completion of their course.”

Some colleges allocated plots (3.05 m by 3.05m) to the interested clubs on their institution’s farm to grow quick-maturing crops such as kale, cabbage, and fruit for sale. Although BAC was the smallest institution in terms student enrollment, it did the best job in training students for entrepreneurship. BAC used a learning-by-doing approach in which student participation was accentuated. The training allows the students to reflect on the course content in order to apply it in their student clubs. An argument advanced by an instructor in the institution who said “entrepreneurship in diploma is meant to give competencies to graduates necessary for planning, starting and managing a business. During training, we try to change the attitude of the students not necessarily to rely on employment but also venture into entrepreneurial activities.” These findings agree with Cope (2005) who indicated that
the only ways to learn to become an entrepreneur are through learning-by-doing and direct observation. All of the EE programs that were observed are accredited by the Ministry of Education. The instructors indicated that all the EE courses offered by the institutions were registered by the Kenya Curriculum Development Institute.

Constraints Facing Entrepreneurship Education

Objective two sought to determine constraints facing implementation of entrepreneurship programs in the colleges. Despite the fact that EE was integrated into the curriculum, its implementation faced a number of constraints. “Inaccessible credit” was a key problem facing EE graduates desiring to start-up or grow their businesses. A student at EP emphasized that “most graduates lack the startup capital and cannot access credit facilities due to lack of collateral, lack of government support.” Another student at RVIST noted that “credit facilities are expensive due to high-interest rates and credit was short-term in length which prohibited the purchase of capital equipment.” Among the challenges, startup capital was perceived as the major barrier that prevented the college graduates from venturing into agribusiness. These financial constraints were confirmed by administrators and instructors.

Some students felt that access to land was inadequate due to land fragmentation and unfavorable land policies. Access to markets emerged as a constraint due to poor infrastructure (e.g. road conditions), as well as a lack of marketing skills. A student at BAC stated that “there are no reliable markets for the produce and most produce is affected by their perishability.” Alila and Atieno (2006) suggested that the main marketing challenges in Kenya include high transportation costs resulting from poor roads, poor handling and storage of produce, and post-harvest losses.

The students also indicated that the EE curriculum was exam-oriented or taught in an expository nature where instructors focused primarily on students passing exams, at the expense of practical knowledge and skills that students needed to apply after the completion of the course. They reiterated that the instructors concentrated on the cognitive domain equipping them with theory delivered through examination–oriented instruction. A student at EP said that “a lot of what we learn is theoretical with minimal opportunities for practical activities.” Another student at RVIST mentioned that “they would have wanted to be supported to start enterprises such as piggery, poultry and aquaculture at the institution and allowed to run them on our own. This would help us to replicate them once we complete our course.” Karimi, Nyaga and Oudo (2014) argued that education systems that are exam-oriented are not successful in providing learners with the required skills and knowledge. Legas (2015) whose study focused on constraints to entrepreneurial success in Africa found that poor laws and regulations, corrupt practices, poor roads, inadequate capital, inadequate entrepreneurial training, and inadequate access to markets are the key causes of business failure.

The administrators and instructors further argued that infrastructure played a vital role in the graduates’ ability to begin a small business. They stated that the minimum infrastructure required for business start-ups were good roads, marketing structures, and an ample power supply of electricity. They pointed out that in some areas agricultural products were sold in open-air markets, which compromises the quality owing to the fact that most of the products are perishable. An
instructor at SIST stated that “module three of our program exposes our students to agro-processing and value addition which could somehow cure the problem of perishability. However, most of them cite lack of capital as an impediment to the utilization of knowledge gained.” Ekeledo and Bewayo (2009) argued that a poor road network, poorly maintained rail lines, inadequate electrical grid and poor water supply make small business operations difficult. Jayaratne et al. (2017) observed that entrepreneurship-focused exchange programs between lesser developed countries and developed nations help to establish a comprehensive strategy that addresses agricultural and rural development challenges facing Sub-Saharan Africa.

**Promising Enterprises for Graduates**

Objective three sought to identify promising enterprises for graduates of EE. Based upon their institution’s catchment areas, the participants were asked to identify four small business enterprises that hold the most promise for graduates as part-time supplements to their family income regardless of their academic major. Most of the students felt that it was easy to initiate and manage dairy (keeping livestock for milk production), horticulture (production of vegetables and fruits), poultry (rearing of chicken for either meat or eggs) and small Agrovet shops (shops that sell agricultural and veterinary products). A student at RVIST said that “I would love to start a poultry enterprise because the market for chicken meat and eggs is readily available.”

The majority of the administrators were in favor of grocery shops, apiculture, poultry, and horticulture. The instructors stated that the most viable enterprises that they would encourage graduates to venture into were dairy, crop, apiculture, and agroforestry. These enterprises, according to the instructors required less capital, though were limited to their graduate’s practical learning experiences in animal husbandry, crop science, apiculture, and/or agroforestry. An instructor at BAC mentioned that “At third year students are required to develop a business oriented project that they would like to venture on after graduation. During this process the students are advised on how to go about it from inception to the end of their projects.” Prevailing weather conditions were also identified by the instructors as a constraint, in that conditions in Turkana were very different than conditions in other parts of the Rift Valley. Overall, the participants agreed that dairy, horticulture, poultry, and apiculture were the most promising enterprises for graduates to start as part-time enterprises.

**Strategies for Improvement**

Objective four was to determine strategies for improvement of entrepreneurship education in the middle-level tertiary colleges. In order to curb the aforementioned challenges and better prepare the students for entrepreneurship, the administrators and instructors felt that the institutions needed to promote promising enterprises by supporting students in the formation of business clubs. Students could learn to run successful enterprises such as grocery stores, shops, and farming plots similar to the approach taken at BAC. A student at RVIST said “we would like to be engaged more on mentorship programs to learn the challenges and opportunities that exists in various enterprises.” They proposed the establishment of networks with local businesses within their catchment area to attach their students for internships upon completion of their coursework. These internships would create avenues for graduates to be mentored after graduation.

Further, the instructors suggested that the colleges should provide seed capital in the form of soft loans and/or grants based
upon student need to selected graduates to assist them as they transition into businesses as it is done at BAC. An administrator at BAC indicated that “we have a program for supporting graduates with seed capital to start their own business within their communities. However, most of the sponsored students come from vulnerable families.” The instructors noted that limited follow-up studies were being conducted to assess the students during field attachment. At BAC, an instructor said “we do assess students on attachment but they normally pay Ksh 2,000 ($20) to cover for the cost of assessment materials and transport.” In addition, most of the institutions were not systematically following up with their graduates after completion of their courses due “to limited resources and limited staff support” as noted by an administrator at EP.

Conclusions & Recommendations
Entrepreneurial Education (EE) in middle-level tertiary agricultural institutions in Kenya’s Rift Valley is offered as a stand-alone course and an integrated curriculum. Some colleges are in the process of developing full diploma programs in EE. This implies that EE at tertiary agricultural institutions in the region is still at the developmental stage, although it is deemed to be important in creating employment (Gichana, 2011) for the institute graduates. However, the increasing popularity and expansion of programs (some institutes are in the process of unveiling diploma programs in EE) in the institutes is a clear indicator of a likely growth of EE in the region. EE being delivered through face-to-face classroom instruction and through applied activities such as projects, student business clubs, as well as compulsory field attachments after the completion of the coursework. This would help promote an entrepreneurial culture among the graduates, a position held by several researchers (Jones & English, 2004; Frederick, 2007; Gatchalian, 2010; Mansor & Othman, 2011).

The ability of the students to apply EE knowledge and skills to initiate and manage small businesses at their institutes is a clear indication of the importance and practicability of the programs. It is also a confirmation that the institutes were creating a culture of entrepreneurship among the students. EE predominantly consists of learning by doing (Cope & Watts, 2000) as such most institutes had integrated hands-on activities in their programs (Simpeh, 2011) although this was limited by resources. Entrepreneurship cultural theorists argue that the key objective of integrating EE content with practical activities within and outside the institutes (through field attachment) not only enhances the skills and knowledge of the students but also helps them apply those skills after graduation (Chakraborty, Thompson, & Yehoue, 2014).

Regarding promising enterprises for EE graduates, dairy, horticulture, poultry and apiculture enterprises are the most promising based on the prevailing social and environmental conditions in the region. In some institutes there was a mismatch between graduate needs for EE and actual outcomes in terms of entrepreneurial skills, knowledge, and attitudes (Matlay, 2008). EE curriculum needs to be revised to accommodate the promising enterprises so as to meet the needs and aspirations of the students. This will in turn make the programs more meaningful and would motivate more students to take up EE programs (Herrington et al., 2010).

The biggest constraints facing middle-level tertiary college graduates is the lack of seed capital arising from high-interest rates due to a lack of collateral to guarantee loans. Inadequate access to land is also a barrier to graduates as argued by Baker, Bassey, Jimoh and Akande (2015) and HRDC (2013). The land inadequacy is
in part due to a gradual increase in rural population growth that has outstripped the growth in arable land, land fragmentation through family inheritance, and unfavorable land policies. Other constraints include exam-oriented curricula that emphasize theory without opportunities for experiential application (Karimi, Nyaga & Oudo, 2014). Inadequate access to markets is also a constraint due to poor infrastructure, competition, and a lack of marketing skills (Legas, 2015).

In order to curb the aforementioned challenges and better prepare students as entrepreneurs, more experiential opportunities are necessary to enable students to relate the theoretical principles to practice (Ngosiane, 2010). The technical institutes should establish business incubators for promising graduates for start-up capital. Incubators would enable the institutes’ graduates to actualize their dreams of becoming entrepreneurs. This can be done with mentorship from instructors and experienced business persons to nurture social entrepreneurship (Etzkowitz, 2003). The authors recommend that each college budget resources for the systematic follow-up to document challenges that young entrepreneurs face and to track successful entrepreneurial graduates. Successful entrepreneurs contribute to economic development in the region by adding jobs and growing the tax base through a multiplier effect. Successful entrepreneurs can also serve as mentors to students in the EE programs. EE facility upgrades are necessary to enhance library holdings, build ICT capacity, enhance applied opportunities for students, and for providing land, equipment, and other infrastructure (e.g. packing houses for horticultural produce) appropriate for their catchment areas as suggested by Baker (2015).

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Haitian Faculty Perceptions of Students’ Competence at Graduation: An Opportunity for Curricula Modification

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Abstract
The contribution of agricultural universities to long-term food security in developing countries is widely acknowledged. The extent to which these universities in each country are helping students develop the requisite competence to meet employment needs is unknown. The purpose of this study was to explore Haitian faculty members’ perceptions of student competence at graduation. Semi-structured interviews were conducted with 37 lecturers who taught at five of the major agricultural universities in Haiti. The results of this revealed that (a) the employment conditions for university graduates were challenging; (b) faculty did not believe it was important for their students to graduate proficient in all the GFRAS New Extensionist competency areas; (c) faculty believed students should have research skills, the ability to be self-directed, and the ability to work in teams; and (d) faculty generally believed their institutions were producing graduates with the competencies needed for employment, although several lecturers identified specific areas for improvement. Recommendations for curricula reform and additional research are suggested.

Keywords: Haiti, agriculture, extension, post-secondary education, research
Introduction

Food security exists when all people, at all times, have physical and economic access to safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2003). This definition integrates the production aspect of the issue as well as the distribution and accessibility levels. On the productive side of food security, emphasis is given to agricultural and rural development, as it has been reported that 70 to 75% of the poor and hungry live in rural areas (FAO, 2002). Based on the Global Hunger Index for 2016, Haiti is unable to feed all its people. Haiti’s hunger index severity is alarming, the only country in the Latin American and Caribbean region in such critical position (von Grebmer et al., 2016).

The act of farming is a core strategy against food insecurity since it is the main source of food production and provides rural employment in many developing countries. However, improvements in agricultural production and productivity depends on the farmers having access to factual information and education. This means extension educators, researchers, and professionals in agriculture must strengthen their knowledge generation and dissemination capacity (FAO, 2002).

Although extension education is crucial for rural development, many universities in developing countries fail to address extension competencies in their curricula, concentrating primarily on the scientific and technical skills (van Crowder, Lindley, Bruening, & Doron, 1998). The universities in these countries have generally failed to integrate and connect extension education to relevant research and educational programing (van Crowder et al., 1998). Given the important roles universities can play in long-term food security, it is relevant to examine if Haitian agricultural universities are providing graduates with the requisite competence to be successful, especially related to extension education and research.

Literature Review

Employers identify the role of higher education as developing potential employees with the skills needed for success, however, universities are often unaware of employer expectations (Bennett, Dunne, & Carré, 1999). In some cases, universities have reached an understanding of the importance of these employer stakeholders, as well as the importance of students’ employability (Harvey, 2000). Although, there is confusion about what those skills should be, employers’ expectations lack clarity at times. For example, terms such as transferable, core, or generic skills have been used by employers (Bennett et al., 1999). The adjectives used to describe skills used by employers can make a difference for any graduate seeking to enter an increasingly competitive workforce (Harvey, 2000). However, there seems to be an emerging consensus in the literature about what these core competencies should be. The competencies most identified were (a) self-management (Bennett et al., 1999), (b) communication, (c) teamwork, and (d) interpersonal skills (Harvey, 2000; Sondergaard, Murthi, Abu-Ghaida, Bodewig, & Rutkowski, 2012).

Apart from core competencies, graduates need career-specific competencies that will enhance their competitiveness in today’s workforce (Bennett et al., 1999). As a result of identified clear career-specific competencies, agricultural colleges can focus on teaching these specific competencies necessary for professionals in the agricultural sector. It has been identified that extension services are an important contributor to agricultural productivity (FAO, 2002). Extension services, also known as rural advisory services, use a
variety of activities to provide farmers, their families, and other stakeholders key services to improve their livelihoods (GFRAS, 2012). Recognizing the importance of extension organizations, and more specifically the individuals who work in these organizations, GFRAS (2016) developed a set of competencies they deemed important for the New Extensionist. These competencies were grouped in the categories of (a) adaption to change, (b) adult learning, (c) agricultural entrepreneurship, (d) agricultural systems, (e) behavior change, (f) communication, (g) community organizing, (h) critical thinking, (i) gender issues in agriculture, (j) leadership, professional ethics, (k) program implementation, (l) program monitoring and evaluation, (m) program planning, and (n) youth issues in agriculture.

Haitian extension services are often limited to transfer of knowledge to farmers and management skill development of farmers as reported by the Ministry of Agriculture, Natural Resources, and Rural Development (MARNDR). The MARNDR has identified nine areas for extension services, eight of which are technical agriculture science and one related to transfer of managerial skills (Arias, Leguía, & Sy, 2013). The public sector is the main provider of extension services in Haiti through the MARNDR and its auxiliary research and education institutions (Arias et al., 2013; GFRAS, n.d.). In addition to MARNDR, there are various NGOs, some private sector firms, and a few farmer-based organizations and cooperatives (GFRAS, n.d.). The level of extension received depends on a few factors such as (a) geographical area, (b) the educational attainment of farmers, and (c) the size of farm (Arias et al., 2013).

Anecdotal evidence suggests a large number of graduates from the Haitian agricultural universities seek employment in jobs that require application of technical, extension, and research skills. It is, however, unclear if students are graduating with the skills needed for success. The existing literature is dated and does not address this question. As such, this study aims to answer this question by exploring Haitian faculty members’ perceptions of student competence at graduation.

Theoretical Framework
This study used a competency-based theoretical framework. Competency is a person’s ability to carry out any activity based on life experience and acquired knowledge and skills (Makulova, Alimzhanova, Bekturganova, Umirzakova, Makulova, & Karymbayeva, 2015). This framework rests on the concept of skills in the context of higher education, which is a term often used interchangeably with competencies and capabilities (Washer, 2007). Tribe’s (1996) meta-analysis of skills in various educational organizations showed the commonalities between what would be considered core skills. The core skills identified were (a) communications, (b) numeracy and information technology skills, (c) interpersonal, and (d) problem-solving skills. What is more, Washer (2007) purported that core competencies or skills links teaching curricula to employability. This is why it is important for higher education institutions to work closely with employers to ensure graduates exit the institution fully competent to enter the workforce.

Extension education and advisory services have their own required set of skills and competencies. Upon recognition of the importance of extension in agricultural development, it has become crucial to determine what these skills may be for graduates in the agricultural fields. GFRAS’s New Extensionist competencies were used as the frame to examine teachers’
perception of students’ levels for extension competence (GFRAS, 2016).

**Purpose**

The purpose of this study was to explore Haitian faculty members’ perceptions of student competence at graduation. Four research questions guided this study:

1. What are the current employment conditions for graduates from Haitian agriculture universities?
2. To what extent do faculty perceive that graduates need the GFRAS New Extensionist competencies?
3. What other competencies do faculty perceive graduates need?
4. How do faculty perceive the effectiveness of their institutions at developing the competencies needed by graduates?

**Methodology**

This research study is part of a larger project funded by USAID and approved by the University of Florida IRB. To address the research questions, we used a basic qualitative design (Flick, 2007) with semi-structured interviews. The interview guide was developed by the research team and included nine open-ended questions and one question addressing the GFRAS (2016) New Extensionist competency areas. The guide was reviewed by a panel of education experts and experts familiar with Haitian higher education. The guide was developed in English, translated to French, and then back-translated to English to ensure the original meaning was maintained. The instrument was pilot tested with a few Haitian faculty and slight adjustments were made.

**Participants**

We employed a snow-ball sampling method to identify faculty working at the five major agricultural universities in Haiti. The universities included in this study were (a) Université d’Etat d’Haïti - Faculté d’Agronomie et de Médecine Vétérinaire (FAMV), (b) American University of the Caribbean (AUC), (c) Université Caraîbe (UC), (d) Université Notre Dame d’Haïti (UNDH), and (e) Université Quisqueya (UNIQ). Initially, the Deans at each university identified a few faculty to be interviewed. At the completion of each interview, the interviewee was asked to identify additional faculty. Participants were recruited until we achieved redundancy in the data. In total, we interviewed 37 lecturers, 11 from FAMV, nine from UNDH, nine from UNIQ, seven from AUC, and one from UC. An exact population frame was not available, but based on numbers reported by the Deans, there were 277 total agriculture faculty in Haiti, with only 61 faculty employed full-time. Many faculty work at multiple universities, and our interviewees were no different. We had 12 who worked for a single university, 13 who worked for two, nine who worked for three, and three who worked for four. Our respondents were 75% male and 30% held administrative duties beyond their teaching roles. Participants were assigned a code number based on the order they were interviewed.

**Data Collection**

Interviews were conducted face-to-face in French by the lead researcher. The locations for the interviews were selected by the participants. The entire interview lasted about 60 minutes, and 30 minutes of the interview was dedicated to this particular study. The lead researcher, the interviewee, and a research assistant were present at all interviews. During the interview, the research assistant took detailed notes and the interview was audio recorded verbatim. Following each interview, the lead researcher created a detailed case file using
the audio recording. The research assistant reviewed each case file for accuracy using detailed interview notes and adjustments were made as necessary.

**Trustworthiness**

Multiple steps were implemented to ensure trustworthiness of the research study. We kept an audit trail and used regular peer-debriefing sessions between the lead researcher in Haiti and the project leader in the U.S. (Lincoln & Guba, 1985). We employed member-checking by allowing participants to review their case files (Merriam, 1998). We established dependability by using multiple coders to verify accuracy (Lincoln & Guba, 1985). We also translated and back-translated our instrumentation to ensure accuracy. We describe our participants as much detail as possible while still maintaining their anonymity (Lincoln & Guba, 1985).

**Data Analysis**

Data were analyzed using a basic thematic analysis with line-by-line coding (Gibbs, 2007). For questions 1, 3, and 4 a constant comparative method (Glaser & Strauss, 1967) was used to establish themes and sub-themes. For question 2, the GFRAS (2016) New Extensionist competency framework was used to categorize responses. Data analysis was completed by the leader researcher in French and then results were translated to English. To establish dependability (Lincoln & Guba, 1985), ten case files were translated to English and then analyzed by an American member of the research team. Those results were compared to the results from the French analysis and accuracy of the analysis and translation was verified.

**Subjectivity Statement**

This research was part of a USAID project and this particular study was designed, implemented, and written by a large team of researchers. Collectively, the research team recognizes the value higher education institutions in Haiti have toward establishing long-term food security in the country. The lead researcher is a Haitian employed by the project. He had previously worked at one of the universities and had previously conducted research on the higher education system in Haiti. The team also includes three American researchers and a Haitian graduate student studying in the U.S. Only the lead Haitian researcher and one American researcher contributed to data analysis and conclusions. The remaining research team critically reviewed the results to minimize the impacts of individual biases.

**Findings**

**Employment Conditions**

**Employers.** Graduates from the five major agriculture institutions in Haiti work for NGOs and international organizations, public and private sectors, with most working for NGOs and international organization (P001; P007; P008; P015; P021). Employment in the public sector is mainly with MARNDR, but a few graduates went to work in the Ministry of Environment and the Trade Ministry (P008). Historically, FAMV and MARNDR had a very strong relationship and graduates from FAMV were automatically hired by this ministry (P015; P007). Now, the close relationship between both institutions for graduates no longer exists (P015). P015 shared that until 1987 it was like an obligation for MARNDR to employ FAMV’s graduates (approximately 30) because it was the only college of agriculture in the country. P011 thought it is not difficult for graduates from his institution to find a job. They work for the government, particularly MARNDR, they create their own business, or they are
working for NGOs and international organization.

Job market. Many universities in Haiti have recently added agriculture programs at their institutions (P001, P009). Consequently, there are more graduates in agriculture fields than ever before and competition for every open job is very high (P001, P009). There appears to be more graduates than there are jobs (P001, P009). Further complicating the situation, since MARNDR quit automatically hiring graduates from FAMV, graduates from this institution are having challenges finding jobs (P007). P001 perceives enhancing the skills of graduates in non-technical areas like communication can help improve their employability (P001). It was also noted that graduates lack practical skills. They are much better in theory than in practice (P001).

Timing. According to interviewees, finding employment for graduates may take six months to three years (P030; P027; P007; P013), with most finding their first job in less than two years (P033; P034; P037; P028; P031; P022; P001). The more talented students often find a job right after completing an internship, during the time they should be preparing to graduate. This means some do not finish their final project before being hired and do not finish their degree (P008, P036).

Social capital. In the city of Les Cayes, social capital plays a large role in assisting graduates find a job (P023; P024; P034; P026). The famous Haitian Creole saying kolonn ki bat (networking is the key way to have a job) was mentioned by many interviewees (P023; P024; P034; P026). P024 summed it up:

In Haiti it is a question of social network (Kolonn ki bat). At the contrary, we stay on ground (on the floor), without a job. Those who do not have a social network do not find a job. Some do not even look for, ask or do any effort.

This was also mentioned by P011, P008, P002, P003, and P004. According to P002, some students’ lack of capacity to network in a market tainted by the clientele phenomenon further complicate the situation. P004 said graduates are technically good, but cannot find a job due to lack of opportunities. This interviewee insisted that to find a job students need to develop their human potential and their interpersonal relationships. Yet, for him, these are the characteristics the students have neglected during their time at college. Having good grades is important, but it is necessary to be able to develop social networks (P004).

First job duration. The length of time graduates stay in their first job is not easily determined. Most of the interviewees perceived the type of jobs graduates take (government vs. temporary, etc.) makes a difference (P008; P001). In NGOs, graduates often have a short-term contract ranging from six months to five years, depending on the duration of the project (P001; P007; P014; P020; P029). In contrast, if they work for the government (not on a special project) there length of employment is not defined (P001). Graduates may also leave their first job because of a new job that offers them a better pay (P008; P036). Finally, many graduates would like to further their education with a master’s degree or a Ph.D., so they may stay in a job for a short duration until they can secure a scholarship to fund their schooling (P008; P036).

Employment qualifications. A competitive job market has led to many graduates taking jobs that do not match their degrees. For example, P009 perceived graduates do not get jobs that match their qualifications. P003 went further, saying very few of them have a job that matches
their qualifications. It is common to find a graduate working in a field which is not agriculture (P004). In Haiti, they say that agronomy leads to all (in French: L’agronomie mène a tout) (P012). Therefore, it is not a surprise to see an agronomist as the owner of a gas station (P012). Some graduates work in the social science fields like teaching at the secondary level (P008). Others are even working for the Ministry of Public Construction, Transport and Communication (P004). Graduates in environmental science face more challenges in finding employment (P005). However, some of their interdisciplinary courses do help prepare them for employment outside of agriculture or environmental positions (P007). As an example of the employment challenges in the Haitian agricultural sector, P001 shared it would not be surprising to find an agricultural technician with a better job than an agronomist and someone with a bachelor’s degree to have a better job than someone with a master’s degree. There are no guarantees that graduates will find jobs that match their qualifications or career goals (P001).

Career advancement. Several interviewees commented on skills and competencies graduates needed to advance in their careers (P001; P001; P019; P022, P027; P037). P001 said they need to have good knowledge of the different regions of the country and have a basic knowledge in agronomy. P001 proposed it is important for them to understand the labor market and have good communication skills. P002 insisted mastering additional languages, like English, is vital for career advancement.

Extension Competence
Adaptation to change. Adaptation to change was viewed as important by many interviewees. According to P011 adaptation to change is the most important skill for students to learn to be able to conduct both extension and research activities. P002 discussed the importance of mastering skills regarding the role of agricultural extension in time of innovation and development. Other interviewees called adaptation to change as very important (P010) and a “key competency” (P036).

Adult learning. Interviewee opinions about the importance of adult learning were mixed. P011 said it was of little importance. While P036 thought it was a key competency for someone working in agricultural extension. P007, P001, P014, and P015 thought that understanding adult learning is important.

Agricultural entrepreneurship. Agricultural entrepreneurship was important to many of the lecturers interviewed. P002 expressed his opinion using the phrase “the promotion of the agricultural business spirit.” P032 thought that agricultural entrepreneurship is the most important for graduates to know if they want to do research and extension and they must learn this competency in the rural context. P029 believed that agricultural entrepreneurship is a key competency needed to work in research and extension. Other interviewees just stated agricultural entrepreneurship was very important (P011) or important (P010).

Agricultural systems. An understanding of the agricultural system was viewed as very important to many interviewees (P010; P011). The importance of sound technical knowledge of agricultural systems was viewed as important by many interviewees (P008; P010; P011). P007 described this as a practitioner with a lot of experiences. P011 talked about being sound in both theoretical and practical skills. P002 thought it was important for graduates to be able to provide answers about certification of the norms and regulatory systems in Haiti. P029 thought an understanding of the agricultural system was critical to work in
agricultural extension or research. P001 and P009 also talked about the importance of understanding the context. Graduates should also have an understanding of the rural areas and be willing to work in these. P013 echoed this by saying it is important for graduates to master the local social aspect of the area. It was noted by P004 that grades alone are not sufficient for success.

Behavior change. Behavior change was not mentioned by many of the interviewees, but some perceived it was relevant to working in extension in Haiti. P009, P010, P019, P025, P030, P033, and P026 called it very important. P036 believed behavior change was one of the key competencies needed by graduates to work in extension. For P013, P024, P034, P016, and P028, it was just important.

Communication. Communication skills are critical for graduates in agricultural and environmental programs in Haiti (P036; P010; P011). For P031 communication is the most important skill needed by graduates. P002 emphasized the importance of being able to effectively use information and communication technologies. As a country with several common languages, the importance of communicating in different languages was also deemed important. P002 thought it was important to speak both Haitian Creole and French. P011 was more certain about the importance of speaking English. In addition to oral communication, graduates should have the ability to write (P001, P009).

Community organizing. Several interviewees discussed the importance of understanding and working at the local level. P001 talked about the importance of reinforcing organizational capacity at the local level to help diffuse new production methods. P002 mentioned the importance of being able to build local capacity to adapt in times of risk and uncertainty. P037 thought that community origination is the most important in terms of research and extension for graduates to know. P026, P024, and P025 thought it was very important. For P023, it was just important for the students to know.

Critical thinking. Critical thinking and problem solving were viewed as important by many of the interviewees (P010; P001; P002; P013). However, at least one interviewee (P011) thought it was less important. Critical thinking was often expressed in terms of solving problems. P001 and P002 believed all graduates should be able to solve problems. They should be able to observe their surroundings and gather data to make decisions (P001; P006). When necessary, they should be able to innovate to solve problems (P013). P010 elaborated on how he teaches critical thinking. He might present five ideas to the students or show them five different ideas and let them evaluate the situation to select the best choice. He then taught them to critique their own ideas. Related to critical thinking, P012 thought creativity is important for graduates.

Gender issues in agriculture. Gender issues received mixed opinions from interviewees. P010 thought it was important for graduates to have. P011 perceived understanding gender issues was second only to adaptation to change in terms of importance for graduates to learn. In contrast, P032 thought gender was a nonissue. For him, young females and males are equal and there should not be discrimination based on gender. He believed that because his institution has many female students, males and females learn to accept each other and work closely together. P036 did not explicitly say if it was important for graduates to understand gender issues, but he did not think it was the responsibility of his institution to help graduates or develop competencies.
Leadership. Many interviewees expressed the importance of leadership. Two interviewees (P010; P011) said all graduates should be leaders. P020 said that being an agronomist is being a leader. P032 talked about the importance of leadership and how it transcends both the personal and professional lives of graduates. Leadership helps a professional to be fair and resolve conflict (P032). Ultimately, it benefits the communities in which the graduates work (P032).

Professional ethics. Having professional ethics was deemed as very important by many of the interviewees (P010; P011). P001 thinks that honesty, respect, responsibility, inclusion, transparency and integrity are critical for graduates. In Haiti, she explained that they do not put enough emphasis on those values (P001). Therefore, she (P001) suggested it is important to integrate them across the curriculum. P002 agreed about teaching professional ethics. However, he (P002) perceived the education system in Haiti no longer stresses ethics. He (P002) insisted “we are living in a society in disguise. People do not follow a logical path in their actions. They tend to give up the ethical values.” P002 also mentioned that teaching ethics falls on the parents and in many cases, this has not happened. P036 reflected on his own teaching experiences and discussed how he stressed ethics. He (P036) connected professional ethics to morality and religion and the spiritual consequences of not being ethical.

Program implementation. Program implementation was mentioned as important by many interviewees (P010; P030; P033; P034). P008 and P011 see it as very important. P001 elaborated that to successfully implement programs, graduates need to understand the reality at the local level. It is very important for graduates to implement a program (P030). However, P015 thinks this competency was a little less important for graduates to know.

Program monitoring and evaluation. Program monitoring and evaluation was viewed an essential competency to several interviewees. P010 and P020 called it important. P011, P008, and P030 were more positive and called it very important. This is the same case too for P008. P034 thinks that it just important. P015 saw it as less important.

Program planning. The importance of program planning was viewed with mixed opinions by interviewees. P010, P020, P034 called it important, while P011, P008, and P030 said it was very important. P015 saw it as less important.

Youth issues in agriculture. Interviewees had conflicting opinions about the importance of graduates understanding youth issues in agriculture. P030 and P031 perceived that it is a very important topic. P010, P034, P008, and P011 thought it was important. For P015 and P032, it was less important. P036 did not perceive it was the responsibility of his institution to help graduates develop this competency.

Other Competencies

Research. Research skills were mentioned as important by several interviewees. P014 said graduates need to able to implement appropriate research methods to solve problems they face. P002 emphasized the necessity to be able to select appropriate methods and tools to reach their audience in a specific context. He (P002) also went on to say that graduates need skills in applying the results of technical research. Communicating the results of research in ways understood by lay people was deemed important (P008; P001).

Self-directed and flexible. Graduates should be able to work independently (P001; P009). They should be disciplined in their work and work habits
P009). P013 discussed the ability to fully implement project. Two interviewees emphasized graduates needed the ability to be flexible and work on several things at the same time (P006; P018).

**Teamwork.** Two interviewees discussed the ability to work in teams as being important (P004; P013). For example, P003 talked about the need to develop networks. Interpersonal skills were seen as important (P004). Graduates should be able to cooperate with people in different positions of authority (P012).

**Personal traits.** Several personal traits were motioned as important. Two interviewees said graduates should have good self-awareness (P003; P004). Other suggested traits included being dynamic (P012), being patient (P012), and being aggressive (P012).

**Institutional Effectiveness**

**Graduate preparedness.** Most of the interviewees think their institution is doing a good job in teaching skills and competencies that graduates need to succeed, but there are some opportunities for improvement (P001; P002; P010). P001 and P002 recognized their institutions do not do enough to help the students prepare for jobs. P036 reported his graduates are not prepared in community organization, gender, or youth issues in extension. However, they are excellent in communication. P008 looked at these issues on a broader level and said Haitian society, in general could be doing a better job preparing young people for careers.

**Teaching extension.** None of the institutions had courses focused exclusively on extension methods. Extension competencies were generally integrated in to existing courses (P011). P001 referenced courses like rural sociology, agricultural climatology, geographic information system, and remote sensing as having extension competencies integrated. P001 went on to say that although students get some skills, her institution had not placed enough emphasis on the teaching of extension methods. The rural sociology course is the only one that can help the students develop a better understanding of the rural areas (P001). Field trips may also help students develop extension skills (P001). P010 specifically noted a deficiency in leadership and communication skills taught at his institution. P010 went on to say his institution does not specifically teach topics such as adapting to change, adult education, behavior change, communication, the problems related to gender, or youth in agriculture. He did, however, acknowledge many of these competencies might be addressed during internships and field experiences. P010 shared he teaches a plant pathology course that helps students learn some extension skills. His examples of activities would primarily fall in the agricultural systems competency area focused on analyzing and diagnosing plant diseases. At least one interviewee (P011) did not think it was the responsibility of his institution to teach all the extension competencies. He specifically said they do not teach adult education, community organization, critical thinking, or professional ethics.

**Teaching research skills.** Institutions had courses focused on teaching research skills. P001 said they have a course in their core curriculum focused on scientific investigation and experimentation. The professor in this course uses problem solving and decision-making approaches as teaching methods to help students learn to solve complex research problems. P010 elaborated more on his plant pathology course. His course teaches students to have a good sense of observation, the ability to establish the difference between a healthy and a sick plant, and to have an open-mind...
to be able to build hypothesis. According to P010, this course is so important that it should be taught to all FAMV students in all options as part of the core curriculum of their first year. For P021, the biometry or biostatistics course is the one which prepares his students to do research. He was confident his students have the theoretical background to initiate research projects. P011 also thought the biostatistics course was a great way to teach research skills.

Conclusions, Recommendations & Implications

Our results allow for several conclusions to be drawn based on the perceptions of the Haitian faculty members who participated in the research. First, employment conditions for university graduates are challenging. It typically takes graduates several years to find employment and they often work on jobs unrelated to their degrees. There appears to be a surplus of graduates. NGOs and international organizations are the largest employers, but these are often short-term positions. Graduates with social networking and communications skills have an advantage finding positive employment. Previous research on the employment conditions for agricultural graduates in Haiti could not be found, so our results provide a baseline for future research. The discovery of the importance of social networking and communication skills is consistent with the previous work in other parts of the world by Harvey (2000) and Sondergaard et al. (2012). Haitian universities should consider making changes to help students learn to establish social networks and develop communication skills better.

Second, Haitian faculty did not perceive it was important for their students to graduate proficient in all the GFRAS New Extensionist competency areas. The competency areas sorted in to three groups, most important, somewhat important, and not too important. They believed the most important competency areas were (a) adaption to change, (b) agricultural systems, (c) communication, (d) professional ethics, and (e) program monitoring and evaluation. Faculty also expressed it was somewhat important for students to be proficient in (a) agricultural entrepreneurship, (b) behavior change, (c) community organizing, (d) critical thinking, (e) leadership, (f) program implementation, and (g) program planning. The least important competency areas were: (a) adult learning, (b) gender issues in agriculture, and (c) youth issues in agriculture. A recent related study (Albert, Roberts, & Harder, 2017) examined this from a quantitative perspective and showed similar results, with the exception of adaptation to change (more important in this study), program implementation (more important in the other study), and behavior change (more important in this study). Both studies showed low importance for (a) adult learning, (b) gender issues in agriculture, and (c) youth issues in agriculture. Additional research should examine the relevance of the GFRAS competencies in the Haitian context. Other research in the Caribbean (Harder, Ganpat, Moore, Strong, & Lindner, 2013) had previously identified program planning and evaluation as a high-need opportunity for professional development for extension officers. Haitian universities should examine their curricula to ensure the most important competency areas are addressed in existing courses or consider developing new courses focused on extension methodologies. Harder et al. (2013) used a much more detailed assessment of extension competency, with 38 specific skills. This could be replicated in Haiti to provide even greater information for curricula modification.

Third, Haitian faculty identified several additional competency areas that
students should possess by graduation. These included (a) research skills, (b) the ability to be self-directed, and (c) the ability to work in teams. These findings are consistent with previous research in other contexts, so it appears Haiti is similar to other developing countries. Specifically, van Crowder et al. (1998) noted the importance of graduates having scientific skills, Bennett et al. (1999) identified the importance of graduates being self-directed, and the ability of graduates to work in teams was mentioned by Harvey (2000) and Sondergaard et al. (2012). Haitian universities should examine their curricula to determine if these competency areas are adequately addressed.

Finally, Haitian faculty generally perceived their institutions are producing graduates with the competencies needed for employment, although several faculty identified specific areas for improvement. All the universities had courses focused on research, but none had courses specifically focused on extension methodologies. Instead, faculty perceived many of the extension competencies were imbedded in other courses. It is important to note that these results are just perceptions of the faculty, not an actual indication of student competence and performance in the workplace. Bennett et al. (1999) had previously noted the discrepancy between university and employer expectations for graduates. Additional research should examine this from the perspective of employers and from students, thus triangulating the results.

References


Knowledge of Extension Agents regarding Professionalization of Extension Services: Evidence from South West Nigeria

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Abstract

The study examined the knowledge of agriculture extension agents on professionalization in South West Nigeria. This was borne out of the need to improve and ensure a viable, effective and vibrant extension and advisory service delivery in the area. 301 public and 55 private extension agents were selected through a two-staged sampling procedure. A questionnaire was used to obtain data on their socio-economic characteristics, knowledge on professionalization and its components, these being analyzed using descriptive, t-test and tobit regression analyses. The results showed that the agricultural agents in the public and private extension organizations had a basic knowledge on the concept of professionalization and its components of accreditation, registration and certification. However, disparities in the level of knowledge between the public and private extension personnel were observed. The findings indicated that their educational level and background were significant influencing factors of knowledge on professionalization. The study has implications for educating and training agricultural extension agents on professionalization. Seminars and workshops should be held specifically for the public extension agencies, to upgrade their knowledge and capacity on the concept, intricacies and potential benefits of professionalization on service delivery. This will help assist the institutionalization of professionalization in the agricultural extension sector and enhance competent, accountable and effective extension and advisory services delivery.

Keywords: knowledge, professionalization, extension agents, certification, Nigeria
Introduction

Globally, agricultural extension is a very important service that promotes rural livelihoods (Davis, 2016), and is an effective way of reaching farming households in rural areas. It remains the cornerstone of agricultural development in many countries, including Nigeria (Adejo, Okwu & Ibrahim, 2012). Agricultural extension services are particularly important for farmers as they assist with increasing their production capacity by disseminating information aimed at addressing issues related to their knowledge, attitude and skills. Nigeria has one of the most elaborate extension systems in sub-Saharan Africa (SSA) (Musa, Aboki & Audu, 2013), which is expected to foster a sustainable and dynamic approach to agricultural development in the country. However, the performance of the Nigerian extension services is regarded as unsatisfactory, as the required professionalization and development is still far from being achieved (Adekunle, 2013).

Extension practitioners in Nigeria are reported to be unresponsive to farmers’ need, unaccountable for services rendered, not held liable for unethical conduct, prone to incorrect and wrong message dissemination, and generally provide an inefficient service. In addition, investment in extension services has generally declined due to donor agencies having shown increasing concern on the decreasing rate of returns on their investments in this sector (World Bank, 2006). As reported by Omotesho, Ogunlade and Ayinde (2015), farmers perceived the level of accountability of extension agents in Nigeria to be poor. All these points to the need to restructure the agricultural extension and advisory services in order to enhance its relevance to meet the need of all actors, and thus play its rightful role ensuring food security and providing innovative solutions.

Several reforms have been introduced into Nigeria’s agricultural extension service approaches, models, methods, funding and training over the years without the desired impact, as part of an attempt to overcome the highlighted problems. Discussions in the field of extension over the last twenty years have brought to the fore a shift from government funded to private sector funded extension services (Adetayo & Eunice, 2013), with a recent increased focus on the professionalization of extension and advisory services. Oladele (2011) and Zwane (2014) opined that the institutionalization of a proper policy framework that outlines the guiding principles for service delivery and the professionalization of extension to promote sound work ethics were essential to improve and ensure excellent extension service delivery.

Professionalization, as operationalized in this study, encompasses the components of accreditation, registration and certification of extension service providers. Accreditation involves the process of ensuring that an individual has gone through a professional program that meets the prescribed standard for a profession (HRPA, 2010). Registration ensures that individuals who have passed qualifying exams are regarded as having met the specified standard of professional training, and can be registered with the accredited organization tasked with oversight of that profession. Certification is the process whereby a professional society or body attests to the professional qualification of an individual, which gives them the right to practice the occupation or profession, having ensured that minimum standards of education or experience have been met (HRPA, 2010).

Professionalization of extension service providers is a mandate in one of the
strategic frameworks and operational plans launched by the Global Forum for Rural Advisory Services (GFRAS) to revitalize agricultural extension internationally (Davis, 2016; Davis, 2015; GFRAS, 2012). This is to ensure that the agricultural extension professional body in each country (such as the Agricultural Extension Society of Nigeria (AESON) which needs revamping) is recognized, legalized and empowered to properly regulates the entry, exit and conduct of individuals in the profession through proper accreditation, registration and certification processes. Terblanche (2015) reported that South Africa has taken the lead in Africa to implement this mandate, which has been reported to enhance the qualification, competence, work ethics, integrity, objectivity and accountability of service providers (Zwane, 2014). As an organizational response to the pressure from an increasingly complex and rapidly changing environment; this mandate should be applied in Nigeria to unlock the extension sector for accountability and efficient service delivery.

This study therefore aimed to examine the knowledge of agriculture extension agents regarding the concept of professionalization of their services in Nigeria prior to its implementation. This will give insight to extension stakeholders both locally and internationally regarding laying the foundation needed to properly refocus strategies that will be used to restructure extension and advisory service delivery in the country.

**Theoretical Framework**

This study is based on the theory of planned behavior, which is an extension of the theory of reasoned action, and is usually adapted to model attitude-behavior relationships (Ajzen, 1985; Ajzen, 1991). The Theory of Planned Behavior is important for analyzing individuals’ intentions and behavior. It emphasizes that individual behavior (such as the participation/adoption of a concept or innovation) originates from their intention (to participate/adopt), with one of the major psychological constructs that determine intention being attitude. The attitude of an individual is a function of their knowledge, which is a significant predictor of intention and behavior (Borges, Lansink, Ribeiro & Lutke, 2014; Oladele, 2012). Knowledge is built through access to relevant information from past experiences and interaction with the environment. Knowledge is generally considered a prerequisite for the acceptance of a new policy, concept and innovation (Rogers, 1995; Oladele, 2012), thus, the knowledge of the extension agents will influence their attitude and their disposition towards implementing professionalization. The theory contends that the attitude towards a particular behavior, the perceived behavioral control and the subjective norms all determine the decision to adopt a particular innovation or perform a given behavior (Adebayo & Oladele, 2012).

The theory of planned behavior establishes that having a high knowledge and favorable attitude about a given concept and behavior strongly enhances the individual’s intention to adopt and perform such a concept or behavior. The theory of planned behavior is thus relevant to this study as the eventual adoption of the innovation of professionalization is based on the knowledge and attitude of the extension agents regarding the concept and its components. A fundamental assumption for this study is that assessing the knowledge of extension agents, as it relates to the concept of professionalization, would give stakeholders in the extension sector the necessary insight into predicting whether or not they would engage in programs geared towards ensuring the professionalization of the sector.
A number of authors have provided an understanding of individuals’ intention, as influenced by knowledge and their adoption behavior in various areas of agriculture, such as water conservation practices (Yazdanpanah, Hayati, Hochrainer-Stigler & Zamani, 2014), organic farming (Lapple & Kelley, 2013) and soil conservation (Wauters, Bielders, Poesen, Govers & Mathijs, 2010). This therefore implies that having the proper knowledge regarding the concept of professionalization and its components will enable extension agents to facilitate its full implementation. It will also predict their behavior regarding their participation in the professionalization processes when implemented.

**Purpose**

The purpose of this study was to determine the knowledge level of extension agents regarding professionalization of extension services in South Western Nigeria. This was done by identifying their socio-economic characteristics, examining their knowledge about accreditation, registration and certification on professionalization, and determining the socio-economic factors that influence their knowledge.

**Methods**

The study was carried out in South West Nigeria. This area has a high concentration of agricultural institutions, extension organizations and research institutes. The study population was all extension agents employed in both public and private extension organizations, with the public extension service being referred to as the Agricultural Development Program (ADP). The study population was 653 public and 70 private extension agents who are employed in the six state ADPs and the four non-governmental extension organizations in the area. A two-stage sampling procedure was used to select the public extension agents. The first stage was a purposive selection of three of the six States within the area, namely, Ogun, Osun and Oyo, based on the information obtained from their various extension agencies. The second stage was a random selection of 87, 129 and 85 extension agents in Ogun, Osun and Oyo States respectively. The proportionate sample size selected in each state was determined through the use of Roasoft sample size technique based on a 5% error margin, and resulted in 301 public extension personnel being identified for inclusion in the survey.

The private extension agents were selected using a two-stage sampling procedure, the first being a purposive selection of two prominent agro-based Non-Governmental Extension Organizations out of the available four, based on their employee base and current activities in the region. Those selected organizations were the Farmers Development Union (FADU) and the Justice Development and Peace Movement-Rural Development Program (JDPM-RUDEP), which had extension employee bases of 23 and 35 respectively. The second stage was a random selection of 22 and 33 extension personnel from FADU and JDPM-RUDEP respectively, the proportionate sample size also being determined through the use of Roasoft sample size technique based on a 5% error margin. The total sample size for the study therefore was therefore 301 public and 55 private extension personnel. The sample frame error was eliminated by ensuring that all administrative and other office staffs in the extension organizations were not included in the study, while the sampling error was controlled by ensuring that a multiple contact strategy was used to contact all field extension agents in the included extension organization.
Table 1

Population and Study Sample

<table>
<thead>
<tr>
<th>Selected Extension Agencies</th>
<th>Population Size</th>
<th>Selected Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Agencies (ADPs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ogun</td>
<td>112</td>
<td>87</td>
</tr>
<tr>
<td>Osun</td>
<td>193</td>
<td>129</td>
</tr>
<tr>
<td>Oyo</td>
<td>108</td>
<td>85</td>
</tr>
<tr>
<td>Private Agencies (NGEOs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FADU</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>JDPM</td>
<td>35</td>
<td>33</td>
</tr>
</tbody>
</table>

Data were obtained with the use of a structured questionnaire that was divided into two sections, the first being for their socio-economic characteristics, and the second regarding their knowledge about the concept and indicators of professionalization, specifically accreditation, registration and certification. Respondents were presented with a list of 12 statements on the general concept of professionalization, eight each on accreditation, registration and certification, totaling 36 statements. They were asked to indicate whether these statements were true or otherwise using a 2 point scale of true/correct (2) and false/incorrect (1). The scale was reversed for negative statements. Several researchers such as Arbuckle, Morton and Hobbs (2015), Mondal, Haitook and Simaraks (2014), Oladele (2012), Oladele (2011) and Rhodes, Leland and Niven (2002) adopted a similar scale of measurement to generate the knowledge scores of respondents. The total knowledge score of the extension agents were aggregated for all the 36 items, giving an overall Knowledge Score, with 36 being the lowest and 72 being the highest.

Lecturers in the Department of Agricultural Economics and Extension at the North West University and local extension managers in South West Nigeria validated the data collection instrument and a reliability test was carried out using the split-half method. An overall reliability coefficient of 0.87 was obtained for the entire questionnaire which showed proper consistency of the instrument. As stated by Kuder and Richardson (1937), a reliability coefficient of 0.85 and above shows that the instrument is highly consistent and reliable. The cronbach alpha reliability coefficients for the different sections of the instrument were general concept of professionalization (0.80), accreditation (0.84), registration (0.79) and certification (0.90). Data were analyzed with SPSS Version 22 and STATA 11 using descriptive statistics, such as numbers, percentages and means. Inferential statistics using the t-Test assessed whether the means of public and private groups were statistically different from each other, and a tobit regression model was fitted to determine the factors influencing the agents knowledge on professionalization of extension services. The model was chosen due to its ability to model variables that have either a left or right censoring in the dependent variable (Tobin, 1958).

The Tobit model is presented as:

\[ Y^* = X_1 \beta + \varepsilon \]  \hspace{1cm} (1)

where \( Y^* \) is the dependent variable, in this case the generated knowledge scores of the extension agents; \( \beta \) is a vector of unknown coefficients; \( X_1 \) is a vector of independent variables (which include age \( X_1 \), gender,
household size ($X_2$), educational qualification ($X_3$), higher degree ($X_4$), years of experience ($X_5$), number of communities covered ($X_6$), rural-urban background ($X_7$), and $\epsilon$ is an error term that is assumed to be independently and normally distributed with mean zero and a constant variance of $\sigma^2$.

Results & Discussion

Socio-Economic Characteristics of the Extension Agents

The results in Table 2 show that the mean age of the public and private extension agents was 42.0 years and 38.5 years respectively, with a statistically significant difference between them ($t = 3.8, p \leq 0.01$). This implies that private extension agents were generally younger than their public counterparts. The majority of the public (74.8%) and private (74.5%) extension agents were males, while only one-quarter of both (25.2% public, 25.5% private) were females. This corroborates Ajayi (2013), Arokoyo (2010) and Oladele and Mabe (2010) findings who reported that there were more males in extension services than females in Africa. A significant difference ($t = 2.8, p \leq 0.01$) was observed between the public agent’s average household size of six persons with a standard deviation of 1.9, and the private agents five persons with a standard deviation of 2.1.

The mean years of experience among the public and private extension agents were 12.5 years and 8.4 years respectively, which was a statistically significantly difference ($t = 5.4, P \leq 0.01$), suggesting that public extension agents are generally more experienced in extension work than their private counterparts. The mean number of communities covered by public and private extension agents was 19.2 and 38.2 respectively (Table 2). Further analysis of the result shows that there is a significant difference ($t = -14.2; p \leq 0.01$) in the number of communities they service. The results from Table 2 also reveal that slightly above half (58.1% and 52.7%) of the public and private agents had a rural background, that they were born and brought-up in the rural area. Oladele (2015) also reported that approximately half of the extension officers in North West Province, South Africa have a rural background.
Table 2
Socio-Economic Characteristics of the Extension Agents

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Public Extension Agents (n = 301)</th>
<th>Private Extension Agents (n = 55)</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq(%) Mean(SD)</td>
<td>Freq(%) Mean(SD)</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 30</td>
<td>17(5.6) 42.0(7.5)</td>
<td>2(3.6) 38.5(6.2)</td>
<td>3.8*</td>
</tr>
<tr>
<td>31-40</td>
<td>134(44.5) 39(70.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41-50</td>
<td>98(32.6) 12(21.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51 and above</td>
<td>52(17.3) 2(3.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>225(74.8) 41(74.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>76(25.2) (14)25.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household Size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-4</td>
<td>62(20.6) 5.8(1.9)</td>
<td>18(32.7) 4.9(2.1)</td>
<td>2.8*</td>
</tr>
<tr>
<td>5-8</td>
<td>216(71.8) 37(67.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 and above</td>
<td>23(7.6) -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ed. Qualifications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>College of Ag.</td>
<td>5(1.7) -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordinary National Diploma (OND)</td>
<td>49(16.3) 3(5.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher National Diploma (HND)</td>
<td>149(49.5) 23(41.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.S.</td>
<td>94(31.2) 26(47.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M.S.</td>
<td>4(1.3) 3(5.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Higher Degree Studies?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>247(82.1) 44(80.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>54(17.9) 11(20.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 10</td>
<td>149(49.5) 12.5(7.3)</td>
<td>40(72.7) 8.4(4.9)</td>
<td>5.4*</td>
</tr>
<tr>
<td>11-20</td>
<td>97(32.2) 13(23.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-30</td>
<td>53(17.6) 2(3.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 and above</td>
<td>2(0.7) -</td>
<td></td>
<td></td>
</tr>
<tr>
<td># of Communities Covered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 20</td>
<td>201(66.8) 19.2(9.5)</td>
<td>3(5.5) 38.2(9.0)</td>
<td>-14.2*</td>
</tr>
<tr>
<td>21-40</td>
<td>91(30.3) 28(50.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 and above</td>
<td>9(2.9) 24(43.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural/Urban Background</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>175(58.1) 29(52.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>126(41.9) 26(47.3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Statistical Significance at p ≤ 0.01 (*)
Knowledge of Extension Agents on Professionalization

Table 3 shows that majority (79.3%) of the extension agents across the study area had a wide range of knowledge regarding professionalization (12 statements). None of the extension agents answered all the knowledge test questions correctly, nor did any respondent answer all questions incorrectly. Across the study area (pooled agents), more than 90% of the extension agents correctly responded to two of the knowledge statements, also, more than 80% of them correctly responded to two other statements, while about 70% correctly responded to the remaining eight. Although both the public and private extension agents demonstrated a high knowledge on the general concept of professionalization, the private agents had a higher percentage of correct responses than their public counterparts. This is in line with Mengal, Mallah, Mirani and Siddiqui (2012), who stated that private extension field staffs in Pakistan were generally more knowledgeable and competent than their public counterpart. This might be due to most of the private agents being younger and have more educational qualification than their colleagues in the public agencies. The overall exhibition of a high level of knowledge on the general concept of professionalization across the entire study area is however a good omen, as it is likely to ensure that the respondents have a positive attitude and behavior to their participation in the process of professionalization when implemented.

<table>
<thead>
<tr>
<th>Professionalization Concept</th>
<th>Pooled %</th>
<th>Public %</th>
<th>Private %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Professionalization is a process of setting up policies and structures to guide the extension profession</td>
<td>98.3</td>
<td>98.3</td>
<td>98.2</td>
</tr>
<tr>
<td>2. Professionalization ensures only extension agents that have met the professional required standards are certified by recognized professional bodies</td>
<td>92.7</td>
<td>91.7</td>
<td>98.2</td>
</tr>
<tr>
<td>3. Professionalization signifies commitment by extension agents to maintain currency of skills and knowledge in the profession</td>
<td>89.0</td>
<td>88.4</td>
<td>92.7</td>
</tr>
<tr>
<td>4. Professionalization does not ensure appropriate regulation for extension service</td>
<td>83.1</td>
<td>81.7</td>
<td>90.9</td>
</tr>
<tr>
<td>5. Professionalization sets a foundation for continuous improvement in service delivery</td>
<td>76.7</td>
<td>81.1</td>
<td>62.7</td>
</tr>
<tr>
<td>6. Professionalization is a mechanism for ensuring that extension agents abide by the code of ethics set for the practice of the extension profession</td>
<td>74.4</td>
<td>73.4</td>
<td>80.0</td>
</tr>
</tbody>
</table>
7. Professionalization is a mechanism to protect, promote and ensure extension service sensitivity to the needs of farmers

8. Professionalization does not point out areas of improvement in extension service delivery

9. Professionalization legalizes extension practice

10. Professionalization promotes efficient and effective use of resources and access to certified information on infrastructures and facilities for service delivery

11. Professionalization does not involve consistent monitoring, evaluation and assessment of extension services

12. Professionalization does not ensure periodic quality review of extension personnel and the services they render

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>7.</td>
<td>74.2</td>
<td>72.8</td>
</tr>
<tr>
<td>8.</td>
<td>73.3</td>
<td>72.4</td>
</tr>
<tr>
<td>9.</td>
<td>73.0</td>
<td>72.1</td>
</tr>
<tr>
<td>10.</td>
<td>72.5</td>
<td>72.8</td>
</tr>
<tr>
<td>11.</td>
<td>72.5</td>
<td>73.1</td>
</tr>
<tr>
<td>12.</td>
<td>72.2</td>
<td>72.1</td>
</tr>
<tr>
<td>Average</td>
<td>79.3</td>
<td>79.2</td>
</tr>
</tbody>
</table>

The results of the responses of the extension agents to the eight knowledge questions regarding accreditation are presented in Table 4, which shows that majority (83.5%) of the agents demonstrated a high level of knowledge about this component of professionalization. More than 80% responded correctly to six of the eight knowledge statements on accreditation, while more than 70% responded correctly to the remaining two statements. However, the result further shows that the private extension agents have higher percentage of correct responses than their public counterparts in more than half (5 statements) of the knowledge statements on accreditation, indicating that they were generally more knowledgeable on most of the statements on the accreditation component of professionalization than the public agents. This agrees with Mengal et al. (2012), who reported a similar trend. The young age and higher educational status of the private agents possibly affected their knowledge level, suggesting that the private agents may adopt and embrace the accreditation process more readily than their public counterpart. Tooheey (2002) stated that knowledge was a major driver of accreditation of agricultural advisers and consultants in Australia.
Table 4
Respondents’ Knowledge on Accreditation Component of Professionalization

<table>
<thead>
<tr>
<th>Accreditation Component</th>
<th>Pooled %</th>
<th>Public %</th>
<th>Private %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Accreditation of extension personnel is an essential criteria for professionalization of extension service</td>
<td>89.6</td>
<td>88.4</td>
<td>96.4</td>
</tr>
<tr>
<td>2. Accreditation promotes accountability</td>
<td>86.0</td>
<td>84.1</td>
<td>96.4</td>
</tr>
<tr>
<td>3. Accreditation is a channel of injecting more integrity and competence into extension service delivery</td>
<td>85.4</td>
<td>85.4</td>
<td>85.5</td>
</tr>
<tr>
<td>4. Accreditation will improve standards of practice in the extension profession</td>
<td>85.4</td>
<td>86.0</td>
<td>81.8</td>
</tr>
<tr>
<td>5. Accreditation ensures a disciplined, systematic and reliable approach to extension training</td>
<td>84.3</td>
<td>85.0</td>
<td>80.0</td>
</tr>
<tr>
<td>6. Accreditation does not strengthen community confidence in quality of service delivery</td>
<td>81.2</td>
<td>83.4</td>
<td>69.1</td>
</tr>
<tr>
<td>7. Accreditation promotes credibility</td>
<td>78.9</td>
<td>78.1</td>
<td>83.6</td>
</tr>
<tr>
<td>8. Accreditation is not a mechanism for quality improvement and assurance in extension service delivery</td>
<td>77.5</td>
<td>76.4</td>
<td>83.6</td>
</tr>
<tr>
<td>Average</td>
<td>83.5</td>
<td>83.4</td>
<td>84.6</td>
</tr>
</tbody>
</table>

The results from Table 5 show that majority (82.9%) of the extension agents were well informed regarding the registration component of professionalization. More than 80% responded correctly to six of the eight knowledge statements on registration, while more than 70% responded correctly to the remaining two statements. This is in line with Terblanche et al. (2012), who reported that majority of extension personnel in South Africa were knowledgeable on professional registration processes. Nonetheless, further comparison of the responses on the knowledge statements on registration revealed that the private extension agents had an overall higher percentage of correct responses across most (5 statements) of the statements than their public counterparts.

The implication of this is that the private extension agents further revealed their innovativeness and openness to new information due to their young age and educational level. This gives a clue to their tendency of adopting faster registration processes involved in professionalization than the public agents. Similarly, Lopokoiyit, Onyango and Kibett (2011) also reported that public agents in Kenya needed more knowledge and a training upgrade than their private counterparts on administration, instructional and cross-cutting issues in extension.
### Table 5

**Respondents' Knowledge on Registration Component of Professionalization**

<table>
<thead>
<tr>
<th>Registration Component</th>
<th>Pooled %</th>
<th>Public %</th>
<th>Private %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Registration promotes accountability</td>
<td>86.8</td>
<td>85.4</td>
<td>94.5</td>
</tr>
<tr>
<td>2. Registration of extension personnel is an essential criteria for professionalization of extension service</td>
<td>86.2</td>
<td>85.0</td>
<td>92.7</td>
</tr>
<tr>
<td>3. Registration is a channel of injecting more integrity and competence into extension service delivery</td>
<td>86.2</td>
<td>85.0</td>
<td>92.7</td>
</tr>
<tr>
<td>4. Registration will improve standards of practice in the extension profession</td>
<td>84.6</td>
<td>84.7</td>
<td>83.6</td>
</tr>
<tr>
<td>5. Registration does not strengthen community confidence in quality of service delivery</td>
<td>84.0</td>
<td>85.4</td>
<td>76.4</td>
</tr>
<tr>
<td>6. Registration ensures a disciplined, systematic and reliable approach to extension training</td>
<td>82.9</td>
<td>85.0</td>
<td>70.9</td>
</tr>
<tr>
<td>7. Registration is not a mechanism for quality improvement and assurance in extension service delivery</td>
<td>77.2</td>
<td>75.7</td>
<td>85.5</td>
</tr>
<tr>
<td>8. Registration promotes credibility</td>
<td>75.3</td>
<td>73.4</td>
<td>85.5</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>82.9</td>
<td>82.5</td>
<td>85.2</td>
</tr>
</tbody>
</table>

Furthermore, the findings from Table 6 reveal that majority (83.6%) of the respondents in the study area pooled together had a wide range of knowledge regarding the certification component of professionalization. More than 80% responded correctly to six of the eight knowledge statements on certification, while more than 70% responded correctly to the remaining two statements. This implies that these extension agents are highly likely to willingly participate in the process of certification when professionalization is implemented. Knowledge and agreement on the need for service quality, public confidence, personnel competence, environmental concerns, code of ethics and continuous education requirements were also some of the drivers of certification in Australia (Tooheey, 2002).

However, across the eight knowledge statements on certification, the private extension agents had a higher percentage of correct responses on five of the statements than their public counterparts. This is similar to Lopokoiyit et al. (2011), who stated that public agents in Kenya needed more knowledge and training upgrade than their private counterparts on contemporary issues in the extension profession. This attribute shows that they have the basic information about the importance of certification as a criterion for professionalization thus enabling them to support, embrace and adopt faster professional certification processes.
Table 6  
**Respondents’ Knowledge on Certification Component of Professionalization**

<table>
<thead>
<tr>
<th>Certification Component</th>
<th>Pooled %</th>
<th>Public %</th>
<th>Private %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Certification is a channel of injecting more integrity and competence into extension service delivery</td>
<td>88.5</td>
<td>87.4</td>
<td>94.5</td>
</tr>
<tr>
<td>2. Certification promotes accountability</td>
<td>88.2</td>
<td>86.4</td>
<td>98.2</td>
</tr>
<tr>
<td>3. Certification of extension personnel is an essential criteria for professionalization of extension service</td>
<td>86.5</td>
<td>85.4</td>
<td>92.7</td>
</tr>
<tr>
<td>4. Certification does not strengthen community confidence in quality of service delivery</td>
<td>84.3</td>
<td>85.7</td>
<td>76.4</td>
</tr>
<tr>
<td>5. Certification will improve standards of practice in the extension profession</td>
<td>83.4</td>
<td>84.4</td>
<td>78.2</td>
</tr>
<tr>
<td>6. Certification is not a mechanism for quality improvement and assurance in extension service delivery</td>
<td>81.2</td>
<td>79.7</td>
<td>89.1</td>
</tr>
<tr>
<td>7. Certification promotes credibility</td>
<td>77.8</td>
<td>77.1</td>
<td>81.8</td>
</tr>
<tr>
<td>8. Certification ensures a disciplined, systematic and reliable approach to extension training</td>
<td>78.7</td>
<td>80.1</td>
<td>70.9</td>
</tr>
<tr>
<td>Average</td>
<td>83.6</td>
<td>83.3</td>
<td>85.2</td>
</tr>
</tbody>
</table>

The total knowledge score of the extension agents were aggregated for all the 36 items, giving an overall Knowledge Score, with 36 being the lowest and 72 being the highest. Using the correct responses of the extension agents to combine their knowledge scores on all the 36 statements on professionalization and its components, Table 7 indicates that majority of the public (86.0%) and private (89.1%) extension agents were highly knowledgeable on the concept of professionalization and its components. Based on the deductions drawn from the theory of planned behavior, this implies that their high level of knowledge is a potential predictor of their positive intention and behavior to adopt and support the implementation of the concept of professionalization. This bodes well for the implementation of professionalization of extension services in the study area.
Table 7

Distribution of the Overall Knowledge Score of the Extension Agents on Professionalization

<table>
<thead>
<tr>
<th>Knowledge Score</th>
<th>Public Extension Agents (N=301)</th>
<th>Private Extension Agents (N=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq. (%)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>36-60 Low Knowledge</td>
<td>42 (14.0)</td>
<td>65.42 (4.66)</td>
</tr>
<tr>
<td>(Below 70%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-72 High Knowledge</td>
<td>259 (86.0)</td>
<td></td>
</tr>
<tr>
<td>(70% and above)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Factors Influencing the Knowledge of the Extension Agents using Tobit Regression

The Tobit regression results from Table 8 reveal that the likelihood ratio statistics as shown by the chi-square value are highly significant (P < 0.000) indicating that the model has a strong explanatory power. Variance Inflation Factors were used to test for multicollinearity among the variables, and were all below 10, with a mean value of 1.58. The result shows that educational qualification and rural-urban background significantly influence extension agents’ knowledge on professionalization.

The coefficient of educational qualification (3.856, p <0.01) of the extension agents was positive and significant. This indicates that there was a direct relationship between their educational qualification and their knowledge level on professionalization of extension services. An increase in the extension agents’ level of education will lead to a marginal increase in their knowledge on professionalization by 3.856. This conforms to apriori expectations, as an increase in extension agents’ educational qualification will enhance their knowledge and cause them to better appreciate the benefits that professionalization will inject into the sector, thereby increasing their innovativeness and rational disposition towards it. Several studies have also note educational level as a determinant of extension agents’ knowledge on innovations and agriculturally related contemporary issues (Ajayi, 2013; Oladele, 2011).

The extension agents’ rural-urban background was seen to have a reasonable contribution to their knowledge on professionalization. The coefficient of background (0.794) was positive and statistically significant (p < 0.05) in the model. The result indicates that there is a direct relationship between the public and private extension agents’ background and their knowledge on professionalization of extension services. Their background had the probability of increasing their knowledge on concepts of professionalization by 0.794. This is expected, as the majority were from the rural, agricultural areas, thus already exposing them to the terrain and challenges faced by farmers which may have made them more motivated to obtain information and knowledge on professionalization, thereby enabling them to render more effective and professional service to their clients.
Table 8
\textit{Tobit Regression Result of Socio-Economic Factors Influencing Extension Agents’ Knowledge on Professionalization}

| Variables                  | B(SE)      | t-stat | \(P > |t|\) | VIF |
|----------------------------|------------|--------|-------------|-----|
| Age                        | -0.102(0.078) | -1.31  | 0.193      | 1.82 |
| Gender                     | 0.287(0.410)  | 0.70   | 0.485      | 1.04 |
| Household Size             | 0.011(0.127)  | 0.09   | 0.929      | 1.99 |
| Educational Qualification  | 3.856(0.326)** | 11.82  | 0.000**    | 1.94 |
| Higher degree              | 0.463(0.552)  | 0.84   | 0.402      | 1.45 |
| Years of Experience        | 0.024(0.077)  | 0.31   | 0.753      | 1.75 |
| Number of Community        | 0.019(0.015)  | 1.25   | 0.211      | 1.06 |
| Rural-Urban Background     | 0.794(0.377)* | 2.10   | 0.036*     | 1.56 |
| (Constant)                 | 50.849(3.334)** | 15.25  | 0.000**    |       |

/sigma 3.267(0.130)

LR Chi2 (8) 283.64
Prob > Chi² 0.000
Pseudo R² 0.1390
Log likelihood -878.6376
Uncensored observations 325
Left censored observation 1 (Minimum \(\leq\) 50)
Right censored observation 30 (Maximum \(\geq\) 72)

Note: ** and * signifies significance at 1% and 5% levels respectively.

\textit{Conclusion, Recommendations & Implications}

Ensuring sustainable agricultural development in many countries hinges on vibrant, effective and efficient extension services. The professionalization of these services has been noted as an important way of unlocking its potential, ideally facilitating the much desired attributes of integrity, credibility, accountability and competence of extension service providers. This survey, carried out in the South West area of Nigeria, has provided insight on extension agent knowledge regarding professionalization and its components, the observed disparities in the level of knowledge between them needs to be addressed.

The findings also revealed that educational level and background were significant influencers of their knowledge on professionalization. This suggests that those who are more educated and focused on pursing higher degrees are more knowledgeable about professionalization, and therefore more likely to support professionalization implementation. These findings have implications for educating and training extension agents on professionalization. If agent knowledge on professionalization is limited, their attitude, perception and behavior may not be favorable towards professionalization, which could ultimately hinder the progress for its smooth implementation.
This is even more salient, as they are major stakeholders in the extension sector.

Therefore, seminars and workshops on professionalization should be held for agents in the extension organizations with greater focus on the public extension agencies, to enhance their knowledge and capacity regarding the concept, intricacies and potential benefits of professionalization on service delivery. In addition, there is need for extension agencies to support continuous professional development through training and acquiring relevant higher degrees, as stated in the requirements for professionalization. Moreover, the curriculum in tertiary institutions where extension agents are trained should be reviewed, and knowledge on professionalization and associated issues incorporated. Each of these recommendations will assist in institutionalizing professionalization in the agricultural extension sector. In due course, this will serve to enhance a competent, accountable and effective extension and advisory services delivery that is focused on driving sustainable agricultural development.

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perceived risk. *Environment and Behavior, 47*(2), 205-234.


Explaining Agriculture Faculty Members’ Involvement in Study Abroad: Structural Relationships Among Personal-Dimension Variables

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J.C. Bunch
University of Florida

J. Joey Blackburn
Michael Burnett
Louisiana State University

Abstract
Agriculture faculty members’ involvement in study abroad programs can influence students’ participation in such. However, faculty members’ involvement may be limited by institutional, professional, and personal factors. This study was conducted to explain agriculture teaching faculty members’ involvement in study abroad programs by examining the structural relationships between their study abroad involvement and personal dimension variables. Results indicated the personal factors influencing faculty members’ involvement in study abroad include their perceptions of the knowledge, skill, and ability (KSA) outcomes of study abroad, awareness of study abroad programs and procedures, and prior international experience (PIE). The effect of faculty members’ perceptions of the KSA outcomes of study abroad programs on their involvement was mediated by their perceptions of the importance of those KSA outcomes for professionals in their field. Further, faculty members’ perceived importance of KSA outcomes was moderated by PIE. Recommendations for future practice include providing professional development and training to increase faculty members’ awareness of study abroad and increase opportunities for faculty members to gain international experiences. Future research should include replication of this study with agriculture faculty members at other institutions and the examination of relationships among professional and institutional dimension factors.

Keywords: agriculture faculty, faculty involvement, personal factors, study abroad
Introduction

Initiatives to produce globally competent students have transpired across many U.S. institutions over the past decade (American Council on Education [ACE], 2012; Green, 2012). Efforts have been directed to the development and promotion of study abroad opportunities as a means of supplementing on-campus initiatives to internationalize the educational experience of students (ACE, 2012; Childress, 2009). A steady increase in student participation in study abroad programs has been observed in recent years (Institute of International Education [IIE], 2016), much of which can be attributed to the shift from traditional, semester-long programs to short-term, faculty-led programs (Dwyer, 2004; IIE, 2016; McCabe, 2001; Zamastil-Vondrova, 2005). However, room for growth remains in current study abroad participation to meet national study abroad participation goals by 2020 (IIE, 2016).

University faculty can be an influential force behind student behavior (National Survey of Student Engagement [NSSE], 2008; O’Hara, 2009). Although influence of parents and friends has also been found to influence the perceptions and behaviors of students, faculty may be a more assessible population through which study abroad goals can be reached. O’Hara (2009) maintained it is largely inconceivable a student would graduate without having had significant interactions with faculty members. Moreover, Green and Olson (2003) identified faculty members’ engagement as a driving force behind successful internationalization and noted this encompassed teaching, research, service, and advising appointments of faculty.

With increased student interest in short-term, faculty-led study abroad experiences, there exists an even more pressing need to involve agriculture faculty in study abroad efforts. In addition to leading a program, faculty study abroad involvement can be operationalized to include a wider range of activities such as (a) disseminating study abroad information to students, (b) encouraging students to study abroad, and (c) assisting students through the process of studying abroad (Lukosius & Festervand, 2013; O’Hara, 2009; Rampold, Bunch, Cater, Blackburn, & Burnett, 2018; Umbach & Wawrzynski, 2005). However, Rampold et al. (2018) found agriculture faculty members were only minimally involved in these activities.

Research is needed to examine factors that may influence faculty involvement. Moreover, this area of research would benefit from a comprehensive framework to better examine relationships between factors and explain faculty members’ involvement in study abroad programs.

Literature Review & Conceptual Framework

The Faculty Engagement Model (FEM) by Wade and Demb (2009) was modified by Rampold et al. (2018) to include (a) institutional, (b) professional, and (c) personal dimension factors influencing faculty members’ involvement in study abroad learning experiences (see Figure 1).

For the purpose of this study, specific variables within the model’s personal dimension were identified from an extensive review of literature and incorporated as an expansion of the original conceptual model to explain faculty members’ involvement in study abroad programs (see Figure 2).
**Professional Dimension**
Professional dimension factors may include attributes such as faculty members’ rank/tenure, characteristics of academic department, and field of study.

**Institutional Dimension**
Characteristics of the institution such as international mission statement, study abroad priorities, and communication of priorities across members.

**Personal Dimension Factors**
May include attributes such as faculty members’ attitude/beliefs, knowledge, demographics, and prior international experience.

**Involvement in Study Abroad Programs**
Faculty members’ activities such as informing, encouraging, and promoting programs; assisting with study abroad process; connecting students with international programs.

*Figure 1. A conceptual model to assess faculty members’ involvement in study abroad (as cited in Rampold, Bunch, Cater, Blackburn & Burnett, 2018)*
Personal Dimension

The personal dimension variables hypothesized to influence faculty members’ involvement in study abroad programs include their (a) attitudes/beliefs regarding the importance of study abroad (e.g., perceptions of KSA outcomes produced by study abroad experiences and the importance of those KSAs for professionals in their field); (b) knowledge and awareness of study abroad opportunities (e.g., available programs, international programs office through which students study abroad, and study abroad policies and procedures); and (c) prior international experience (e.g., personal and professional experiences [see Figure 2]).

Beliefs and attitudes. Faculty members’ perceptions of the importance and effectiveness of study abroad programs can influence their involvement in such activities. If faculty members perceive study abroad participation as an effective means of producing important learning outcomes among students, they may be more likely to engage in activities to facilitate study abroad participation by their students (Green & Olsen, 2003; NSSE, 2008; Paus & Robinson, 2008). However, faculty members may be less inclined to engage in
study abroad activities if they do not perceive studying abroad as a valuable or effective endeavor (Green & Olsen, 2003). Navarro and Edwards (2008) examined what skills, competencies, and experiences agriculture teaching faculty members perceived to be priorities for the undergraduate agricultural curriculum. Faculty participants in the study ranked emphasizing international awareness or experience last on the priority list (Navarro & Edwards, 2008). Rampold et al. (2018) found agriculture faculty members agreed learning outcomes of studying abroad were important for agricultural professionals, but they agreed less that study abroad programs generate those outcomes. Research is needed to examine the influence of these beliefs on agriculture faculty members’ involvement in study abroad programs.

Prior international experience. Faculty members’ prior international experiences can influence their perceptions of and involvement in study abroad learning experiences. Akpan and Martin (1996) found that agriculture faculty who had traveled to a foreign country held more positive perceptions of internationalizing the agricultural education curriculum than faculty members who did not have international experiences. In prior studies conducted with non-agriculture faculty, the degree of international experience acquired by faculty members influenced (a) their personal attitudes and beliefs, (b) their attitudes and behaviors in their professional settings, (c) the likelihood they would incorporate international components into their teaching, research and service responsibilities, and (d) the attitudes and behaviors of their students (ACE, 2012; Bond, Qian, & Huang, 2003; Dooley, Dooley, & Carranza, 2008; Finkelstein, Walker, & Chen, 2013; Green & Olsen, 2003; Hulstrand, 2009; O’Hara, 2009; Stanford Research Institute [SRI], 2002). International experiences can also help faculty members expand their own international knowledge and awareness and motivate them to share that knowledge with their colleagues and students (Hulstrand, 2009). In a study conducted to examine outcomes of the U.S. Fulbright Scholar Program, the majority of faculty participants (a) developed a greater understanding of their host country and shared that information with colleagues, (b) continued to collaborate with host country or institutional colleagues, and (c) incorporated their experiences into their curricula or teaching methods (SRI, 2002). In a follow up study with the Fulbright participants, 80% of the faculty members reported having encouraged their students to study abroad (O’Hara, 2009). Similar to O’Hara (2009), Hulstrand (2009) found faculty members’ international experience influenced their degree of involvement in study abroad activities. In turn, students with internationally engaged and experienced professors were more likely to pursue international opportunities themselves.

Experiences abroad can also aid faculty members in leading study abroad programs. Good (2008) examined the informal preparation of faculty study abroad directors and found the international experiences of some faculty members better prepared them to lead students abroad. The types of international experiences acquired by the faculty members included (a) study abroad participation as a student, (b) attending a seminar or international conference abroad, (c) studying a foreign language abroad, (d) working or volunteering in another country, and (e) conducting research abroad. Some faculty members also noted the most helpful experience was their first experience as study abroad directors (Goode, 2008).

To the contrary, Woodruff (2009) concluded increased international
experiences among faculty members did not directly translate into increased efforts by those faculty members to promote study abroad opportunities to their students. Faculty members in the study who had international experiences held positive so than faculty members with fewer international experiences (Woodruff, 2009). The inconclusive findings observed across research in this area warrant further examination of the relationship between faculty members’ international experiences and their degrees of involvement in study abroad programs.

Knowledge and awareness. The extent to which faculty members are involved in study abroad programs also may be explained by (a) their knowledge and awareness of study abroad opportunities, (b) administrative policies and processes associated with such, and (c) the international programs office on their respective campuses (Bond et al., 2003; Doyle et al. 2010; Lukosius & Festervand, 2013; Woodruff, 2009). Lukosius and Festervand (2013) found faculty members’ knowledge of administrative procedures was vital in reducing the likelihood students would drop out of study abroad programs. However, faculty members’ lack of knowledge and awareness of study abroad programs and processes has been reported as an inhibiting factor in their involvement (Bond et al., 2003; Doyle et al., 2010). Faculty members’ lack of knowledge and awareness may, therefore, counteract factors that would otherwise motivate their involvement in study abroad programs. For example, faculty members’ knowledge may explain why Woodruff (2009) found no differences in their involvement based on prior international experiences. Faculty members in the study who had prior international experiences held positive perceptions of study abroad learning experiences, but reported having a lack of knowledge and awareness of study abroad opportunities available to their students (Woodruff, 2009). An examination of the relationships between factors influencing faculty members’ involvement is needed to understand better the complex interactions of these factors and how they may influence their involvement.

Personal interest in leading a study abroad program. Faculty members’ involvement in study abroad learning experiences was operationalized intentionally in this study to include a range of activities in addition to leading study abroad programs. However, increasing student participation in study abroad learning experiences is highly dependent on having faculty members willing to lead such programs (Stohl, 2007). Barriers to faculty members’ involvement in leading study abroad programs identified in prior studies have included (a) time constraints, (b) perceived lack of support from administration, and (c) lack of guidance and formal preparation (Dewey & Duff, 2009; Goode, 2008). Dewey and Duff (2009) examined barriers to faculty involvement in leading study abroad programs and reported faculty members emphasized the issue of time required to develop or direct such programs. Moreover, faculty members noted that, considering the amount of time and work required, it was discouraging or even off putting when administrators viewed their participation in leading study abroad programs as merely a fringe benefit (Dewey & Duff, 2009). Faculty members in the study also identified the lack of useful templates or guidelines for initiating a new study abroad program as problematic (Dewey & Duff, 2009). Goode (2008) examined the formal and informal preparation of faculty study abroad directors and found faculty members had little to no formal preparation, nor did they perceive
their academic programs supported their interests in leading a study abroad program.

Further involvement of agriculture faculty members in study abroad programs is needed (Rampold et al., 2018). Research to examine the factors influencing agriculture faculty members’ involvement in study abroad learning experiences can help inform future practice and policy to facilitate their participation in such. Moreover, because faculty members’ involvement in study abroad programs has been found to influence students’ decisions to participate in such programs (Lukosius & Festervand, 2013), research may provide recommendations that help increase study abroad participation rates by agriculture students.

**Purpose & Objectives**

This study sought to explain agriculture faculty members’ involvement in study abroad programs by examining the structural relationships among faculty members’ study abroad involvement and personal dimension variables. The objectives of this study were (a) to describe personal dimension factors of agriculture faculty members, including their perceptions of the importance of study abroad programs for students and personal interest in leading such programs; and (b) to develop a model to explain faculty members’ involvement in study abroad programs in terms of personal dimension factors.

**Methodology**

**Population**

The targeted population of this study was all faculty members employed in the colleges of agriculture at Louisiana State University (LSU; N = 173) and the University of Florida (UF; N = 388) who held a formal teaching appointment at the time the study was conducted (combined N = 561). Frame error was discovered during analysis, and a total of 50 faculty were removed due to not meeting the a priori criteria of holding a formal teaching appointment. In addition, one faculty member opted out, which yielded a revised population frame of 510 faculty members. Useable responses were collected from 184 faculty members for a 36% response rate.

Participants were employed in the colleges of agriculture at LSU (f = 54; 29%) and UF (f = 130; 71%). Regarding professional status, more faculty members held the rank of professor (f = 74; 40%) and a majority were tenured (f = 109; 59%). Slightly more faculty members were male (f = 103; 56%), and a majority were White, Non-Hispanic (f = 149; 81%).

**Data Collection**

A modified approach to Dillman’s, Smyth’s and Christian’s (2009) Tailored Design Method was employed to collect responses. Electronic mail (email) listservs of agriculture teaching faculty members from LSU and UF were obtained from college administrators and used to distribute an online questionnaire via Qualtrics. The initial email to faculty members included a description of the study and a link to the questionnaire. Follow up reminders were sent weekly for two weeks following initial contact. Due to low response, a fourth and final reminder was sent.

Given the 36% response rate, differences in respondents and non-respondents may exist. Using a university distribution list restricted the ability to compare respondents and non-respondents and was a limitation of this study. However, the following methods were employed during the survey’s design and data collection processes to help generate higher response and completion rates: (a) critical attention was given to survey length so that the time needed to complete the instrument would not be a barrier to participation; (b)
progress bars were included in the online questionnaire rather than item numbers; and (c) three follow-up reminder emails were sent to non-respondents encouraging their participation (Couper, Traugott, & Lamias, 2001; Dillman et al., 2009).

**Instrumentation**

An original instrument was developed by the researchers to assess agriculture teaching faculty members’ involvement in and perceptions of study abroad learning experiences for students. To ensure content validity, an extensive review of literature was conducted to identify (a) activities associated with study abroad programs in which faculty members can be involved, (b) the knowledge, skills, and abilities (KSAs) most frequently identified as outcomes of study abroad programs, (c) institutional- and individual-level factors found to influence agriculture faculty members’ involvement in and perceptions of study abroad programs, and (d) factors that influence agriculture faculty members’ involvement in and perceptions of other components of internationalizing higher education that may be transferrable to study abroad programs. The questionnaire was then reviewed for content validity by an expert panel consisting of faculty members with collective proficiencies in study abroad program development and instrument development. The panel deemed the instrument acceptable. Post hoc reliability estimates for the instrument’s constructs, i.e., KSA outcome agreement, KSA outcome importance, and study abroad awareness, were calculated using Cronbach’s alpha and reported below.

Seven sections of a larger survey instrument were used for data analysis in this study: (a) involvement in study abroad programs; (b) perceived importance of study abroad for students; (c) agreement with KSAs as outcomes of studying abroad; (d) perceived importance of KSA outcomes; (e) awareness of study abroad programs and procedures; (f) personal interest in leading study abroad programs for students; and (g) prior international experience.

The first section of the instrument was designed to assess the involvement of faculty members in activities associated with increasing student participation in study abroad programs. To measure involvement, faculty members’ responses to check all that apply items were coded (0 = item not selected; 1 = item selected), and a composite score was computed. Participants were asked to indicate by checking all that apply regarding which of the 12 activities they had been engaged. Examples of the activities listed included: “I have encouraged students I teach/advise to study abroad”; “I have used time in class to inform students I teach of study abroad opportunities in the College of Agriculture”; and “I have helped design a study abroad program for students.”

The second section of the instrument included a single Likert-type response item to assess faculty members’ level of agreement with this statement: “I believe study abroad is important for students.” Responses were collected using 6-point Likert-type response options: 1 = disagree strongly, 2 = disagree, 3 = disagree slightly, 4 = agree slightly, 5 = agree, and 6 = agree strongly. Real limits were set for the interpretation of the responses: 1.00 to 1.50 = disagree strongly; 1.51 to 2.50 = disagree; 2.51 to 3.50 = disagree slightly; 3.51 to 4.50 = agree slightly; 4.51 to 5.50 = agree; and 5.51 to 6.00 = agree strongly.

The third section of the instrument measured faculty members’ perceptions of the KSAs students may develop as a result of studying abroad. This construct included seven items. These items were the KSAs reported most frequently across the relevant body of literature as being student outcomes of studying abroad. Participants were asked.
to indicate their agreement with statements such as “studying abroad increases students’ acceptance of other cultures” and “studying abroad increases students’ knowledge of global issues.” Responses were collected using the previously mentioned 6-point Likert-type scale of agreement, and the same real limits were used for the interpretation of responses. An overall mean was calculated to represent faculty agreement with KSAs as student outcomes of studying abroad. The internal reliability estimate for this scale was $\alpha = .92$.

The fourth section of the instrument measured faculty members’ perceptions of the importance of select KSAs for professionals in their field. The KSA outcome importance construct comprised 10 items intended to mirror the items in the KSA agreement construct. Faculty members were asked to indicate their agreement with statements such as “being accepting of other cultures is important for professionals in my field” and “having knowledge of global issues is important for professionals in my field.” Responses were collected using the same 6-point Likert-type scale of agreement. The same real limits described above were used for the interpretation of responses. An overall mean was calculated to represent agriculture faculty members’ perceptions of KSA importance. The internal reliability estimate for this scale was $\alpha = .94$.

The fifth section of the instrument assessed faculty members’ knowledge and awareness of study abroad programs and associated policies and procedures. The study abroad awareness construct included five items representative of the areas in which faculty need to be familiar to facilitate student participation in study abroad programs. Faculty were asked to indicate their agreement with statements such as “I am aware of study abroad opportunities for my students” and “I am familiar with the process of transferring study abroad credits to students’ degree plans at home.” Responses were collected using the previously mentioned 6-point Likert-type scale of agreement, and the same real limits were used for the interpretation of responses. An overall mean was calculated to represent agriculture faculty members’ awareness of study abroad programs, policies, and practices. The internal reliability estimate for this scale was $\alpha = .87$.

The sixth section of the instrument assessed the prior international experience (PIE) of agriculture faculty members. Faculty members’ responses to check all that apply items were coded (0 = item not selected; 1 = item selected), and a composite score was computed. Participants were asked to indicate by checking all that apply regarding which of the 13 experiences they had acquired. Examples of the activities listed included: “I have participated in international activities on campus”; “I have worked in a country other than the U.S.”; and “I have participated in a study abroad program for faculty.”

Faculty members were also asked to indicate their personal interest in leading a study abroad program for students. Responses were collected using a 4-point Likert-type scale: 1 = definitely no, 2 = probably no, 3 = probably yes, and 4 = definitely yes. Real limits were set for the interpretation of responses: 1.00 to 1.50 = definitely no; 1.51 to 2.50 = probably no; 2.51 to 3.50 = probably yes; and 3.51 to 4.00 = definitely yes.

**Data Analysis**

Findings for objective one were reported through means and standard deviations. For objective two, structural equation modeling (SEM) was employed to examine structural relationships between variables predicted to influence faculty involvement in study abroad programs. SEM
was selected due to its predictive ability, as well as the capacity to examine the mediating effect of variables for which direct effects may not have been observed. SEM procedures were conducted using the MPlus 7.31 software package. Indices of absolute fit included the standardized root mean square residual (SRMR) and Steiger’s (1999) root mean square error of approximation (RMSEA), with smaller values indicating a better fit to the data. SRMR values range from 0 to 1, with values less than .08 indicating a good fit (Hu & Bentler, 1999). RMSEA values below .10 indicate a good fit, and values below .05 indicate a very good fit (Steiger, 1990).

Indices of comparative fit included the comparative fit index (CFI) and the Tucker-Lewis Index (TLI). The CFI ranges from 0 to 1, with values exceeding .95 indicative of a good fit (Hu & Bentler, 1999). The TLI, or non-normed fit index, is a measure of incremental fit that attempts to (a) capture the percentage improvement of a hypothesized model over the null model, and (b) adjust this improvement for the number of parameters in the hypothesized model. Values exceeding .95 indicate a good fit (Hu & Bentler, 1999).

Findings

Objective One

Objective one sought to describe agriculture teaching faculty members’ perceptions of the importance of studying abroad for students, as well as their personal interests in leading a study abroad program. Descriptive information for other variables examined in this study were reported previously in Rampold et al. (2018) and not reported in this article. Agriculture faculty members agreed that studying abroad was important for students ($M = 5.17; SD = .86$), and they indicated probable interest ($M = 2.71; SD = .94$) in leading a study abroad program for students.

Objective Two

Objective two sought to develop a model to explain agriculture teaching faculty members’ involvement in study abroad programs in regard to personal factors. The dependent variable was faculty members’ involvement in study abroad. Independent variables included (a) their agreement with KSAs as student learning outcomes of study abroad participation, (b) their study abroad awareness, and (c) PIE. Possible mediating variables included perceptions of the importance of KSA outcomes and perceived importance of studying abroad.

The chi-square statistic for the full mediation model (see Table 1, Model 2[M2]) was statistically significant at the .001 level. The absolute fit index for SRMR (.092) was borderline, and RMSEA (.093) was within Steiger’s recommended range of values for good fit of the data. Further, the comparative fit indices CFI and TLI did not meet the recommended cutoff value of .95 (Hu & Bentler, 1999; see Table 1, M2). As such, this model was not considered a good fit and a partial mediation model was examined. The chi-square statistic was significant at the .001 level for the first partial mediation model (see Table 1, M3). The absolute and comparative indices showed mixed results with slight improvements to SRMR and TLI; however, the overall model did not suggest a good fit for the data (see Table 1, M3). As such, two exploratory partial mediation models were examined (see Table 1, M4, M5). The chi-square statistic was significant at the .001 level for both models. Again, neither absolute nor comparative indices for either model suggested a well-fitted model. The absolute index SRMR as well as the comparative indices CFI and TLI were slightly better for the second exploratory
partial mediation model (see Table 1, M5). As such, this model was deemed the best fit of the four models examined (see Figure 3).

Table 1

<table>
<thead>
<tr>
<th>Model</th>
<th>X²</th>
<th>df</th>
<th>RMSEAa</th>
<th>CFI</th>
<th>TLI</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null (M1)</td>
<td>69.01</td>
<td>19</td>
<td>.092</td>
<td>.908</td>
<td>.869</td>
<td>.143</td>
</tr>
<tr>
<td>Full (M2)</td>
<td>764.80***</td>
<td>272</td>
<td>.093</td>
<td>.843</td>
<td>.827</td>
<td>.092</td>
</tr>
<tr>
<td>Partial 1 (M3)</td>
<td>742.56***</td>
<td>269</td>
<td>.091</td>
<td>.849</td>
<td>.832</td>
<td>.080</td>
</tr>
<tr>
<td>Partial 2 Exploratory (M4)</td>
<td>751.64***</td>
<td>270</td>
<td>.092</td>
<td>.847</td>
<td>.830</td>
<td>.089</td>
</tr>
<tr>
<td>Partial 3 Exploratory (M5)</td>
<td>738.53***</td>
<td>270</td>
<td>.091</td>
<td>.851</td>
<td>.834</td>
<td>.083</td>
</tr>
</tbody>
</table>

Note: RMSEA, Root-Mean-Square Error of Approximation; CFI, Comparative Fit Index; TLI, Tucker-Lewis Index; SRMR, Standardized Root-Mean-Square Residual.

All factors in the model contributed to faculty members’ involvement in study abroad programs to varying degrees (see Figure 3). Faculty members’ awareness of study abroad had a direct effect on their involvement. The effect of faculty members’ agreement with KSAs as student learning outcomes of studying abroad on their involvement in study abroad programs was partially mediated by faculty members’ perceptions of the importance of KSA outcomes for professionals in their field, as well as by perceptions of the overall importance of students studying abroad. In addition, faculty members’ perceptions of the importance of KSA outcomes for professionals in their field were partially moderated by the PIE they had acquired.

Conclusions & Recommendations

Although none of the models met the criteria for a well-fitted model, all of the models exhibited elements of close fit in some areas with marginal fit in others. Per the accepted model, the personal dimension factors that predicted agriculture teaching faculty members’ involvement in study abroad programs include their (a) agreement with KSAs as student learning outcomes of studying abroad, (b) perceived importance of those KSA outcomes for professionals in their fields, (c) perceived overall importance of studying abroad, (d) awareness of study abroad programs and procedures, and (e) PIE.

‘The effect of faculty members’ agreement with KSAs as being student outcomes of study abroad programs on their involvement in such learning experiences was partially mediated by their perceptions of the importance of those outcomes and the overall importance of study abroad experiences for students. As indicated by the relationships observed in the accepted model (see Figure 3), faculty members who perceived studying abroad produces KSA outcomes among students will perceive studying abroad as more important and are more likely to be involved if they also view such outcomes as important for professionals in their field.
The findings of this study and prior research support the notion that convincing faculty of the value of study abroad programs can positively influence their involvement in such (Green & Olsen, 2003; Paus & Robinson, 2008). Therefore, future research should examine why agriculture faculty members perceive some KSAs are outcomes of studying abroad, and why they view those KSAs as important for professionals in their field. Some academic disciplines tend to be more global in nature and have more obvious international relevance than others, which may influence faculty members’ perceptions depending on their discipline (Bond et al., 2003; Ellingboe, 1988). As such, it may be beneficial to include academic discipline as a variable in future models to explain faculty members’ perceptions of the importance of such KSA outcomes.

Faculty members’ perceived importance of KSA outcomes was moderated by their PIE. Consistent with prior research, faculty members in this study were more likely to perceive KSA outcomes of studying abroad as important for professionals in their field if they had acquired international experiences themselves (ACE, 2012; Akpan & Martin, 1996; O’Hara, 2009). Therefore, efforts should be directed toward increasing international opportunities for faculty members. Gaining international experience has been identified frequently as influencing faculty members’ perceptions of the importance of such KSA outcomes.
involvement in internationally-focused educational activities, such as study abroad programs (ACE, 2012; Akpan & Martin, 1996; Bond, 2003; Dewey & Duff, 2009; Dooley et al., 2008; Green & Olsen, 2003). However, less research exists regarding which types of international experiences best influence faculty members’ involvement in or perceptions of study abroad learning experiences. Qualitative inquiries to explore how specific international experiences have impacted faculty members’ beliefs regarding study abroad programs may aid in determining the types of opportunities that should be offered to faculty.

Faculty members’ awareness of study abroad programs and procedures had a direct effect on their involvement. Faculty members were more likely to be involved in study abroad programs if they were aware of such opportunities and associated processes (Bond et al., 2003; Doyle et al., 2010; Woodruff, 2009). Therefore, future efforts should be directed toward faculty professional development and training regarding study abroad programming. Such efforts may include informational sessions or seminars designed to inform faculty members of upcoming study abroad programs within their departments and communicate to faculty how those programs may benefit their students, especially in regard to their future graduates’ careers.

The complexity of the model employed in this study posed limitations regarding its power to explain fully the influence of personal dimension factors on agriculture faculty members’ involvement in study abroad programs. As such, it would be beneficial to explore separate, more simplified models in future research to explain better the personal dimension factors influencing faculty members’ involvement in study abroad programs. Considering the small number of respondents in this study, this research should be replicated to include more agriculture faculty members from other institutions. Future research should also examine relationships between professional- and institutional-dimension variables and their impact on faculty members’ involvement in study abroad programs. Inclusion of such variables in future models may help provide institutions and their departments of agriculture practical recommendations for involving their faculty in study abroad programs.

References


http://nsse.indiana.edu/NSSE_2008_Results/docs/withhold/NSSE2008_Results_revised_11-14-2008.pdf


Critical Action Inquiry for the Establishment of a Global Food Security Graduate Certificate in Latin America and the Caribbean at Texas Tech University

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Abstract
The purpose of the study was to determine the topics and courses of a graduate certificate focusing on Global Food Security (GFS) for Latin America and the Caribbean (LAC) through critical action inquiry. GFS is a major issue worldwide that will continue to expand in years to come. Almost 795 million people are estimated to have suffered from chronic hunger globally in 2014-2016. Studies have shown the strong relationship between education and food security and we do not argue for causation, merely association. For this reason, curricula focused on teaching GFS to graduate students will enable professionals in international settings to manage the complexities of food security more effectively. For this critical action inquiry study, identification of the content was the result of a three-round Delphi study performed with experts from LAC and its comparison with the result of the Texas Tech University (TTU) professors survey to determine the topics and courses. Of the 91-originally-identified topics, 40 reached experts’ consensus. The topics were then grouped into 23 courses. Faculty from TTU also ranked the courses. In the end, seven courses emerged from the research. The curriculum was approved and directed toward professionals in Latin America and the Caribbean. The courses for the online and face-to-face delivery of this multidisciplinary graduate certificate comprise the four pillars of food security and cross-cutting topics.

Keywords: Delphi, food security, critical action research, curriculum, experts
Introduction

With close to almost 800 million people still suffering from chronic malnourishment worldwide, global food insecurity continues to be a major issue at the forefront of discussions among policymakers across the globe (Food and Agriculture Organization of the United Nations [FAO], International Fund for Agricultural Development [IFAD], & World Food Programme [WFP], 2015a). According to the FAO (2009a p. 1), the definition of food security is: “when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.” This definition addresses the four pillars of food security: Availability, Access, Utilization, and Stability (FAO, 2009a). Food insecurity is a complex problem that could be exacerbated as the population grows in years to come (Spiertz, 2012). This global problem affects all countries and needs to be addressed because “the situation is an affront to humanity dignity, a social disease and a threat to democracy” (Inter-Parliamentary Union, 1996, paragraph 2). Currently, the percentage of undernourished people worldwide has been reduced from 23.3% in 1990-1992 to 12.9% in 2014-2016 (United Nations [UN], 2015). However, when measuring the quantity of people, between 2014 and 2016, there were still 795 million people that continue to suffer from chronic hunger (FAO et al., 2015a).

The third target of the first objective of the UN Millennium Development Goals (MDG) was to reduce the proportion of people who suffer from hunger in half from 1990 to 2015 (UN, 2015). This third target was accomplished in over half of the developing countries; (FAO et al., 2015a). However, regionally, there are several differences in status of goal achievement (UN, 2015). In addition, the World Food Summit (WFS) established the goal to “eradicate hunger in all countries, with an immediate view to reducing the number of undernourished people to half their present level no later than 2015” (FAO, 1996). This initiative was less successful than the first MDG, but still 29 developing countries did manage to achieve the objective of halving the number of undernourished people (FAO et al., 2015a).

The MDG and WFS challenges ended in 2015; for this reason, the UN proposed new strategies to eradicate poverty in all forms through the Sustainable Development Goals (SDGs) (UN, n.d.). The SDGs are much more ambitious than the MDGs because they pursue peace and freedom by 2030 (Sustainable Development Knowledge Platform, 2015). For this reason, efforts must be multiplied in order to accomplish the goals proposed by the UN to the world.

Food Security in Latin America and the Caribbean

Latin America and the Caribbean (LAC) is one of the most successful regions in reducing the percentage of undernourished people. This region reduced undernourishment from almost 14% to less than five, and the actual number of undernourished people decreased by almost half (FAO et al., 2015a). As a result of its progress, the region has accomplished the MDG and the WFS goals (FAO et al., 2015a). In spite of the overall progress in the region, work remains to be done. The most recent data indicate that food security in the region began to deteriorate, showing an increase in the percentage of undernourishment (FAO et al., 2017).

In January 2015, the Economic Commission for Latin America and the Caribbean [ECLAC, CELAC for its acronym in Spanish] signed the “Plan for Food Security, Nutrition, and Hunger
“Eradication 2025” with the purpose of completely eliminating hunger by 2025 (FAO, ECLAC, & Latin American Integration Association [ALADI], 2015b; Food and Nutrition Security Platform, 2015). The plan consists of four specific components: human rights, stable food production, nutritional security, and expanding access to food (ECLAC, 2013).

By 2050, food production will need to almost double in order to ensure the food security of the global population that is estimated to reach 9.7 billion (UN DESA, 2015). Food insecurity is an important issue and because of its complexity, it is a long and difficult challenge and cannot be adequately addressed with only one strategy (FAO et al., 2015a). Consequently, different strategies to approach the problem have been identified (FAO, IFAD, & WFP, 2012). One of these strategies is through education.

Research indicates that education is a key component to address the food insecurity phenomenon. Education is a foundation for building skills, knowledge, and technical capacity in order to facilitate the development of the most vulnerable regions (IFAD, 2010). Education can increase people’s economic capacity; thus, facilitating greater food security through enhanced purchasing power (IFAD, 2010; Nordin, Boyle, & Kemmer, 2013). However, in order to provide a quality education, educators themselves need to have the necessary tools and knowledge to share with their students and stakeholders. Having educators, researchers, and other professionals with the necessary tools to combat food insecurity is fundamental in addressing the global food security challenge (Roberts, Harder, & Brashears, 2016). Thus, a curriculum in GFS must include as an objective the preparation of professionals to understand the problem and its possible solutions.

Conceptual Framework

This study is based on the Framework of Course Development Processes proposed by Graves (2000) focused on the needed steps for effective curriculum design (Figure 1). Graves suggests the model is not linear because a course design can start in any of the components (Graves, 2000). Designing a course is a dynamic process that involves different parties (Graves, 1996). The elements in the circles are the ones to be elaborated in this study, which are: defining the context, assessing needs, conceptualizing content, and formulating goals and objectives.

Defining the context was determined by the researcher; the curriculum will be a graduate certificate focused on GFS for LAC stakeholders. The certificate will be distance-delivered in order to reach graduate students throughout region. In conceptualizing content, the pillars of the course content have to be determined and articulated and will be used to frame the study. Assessing needs refers to students’ needs and how to better understand them. The Delphi study will provide the necessary information to determine the topics and courses of importance with the goal of preparing graduate students to overcome the regional challenges. The designer has also to formulate the goals and objectives to have a clear purpose and identify the outcomes. In this case, the goal of the certificate is to give students the necessary tools to gain knowledge related to food security, to make informed decisions, and prepare them for leadership positions. These three components will be determined using the results of the Delphi study. The remaining components of Graves’ model can then be elaborated by each instructor according to his or her beliefs and expertise.
Purpose and Objectives
The purpose of the study was to develop a graduate certificate in GFS for Latin America and the Greater Antilles of the Caribbean through critical action inquiry. The following research objectives were developed to create an online graduate certificate focusing on GFS for LAC:
1. Identify the specific topics that should be included
2. Determine the specific courses that should be included
3. Compare the LAC and Texas Tech University (TTU) faculty selection of courses

Methodology
The study was designed as critical action research due to its application in curriculum development (Ary, Jacobs, Razavieh, & Sorensen, 2010). Critical action inquiry is participatory, helps to understand a phenomenon within a context, and the knowledge will ultimately result in social change (Mills, 2000). The study consists in three phases (Figure 2).
Phase I – Reflect
Gathering the information necessary to understand the problem (Mertler, 2009). Researchers reviewed the existing information related with food insecurity in the world and LAC, and the importance of education in reducing food insecurity.

Phase II – Plan
Collect the information needed (Ary et al., 2010). To complete this phase, a Delphi study and a survey to the professors from TTU were used.

Delphi study. The Delphi technique is recommended for curriculum development (Linstone & Turoff, 2002; Custer, Scarcella, & Stewart, 1999). This methodology utilizes experts related to a specific topic to arrive at a consensus (Turoff, 1970). The three-round Delphi study began after the approval from the TTU Human Research Protection Program.

Selection of the panel. Many Delphi studies have a sample size between 15-20 participants (Ludwig, 1997). The selection of the panel was made through a nomination process in which experts (members of academia and industry) involved in the topic nominated the individuals with expertise on food security in LAC (Anderson & Jones, 1986). The experts selected were from Latin America and the Caribbean mainly. Forty-two names of possible candidates were collected for the study. Individuals selected were members of academia and specialists in areas related to: agriculture, nutrition, food safety, policies, economics, rural development, food security, health, trade, program monitoring and evaluation, and emergency preparedness and response.

Round one. Before sending the email to the 42 experts identified in the selection process, five content experts reviewed the instrument that contained a single question: What courses should be taught in a 15 hour-credit graduate certificate focusing on GFS? After their approval, an email was sent to the panel of experts describing the purpose of the research with a link to Qualtrics containing one question: Of the original 42 experts from Latin America and the Caribbean contacted to participate, 22 responded. Responses were condensed, analyzed, and sorted according to the four pillars of food security assuring all dimensions were covered in order to create the instrument for Round Two.

Round two. Participants received a list of topics and had to rank them according to level of importance from Strongly Disagree (1) to Strongly Agree (4). Consensus for inclusion was determined a priori when a topic achieved at least 75% of the panel agreement by either agreeing or strongly agreeing (Akers, 2000). Round two had a total response rate of 86%. Based on the results from the experts, topics reaching agreement were grouped into different courses through inter-observer agreement.

Round three. Experts were asked to rank the importance of each course for the graduate certificate. Experts used a 10 Likert-type scale that went from 1 = “Not important” to 10 = “Essential.” This round had a total response rate of 86%.

To assure a high response rate, follow-ups and thank-you messages were sent in all rounds of the study.

Survey of TTU professors. Based on the results of the Delphi study and following the critical inquiry process and the Course Development Framework. Researchers asked the input of TTU professors with expertise in the topics and the region. A 10-point Likert-type scale was developed based on the Delphi study and distributed to the professors. The items on the survey consisted of the 23 courses developed by the researchers. The instrument was previously pilot tested through the third round of the Delphi study. The group of professors who
ranked the courses to be included in the certificate consisted of fifteen professors from the College of Agricultural Sciences and Natural Resources and the Department of Nutritional Sciences in the College of Human Sciences at TTU.

This group had a total response rate of 100%. Following the same criteria of the Delphi Study, the courses that reached 75% agreement were considered for the creation of the certificate.

**Data analysis.** Results were exported to The Statistical Package for Social Science (SPSS®) v.22 for Windows database. Results were assigned with numerical values and summarized. Frequencies, percentage, averages, and standard deviations were used to evaluate the results. Hasson, Keeney, and McKenna (2000) suggest in order to achieve rigor, several elements should be considered; one of them is trustworthiness. A strategy commonly used to achieve trustworthiness is inter-observer agreement; this strategy encourages researchers to analyze the results separately and then, compare results (Ary et al., 2010). Which was followed in the study to achieve trustworthiness.

**Phase III – Act**

Researchers implemented the plan (Mertler, 2009). Results of phase two were analyzed and compared. Finally, the comparison of the Delphi study and the survey of TTU faculty, gave as a result the courses and topics included in the graduate certificate.

**Findings**

**Delphi Study**

The results of the Delphi technique are summarized in Figure 3.

**Round one.** The open-ended question had a total of 175 item responses. The analysis of the responses produced a total of 91 topics that were divided in the following categories: access 13 (14.3%), availability 11 (12.1%), utilization 33 (36.3%), stability 7 (7.7%), general 27 (29.7%).

**Round two.** The results of the panel showed 40 topics reached more than 75% agreement. The topics with greatest agreement were *Food Safety* (87.5%), *Components of Food Security and Nutrition* (85.9%), *Causes of Food Insecurity* (85.9%), *Design, Monitoring, and Evaluation of Indicators in Food Security and Nutrition* (85.9%), *Information Systems*
and Assessment of Food Insecurity (85.9%), Surveillance and Early Warning (85.9%), Assessment of Food Security and Nutrition (84.4%), Comprehensive Analysis of Information Related to Food Security (84.4%), Strategies to Advance Food and Nutritional Security (84.4%), Design of Food Security Policies (82.8%), Marketing Surveillance in Food Security and Nutrition (82.8%), and Vulnerability in Food Insecurity (82.8%). In total, seven topics were selected from the access dimension of food security (17.5%). six topics were selected from the availability dimension (15%), eight topics were selected from the utilization dimension (20%), five topics were selected from the stability dimension (12.5%), and fourteen topics were chosen from the general category (35%).

Researchers grouped the topics into 23 courses through the inter-observer process. In this process, five researchers independently grouped the topics into courses. Then, they gathered, reviewed, and compared their results. The courses were designed based on the topics with highest agreement reported on Round Two.

**Round three and survey to the TTU professors.** Responses of round three and the TTU survey are compared on Table 1 (see Table 1).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Course Agreement LAC Experts (Delphi) and Professors from TTU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
<td>LAC experts (n=17)</td>
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<tr>
<td></td>
<td>$M^a$</td>
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<tr>
<td>Animal Production Systems</td>
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<tr>
<td>Economics</td>
<td>7.00</td>
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<tr>
<td>Effects of Climate Change in GFS</td>
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<td>Entrepreneurship</td>
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<tr>
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<td>Human Nutrition</td>
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<td>Introduction to GFS</td>
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</tr>
<tr>
<td>Water Issues</td>
<td>8.62</td>
</tr>
</tbody>
</table>

*Note: Nine-point Likert-type scale. *1 = “Not important,” 10 = “Essential,”
The results of LAC (Delphi) showed 11 courses reached more than 75% agreement. The topics with more than 75% agreement were Human Nutrition (93.3%), Food Security Policy (90.7%), Food Safety (87.9%), Water Issues (86.2%), Program Planning and Evaluation (85.0%), Methods of Analyzing Food Security (84.3%), Introduction of GFS (83.3%), Statistics (79.2%), Risk Management (78.2%), Food Processing (76.2%), and Effects of Climate Change on GFS (76.0%).

The results of the TTU professors showed eight courses reached more than 75% agreement. The courses were: Food Safety (89.3%), Food Security Policy (88.7%), Human Nutrition (83.3%), Sustainability (83.3%), Water Issues (81.3%), Introduction of GFS (80.0%), Animal Production Systems (78.0%), and Methods of Analyzing Food Security (79.3%).

The results of the Delphi study and the professors from TTU were compared and the average between the two groups produced the courses to be included in the certificate. There were some courses such as Program Planning and Evaluation, Food Processing, Effects of Climate Change in Global Security, Risk Management, and Statistics that reached agreement according the experts from LAC, but were not included because the average agreement from the experts at TTU was below agreement. On the other hand, the course Animal Production Systems had a high agreement with the experts from TTU, but the average agreement among experts from LAC was below 7.5 –equivalent to 75%. Consequently, it did not achieve agreement. The seven courses that reached agreement can be seen in Figure 4.

Seven courses reached agreement in order to be included in certificate. The courses were Food Security Policy ($M = 8.97$), Food Safety ($M = 8.86$), Human Nutrition ($M = 8.83$), Water Issues ($M = 8.37$), Methods of Analyzing Food Security ($M = 8.18$), Introduction of GFS ($M = 8.17$), and Sustainability ($M = 7.90$). The courses that reached agreement with their topics are shown in the Figure 5.

![Figure 4. Courses that reached ≥75% agreement level in final round.](image-url)
The seven courses included 22 topics. These courses reached agreement necessary to be included in the certificate.

**Conclusions, Recommendations & Implications**

Objective one sought to identify the topics for the certificate. The panel of experts who participated in the study agreed 40 topics were appropriate for inclusion in the certificate. These topics were divided into the four pillars of food security, and a general category.

The topics *Food Safety, Foodborne Hazards* and *Good Manufacturing Practice* are important to assure healthy food. It is important to guarantee safe and healthy food for society, as the pillar of food utilization promotes (FAO, 2009a).

The pillar of food utilization emphasizes the importance of nutritious food (FAO, 2009). The topics related to nutritious food were *Nutrition, Nutritional Surveys, Food Bio Fortification, Food Fortification,* “*Nutritional Problems in Developing and Developed Countries,*” and *The Global Problem of Disparity.* The region recognizes and is highly committed to the “nutritional wellbeing and assurance of nutrients for all vulnerable groups,
respecting the diversity of eating habits” (FAO et al., 2015b, p. 7).

The topics Design of Food Security Policies, International Institutional Architecture for Food Security, Information Systems and Assessment of Food Insecurity and Strategies to Advance Food and Nutritional Security are mainly related with stability. Leaders of these regions have to create appropriate policies focused on food security and nutrition to avoid falling into a price crisis that will affect the poorest and the economy in general (Committee of World Food Security [CFS], 2013; FAO et al., 2015a; IFAD, 2010). Facilitating good communication among countries will help to design a better system to make appropriate decisions from a regional perspective. In addition, program assessment on food security will clarify all the processes, promoting the transparency and effectiveness of the programs (FAO, 2014).

The topics Food Availability and Controls of Food Imports are also related to policies. Availability refers to the quantity of food that exists in the country (FAO, 2009a). The region is committed to assure food availability through “stable production and timely attention to socio-natural disasters” (FAO et al., 2015b). In addition, the topics Sustainability, Agroecology, and Water Access are mainly related with natural resources management. The region has also committed to having a sustainable access to food for all the population (FAO et al., 2015b). The adoption of sustainable and responsible agriculture is important to ensure the longevity of the production (FAO et al., 2015a). In addition, access to safe water is an important issue the region needs to address.

Objective two sought to determine the courses included in the curriculum. Experts who participated in the study agreed that 7 courses are the most appropriate for inclusion in the certificate. These courses are: Food Security Policy, Food Safety, Human Nutrition, Water Issues, Methods of Analyzing Food Security, Introduction of GFS, and Sustainability.

The four pillars the ECLAC to eradicate hunger by 2025 are well represented in the courses. The courses Food Security Policies and Methods of Analyzing Food Security refer to the first pillar according to the ECLAC because the courses have topics related with policies and information systems. The second and third pillars are represented thought the courses Sustainability, Food Safety, Human Nutrition, and Water Issues. The last pillar can be achieved through the courses Sustainability and Food Security Policies.

Objective three sought to compare the courses selected from the LAC experts with the courses selected by the TTU faculty. The seven courses proposed in objective two gathered consensuses by both groups of experts: LAC and TTU faculty. However, there were some topics the experts from LAC considered essential for the certificate but the professors from TTU did not consider as fundamental. The course Program Planning and Evaluation reached agreement ($M = 8.50$) by the LAC panel; this is because the region is trying to make processes more transparent and to replicate programs with positive results (FAO, 2014). Program planning and evaluating are key factors for achieving food nutrition and security (Nordin et al., 2013). Effects of Climate Change in Global Security, and Risk Management, reached averages of 7.60 and 7.82, respectively. It is important to adapt and handle the impacts of climate change to guarantee food systems (UN, n.d.). Climate change is one of the biggest concerns in the region and there are serious damages that this phenomenon is causing (FAO, 2014; CFS, 2013). LAC is a region highly vulnerable to climate change because most of the countries are in tropical areas,
have fragile ecosystems, and are dependent on agriculture (FAO, 2009b). Having strategies to overcome the disasters in an integrated way is important for recovering faster from the damages (Global Facility for Disaster Reduction and Recovery [GFDRR] and The World Bank, n.d.). Finally, Statistics had an average of agreement of 7.92. This course is very important for stakeholders and decision-makers to help them understand the numbers involved with food security. It is important to gather accurate and reliable information with the purpose of making the right decisions (FAO, 2003).

There is one topic the experts from TTU considered essential for the certificate (M = 7.80) but the experts from LAC did not consider as fundamental: Animal Production Systems. Delphi studies will produce different results based on the expertise and the experiences participants have with the topic studied (Okoli & Pawlowski, 2004). When discussing a complex topic like food security, it is natural to have different perspectives based on the expertise of the group. However, it is important to acknowledge the differences and tried to come to consensus. Latin America is largely considered an excellent place for livestock and poultry production (FAO, n.d). The experts from Latin America prioritized other issues before the animal production systems based on their perspective internal to the region. Thus, issues they deal with on a day-to-day basis take precedence over the projected benefit of improved animal production systems. However, the experts from Texas Tech University considered investment in animal production systems important because of the potential the region has for enhanced animal production. Thus, animal production systems was included in the final list of topics.

Research using the Delphi technique reflects the expertise and diversity of the experts involved in the process. Understanding these complex issues will help leaders and stakeholders to make sound decisions about food security (IFPRI, 2015a). The topics and courses selected by the experts cover the four pillars of food security and are related to the four pillars of ECLAC to eradicate hunger in the region. Having professionals with knowledge in the four pillars of food security and the four pillars to eradicate hunger in LAC is important to accomplish the goal. The courses will prepare key stakeholders and leaders to make decisions armed with knowledge and accurate information regarding these issues. In addition, if professionals are educated about these topics they will be more aware of the challenges and possible solutions to overcome food insecurity.

Professionals who participate in this certificate are expected to acquire knowledge and transfer it to the most vulnerable populations as well as decision-makers and stakeholders. For this reason, follow-up studies will be conducted to measure the impact these professionals have on food security. People from countries that fight with food insecurity need to build capacities in topics related to agricultural practices, economy, and nutrition (CFS, 2013). Professionals with knowledge about food security who are willing to communicate the information are important for creating awareness on food security issues (Nordin et al., 2013). For this reason, transferring knowledge, especially to the most vulnerable groups, is important to the success of the region in accomplishing food security. Preparing graduates with knowledge of the complex phenomenon of food insecurity will help the region to confront the future challenges.
Some of the comments made by the experts were that some courses could be combined, for example *Animal Food Production* with *Plant Production* because farmers in LAC produce both in a small scale. Additionally, some experts commented as essential for the certificate but did not reach agreement is rural participation. Additionally, there is one aspect that was not included among the selected topics or the comments: economics. In the definition of food security, the word economics appears as an important factor, but this topic/course did not reach agreement. Researchers considered the course and the topics that reached agreement are related with economics and it will be indirectly taught. However, for future steps, it is important to take into consideration that economy is essential on food security. People need to have economic access to food, and decision-makers and key stakeholders need to be aware of this aspect when referring to food Security.

It is recommended to evaluate the courses every semester in order to maintain the quality and rigor of the certificate. This is an action research and, consequently, it is essential to design an assessment plan for the curriculum. In addition, keeping track of the professionals who complete the certificate and regular communications with these professionals, will provide the program faculty and institution critical effectiveness feedback.

Four of the classes are not included in the certificate based on selection results of the professors from TTU. Among the reasons, it is important to consider the lack of expertise available in the topics that were not selected. Gaining expertise in the areas we are lacking such as: water issues and the effect of climate change in global security is essential to providing a certificate that covers food security holistically.

Development and delivery of this multidisciplinary program will require the right faculty and support from administration to provide the resources to teach the courses. For this reason, it is important to find faculty with knowledge of these topics and this region. Faculty need to be aware the course must meet the necessities of LAC stakeholders. Additionally, it is important to include discussions, teamwork, and different activities to encourage networking. Students’ personal experiences will enrich the learning. The exchange of experiences will help students to understand different initiatives in the region that can be duplicated (FAO et al., 2015b).

Future studies need to consider the importance of broadening representativeness and enough experts to cover the four pillars of food security. The selection of the experts is essential to have good representation and accurate results. It is important to emphasize that data is specifically for the region of LAC. The researchers encourage further studies in the region to understand the challenges on a smaller scale. The region of LAC can be divided in sub regions to better understand the individual challenges. Using a bigger sample of experts with wider variety of knowledge in the Delphi study, will generate more specific data.

A Delphi technique is a good strategy to gather the consensus of experts who are in different geographical regions. However, other strategies can be used to understand the challenges of food security in other regions of the world. Further research can be made in other regions of the world that are struggling with food security to create certificates according to their necessities.

**From Research to Practice**

Phase three of this critical action inquiry study, the action phase, resulted in
the ultimate approval of the curriculum. After the results of the study were shared with the faculty and administration of TTU, some changes were made and the faculty from the International Center for Food Industry Excellence [ICFIE] worked to make the certificate available for students. As a result, the certificate focused on GFS started on January 1st, 2016.

References


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Exploring the Influence of Innovation Characteristics on the Adoption of a Water and Input Saving Technology in the Jordan Valley: Implications for Community Extension Workers

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University of Florida

Abstract
As the world’s population is set to increase to an estimated 9.6 billion people, the greater the strain becomes on the food system to meet people’s food and nutrition needs (United Nations, 2013). The MENA region is expected to increase in population by double by 2050 further straining their water and food resources (IFPRI, 2010). Improved innovations to increase production have been encouraged to address those issues. Fertigation, and in particular the more effective hydraulic injector, was introduced in the Jordan Valley to help manage the amount of fertilizer application, reduce run-off in irrigated agriculture, and improve water use efficiency. However, despite its advantages, the hydraulic injector fertigation technology has not been widely adopted. This study sought to better understand this phenomena through the use of mixed methods research on the impact of innovation characteristics, as defined by Rogers (2003), on adoption of the technology. Results found complexity to have a statistically significant impact on adoption and to be a significant predictor of adoption. While not specifically a component of Roger’s innovation characteristics, affordability was a key factor in non-adoptions.

Keywords: Jordan, adoption, fertigation, Diffusion of Innovations
Introduction

As the world’s population is set to increase to an estimated 9.6 billion people, the greater the strain becomes on the food system to meet people’s food and nutrition needs (United Nations, 2013). Middle East North Africa (MENA) is expected to follow this trend and is expecting to double in population by 2050 (IFPRI, 2010). Additionally, changes in climate, reduction of water resources, increasing unemployment, and conflicts exacerbate food insecurity for countries in MENA (IFPRI, 2010).

Growing populations and increased water use has further created a water scarcity issue in Arab countries (WB, FAO, & IFAD, 2009). According to the World Bank (2007), about 73% of renewable water resources are constantly withdrawn from the natural system in the MENA region, as compared to the 1 to 30% in other regions. MENA countries are faced with very limited internal renewable water resources, are among the lowest in the world, and are to be reduced by an expected 50% by 2050 (FAO, 2014). This rapid reduction in water resources directly impacts the agricultural production of the region.

Jordan is one of the driest countries in the world with an annual precipitation below 100 mm (FAO, 2009). The changes in crop yield and water consumption levels by agriculture and other sectors has been linked with adverse climate change and water and food insecurity (Al-Bakri et al., 2013). Jordan has been working on increasing its production through improved agricultural practices including the use of improved irrigation techniques.

Along with improvements in irrigation, came the increased use of fertigation. Fertigation improved water usage, however fertilizers were applied without accounting for the actual needs of the crops, leading to over application and waste (Zuraiqi, Rusan, & Qawasmi, 2004). In response, fertigation technologies were developed to increase the direct application of fertilizers in conjunction with irrigation practices. Through fertigation technologies, fertilizers are injected through drip emitters to achieve the optimum level of water content and nutrient concentration applied directly to the root zone (Bar-Yosef, 1999; Gardner & Roth, 1984; Miller, Rolston, Rauschkolb, & Wolfe, 1981; Papadopoulos, 1993).

The hydraulic injector technology is an advanced fertigation technology that controls the nutrient concentration in irrigation water based on crop requirements, allowing farmers to achieve optimum fertilizer and water applied directly to the root zone (Zuraiqi et al., 2004). While the injectors have been seen to have a high advantage over the other types of fertigation, the high costs and the need for training of highly skilled operators may pose significant limitations in farmers’ adoption of this hydraulic fertigation technology.

Despite the obvious success of an innovation in pilot tests, encouraging farmers to adopt a new practice can be very difficult due to factors such as conflicting information, risk, implementation costs, or other factors (Vanclay & Lawrence, 1994). Adoption of innovations must occur in order to meet the challenges presented from changes in climate, water resource availability, and strains on food systems. Fertigation, and in particular the more effective hydraulic injector, was introduced in the Jordan Valley to help manage the amount of fertilizer application, reduce run-off in irrigated agriculture, and improve water use efficiency. However, despite its advantages, the hydraulic injector fertigation technology has not been widely adopted.
Theoretical Framework

Rogers (2003) developed a theoretical framework by which an innovation moves through the process of diffusion to adoption. Rogers (2003) defined diffusion as the process by which an innovation passes through communication channels over time among people within a social structure. The adoption process is based on a series of decisions that individuals make to decide to adopt or reject (Feder, Just, & Zilberman, 1985; Gatignon & Robertson, 1991; Rogers, 2003). Rogers’ (2003) has been previously applied to look at the adoption of water saving technologies in greenhouses (Lamm et al., 2017), which has many parallels to the current study.

Characteristics of the innovation itself have been seen to influence adoption (Feder, 1982; Feder et al., 1985; Fliegel & Kilvin, 1973; Lamm et al., 2017; Rogers, 2003). Through extensive research, Rogers (2003) found five characteristics that can help to explain the rate of adoption of individual innovations: relative advantage, compatibility, complexity, trialability, and observability. Each innovation characteristic can affect the adoption decision in different ways.

Relative advantage is when new innovations are seen as relatively better than the preceding practices (Rogers, 2003). The relative advantage needs to be great enough for the targeted people to want to make the decision to adopt. It can be measured in terms of economic gain, social prestige, convenience, and/or satisfaction (Rogers, 2003). Relative advantage is the perceived total benefits if one adopts the innovation and has been seen as a decisive factor in determining adoption of an innovation (Lamm et al., 2017; Pannell et al., 2006).

Another important characteristic is how compatible the innovation is with existing norms and values, past experiences, and present needs (Rogers, 2003). Not only does an innovation need to be compatible personally with the farmer, it must also be compatible with existing technologies, practices, and resources being used by the farmer (Kaine & Lees, 1994; Lamm et al., 2017). Additionally, the innovation must be at an acceptable level of complexity, which is the degree that an innovation is perceived as relatively difficult to understand and use (Rogers, 2003). The easier it is for a household to try an innovation, the better it will be for the adoption process. It is important to note even if the innovation itself is not complex, implementing the innovation might add to the complexity of the farm’s activities (Pannell et al., 2006). Tornatzky and Klein (1982) found a negative relationship between complexity and adoption.

Trialability refers to how easily a potential adopter can learn about an innovation’s performance and optimal management (Pannell et al., 2006). The ability to try the innovation can give the adopter information that may reduce uncertainty about the relative advantage and complexity of an innovation (Lamm et al., 2017; Pannell, et al, 2006; Rogers, 2003).

Lastly, the degree to which the innovation’s advantages and impacts can be observed will be a determining factor for the individual (Rogers, 2003). When impacts are easily seen, the person will want to adopt to show others what he or she is doing and the resulting successes. Likewise, high observability can lead to observational learning by neighboring farmers and can aid in diffusion of an innovation (Geroski, 2000; Lamm et al., 2017; Shampine, 1998).

Purpose & Objectives

The purpose of this study was to explore how innovation characteristics impacted the adoption of hydraulic injector fertigation by farmers in the Jordan Valley. The specific research objectives were:
1. Describe current fertigation practices in the Jordan Valley.
2. Describe how innovation characteristics influence adoption of the hydraulic injector.

**Methodology**

This study was conducted as a mixed method case study of farmers in the Jordan Valley. Merriam (1998) defined a case study as a descriptive and heuristic design meant to give an in-depth understanding of a situation and the associated meanings for those involved. This approach is focused in particular to the population being studied, provides a thick rich description, and allows for an illuminated understanding of the phenomenon (Merriam, 1998). As a process, adoption is extremely complex and can benefit from the case study approach.

The complexity of this study calls for an appropriate use of a convergent parallel mixed methods design (Creswell & Plano Clark, 2007). This type of design allows for different, but complementary data to be collected concurrently. In this approach, quantitative and qualitative were collected separately and independently. Quantitative data, collected via questionnaire, were analyzed first, and then qualitative data, collected via focus groups, were used to help explain the quantitative results.

**Context**

Jordan is in the arid MENA region: northwest of Saudi Arabia, Israel, and the West Bank to the west, Syria to the north, and Iraq to the northeast. Jordan is mostly an arid desert with a short rainy season in the western part of the country. Only 1.97% of Jordan is considered arable land. To further complicate the situation, Jordan struggles with issues of deforestation, desertification, soil erosion, and depletion of freshwater resources (CIA, 2011). According to the World Bank (2013), Jordan is the world’s fourth poorest country in terms of water resources. Most of the water use in the country is for agricultural production, which is the major source of food for Jordanians as well as providing export crops. The Jordan Valley is situated along the western part of the country and is the nation’s most fertile region. With its geographical diversity and availability of water resources, the Jordan Valley is the ideal and most prominent place for agricultural production. Water use in the Jordan Valley and its production of agricultural crops make this area the most ideal from which to understand adoption of water saving technologies by farmers.

**Subjectivity Statement**

As a Hispanic-American woman, I am privileged to have unique values, characteristics, and worldviews as products of my life experiences. I have traveled and worked in several developing contexts. I have dedicated my work to the study of behavior change and base my work in the theory of Diffusion of Innovations. As a researcher, I recognize that as the instrument for the qualitative portion of this study, my biases may impact data interpretation.

**Data Collection**

**Quantitative methods.** According to Rogers (2003), adoption is “a decision to make full use of an innovation as the best course of action available” (p. 21). For the purpose of this study, adoption will be defined as use of the injector pump for fertigation or no use. It is important to note that this definition does not leave room for modification or partial use of an innovation presenting a limitation of this study. Stratified random sampling was used allowing for subsets of the population to be studied according to their different characteristics (Ary, Jacobs, & Sorensen, 2010). Researchers in Jordan had a list of potential participants in each strata. The sample resulted in a total of 61 adopters and 39 as non-adopters. Adopters were
comprised of farmers who learned about the technology through a loan program as well as farmers who did not take the loan but still adopted the technology.

The instrument collected both demographics and perceptions of characteristics of the hydraulic fertigation technology. Questions pertaining to innovation characteristics were adapted from Moore and Benbasat’s (1991) previously developed instrument which measured perceptions of adoption of an innovation. The questionnaire presented Rogers’ (2003) innovation characteristics detailed by in a 38-item instrument.

The innovation characteristics as a part of Moore and Benbasat’s (1991) questionnaire were: voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability, visibility, and trialability. To keep true to Roger’s (2003) theory, relative advantage, compatibility, complexity (ease of use), observability (visibility), and trialability were used in the questionnaire. It is important to note that when complexity is measured, it is in fact measuring the perceived ease of use by the farmer. The instrument was modified to include 22 items, which were tailored to reflect fertigation as the innovation and the Jordanian research context.

The questionnaire was designed for oral administration, differing from other questionnaire formats, as deemed appropriate for the Jordanian context. The questionnaire was mostly closed-ended questions with some open-ended questions. A panel of experts was asked to review the questionnaire to determine the content and construct validity before administration. Face validity was ensured through a cognitive evaluation with a group of advisors (Ary et al., 2010). Construct validity was further assessed through Cronbach’s alpha and a factor analysis to determine internal consistency (Cronbach, 1971). To address error, the researcher used the tailored design method (Dillman, Smyth, & Christian, 2009). Non-response error was reduced through the face-to-face administration.

Reliabilities for the innovation characteristic index were calculated ex post facto as a pilot test was not possible. A Cronbach’s alpha of a 0.70 or higher is seen to be a reliable index (Nunnaly, 1978). The relative advantage index consisted of five items ($\alpha = 0.86$). The compatibility index consisted of four items ($\alpha = 0.90$). The complexity index originally consisted of five items. After a factor analysis of the items, one was removed leaving four items ($\alpha = 0.73$). The trialability index consisted of four items ($\alpha = 0.61$). Lastly, the observability index consisted of four items ($\alpha = 0.78$).

**Qualitative methods.** Qualitative methods were essential to gaining an in depth understanding of the adoption process. Quantitative data gives a general understanding, while the qualitative data allows for more in depth exploration of the phenomenon (Creswell & Plano Clark, 2011; Flick, 2007). Purposive sampling reflects the diversity within the population under study, is most often used in qualitative research, and was thus used in this study (Barbour, 2007; Merriam, 1998). Three semi-structured three focus groups were conducted, two with adopters, and one with non-adopters. Each focus group had four to five participants. The semi-structured format allows for the researcher to explore interesting paths opened by the participant’s responses (Kvale, 2007; Merriam, 1998). The researcher’s in-country collaborator facilitated the focus groups while two trained research assistants took notes. The researcher was also present and took observational notes.
Limitations

Limitations of this study are important to note. The research was conducted in Arabic. To address this, the Brislin model for cross-cultural translation (Jones, Lee, Phillips, Zhang, & Jaceldo, 2001) was used to ensure correct wording for the questionnaire and the focus group questions. Focus groups were facilitated in Arabic by a Jordanian researcher using a moderator’s guide, which was translated from English to Arabic and back again to ensure meaning transfer.

Data Analysis

Correlations were first run to see if any relationships existed (Ary et al., 2010). A logistic regression was deemed appropriate to look at a binomial dependent variable and several independent variables impacting the dependent variable (Ary et al., 2010). Ultimately, a backward step-wise regression was conducted to further explore the effect of the variables. The dependent variable for this study was: adoption or non-adoptions. The independent variables were characteristics of the innovation.

Qualitative data analysis was conducted using context-driven coding to explore the adoption of fertigation. This was driven by Rogers’ (2003) theory creating previously established codes (Merriam, 1998). The codes were the innovation characteristics according to their descriptions per Rogers’ theory. Emergent codes were also allowed as the data dictated.

Qualitative and quantitative data are inherently different giving diverse insight to the study. As such, it is important to maintain the integrity of the data and merge the data after separate analysis and interpretation (Creswell & Plano Clark, 2007). Once all data was analyzed, the researcher combined the data from the quantitative questionnaire and the qualitative focus groups under each objective to present overall results. The integration of the data gives a complete picture of the data set, which answers the overall research question.

Results

A total of 100 farmers were surveyed. One hundred percent of questionnaire respondents were male, ages ranging from 21 to 70 with a mean age of 45.87 ($SD = 10.88$). The largest portion of respondents had at least a secondary school education (37%). About half (57%) reported fully owning their farms. Farms in Jordan are measured in dunam or 0.24 acres. The farms varied in size from 7 dunam (1.73 acres) to 70 dunam (17.30 acres). The mean farm size was 34.79 dunam (8.60 acres) ($SD = 9.06$). Respondents represented 19 villages and 2 regions. All respondents were from the Middle and South areas of the Jordan Valley. Ninety-nine percent of respondents reported having begun using fertigation more than two years ago.

Objective 1: Fertigation in the Jordan Valley

The following results describe the current situation for fertigation in the Jordan Valley. Ninety-nine percent of respondents stated they were familiar with fertigation. Table 1 shows the varying degrees to which respondents stated their familiarity with the different fertigation technologies, both in having knowledge of the technology and having seen it in use, as well as use of the technologies on their farms. All (100%) of respondents had heard about the water pump technology, 99% had seen it in use, and the majority of farmers (68%) reported using this technology on their farm. Additionally, respondents stated they heard about fertigation technologies from various sources, primarily from other farmers (92%).
Table 1
Familiarity with Fertigation Technologies and Use

<table>
<thead>
<tr>
<th>Fertigation Technology</th>
<th>Knowledge of Seen in use</th>
<th>Use on farm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>By-pass tank</td>
<td>53</td>
<td>47</td>
</tr>
<tr>
<td>Water pump suction</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Hydraulic injector</td>
<td>78</td>
<td>22</td>
</tr>
<tr>
<td>Electric pump</td>
<td>44</td>
<td>56</td>
</tr>
<tr>
<td>Venture injector</td>
<td>51</td>
<td>49</td>
</tr>
</tbody>
</table>

However, responses indicated the National Centre for Agricultural Research and Extension (NCARE) (79%) and the private sector (76%) also played a significant role in providing information about fertigation.

Seventeen different crops were reported as using fertigation in production in open planting as well as greenhouses. Over half (61%) of respondents reported growing tomatoes with a mean productivity in the greenhouses of 14.32 tons/dunum. Data showed certain crops are more appropriately grown in greenhouses rather than open planting, and vice versa. Total area under fertigation ranged from 1 dunum (0.25 acres) to 70 dunum (17.30 acres) with a mean of 32.42 dunum (8.01 acres) (SD = 11.27). When asked if the area under fertigation was the entire farm, 85% stated it was. Most frequently stated reasons for using fertigation on the entire farm were: work is completed faster (61.6%), increased productivity (19.8%), and the land needs fertilizer (22.4%). Likewise, the biggest reason for not applying it to the entire farm was the high costs associated with purchasing and maintaining the system (80%).

Objective 2: Innovation Characteristics and Adoption

The second objective was to measure how these innovation characteristics influenced adoption of the hydraulic fertigation technology. Indices for each innovation characteristic were calculated by using a grand mean for all questions within that index (see Table 2). Index means could range from 0 to 1.0; strongly disagree (0.0) to strongly agree (1.0). Relative advantage had an overall index mean of 0.66 (SD = 0.17). Compatibility had an overall mean of 0.67 (SD = 0.15). Complexity had an overall index mean of 0.68 (SD = 0.13). Trialability had an overall index mean of 0.57 (SD = 0.12). Lastly, observability had an overall index mean of 0.61 (SD = 0.14).

Table 2
Index Means of all Innovation Characteristics by Adopter/Non-adopter

<table>
<thead>
<tr>
<th>Innovation Characteristics</th>
<th>Adopter Mean</th>
<th>Adopter SD</th>
<th>Non-Adopter Mean</th>
<th>Non-Adopter SD</th>
<th>Overall Mean</th>
<th>Overall SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Advantage</td>
<td>0.66</td>
<td>0.17</td>
<td>0.65</td>
<td>0.17</td>
<td>0.66</td>
<td>0.17</td>
</tr>
<tr>
<td>Compatibility</td>
<td>0.67</td>
<td>0.12</td>
<td>0.67</td>
<td>0.18</td>
<td>0.67</td>
<td>0.15</td>
</tr>
<tr>
<td>Complexity</td>
<td>0.70</td>
<td>0.12</td>
<td>0.65</td>
<td>0.15</td>
<td>0.68</td>
<td>0.13</td>
</tr>
<tr>
<td>Trialability</td>
<td>0.58</td>
<td>0.10</td>
<td>0.56</td>
<td>0.16</td>
<td>0.57</td>
<td>0.12</td>
</tr>
<tr>
<td>Observability</td>
<td>0.63</td>
<td>0.10</td>
<td>0.58</td>
<td>0.18</td>
<td>0.61</td>
<td>0.14</td>
</tr>
</tbody>
</table>
A binary logistic regression analysis was conducted using the five innovation characteristics as independent variables to predict their influence on adoption (or non-adoption) of the hydraulic injector fertigation technology. A test of the full model (including all independent variables) against the constant model was not found to be statistically significant, \( \chi^2 (5, N = 100) = 8.059, p = 0.15 \). Table 3 shows the analysis of the regression.

Table 3
Logistic Regression Results for Innovation Characteristics

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>p</th>
<th>Exp (B)</th>
<th>95% CI Exp (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept (constant)</td>
<td>-2.78</td>
<td>1.62</td>
<td>2.94</td>
<td>0.09</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Relative Advantage</td>
<td>-0.14</td>
<td>2.12</td>
<td>0.01</td>
<td>0.95</td>
<td>0.87</td>
<td>0.04 54.98</td>
</tr>
<tr>
<td>Compatibility</td>
<td>-1.92</td>
<td>2.75</td>
<td>0.49</td>
<td>0.48</td>
<td>0.48</td>
<td>0.15 31.71</td>
</tr>
<tr>
<td>Complexity</td>
<td>3.91</td>
<td>2.13</td>
<td>3.35</td>
<td>0.07</td>
<td>49.70</td>
<td>0.76 3256.73</td>
</tr>
<tr>
<td>Trialability</td>
<td>0.28</td>
<td>2.06</td>
<td>0.02</td>
<td>0.89</td>
<td>1.33</td>
<td>0.02 74.60</td>
</tr>
<tr>
<td>Observability</td>
<td>2.61</td>
<td>1.77</td>
<td>2.17</td>
<td>0.14</td>
<td>13.57</td>
<td>0.42 435.38</td>
</tr>
</tbody>
</table>

Note: Model Summary (Omnibus Tests): Chi-square = 8.06; 2-Log Likelihood = 125.69; df = 5; \( p = 0.15 \); Nagelkerke’s \( R^2 = 0.15 \), Cox and Snell \( R^2 = 0.08 \)

A backward stepwise binary logistic regression (Wald) was then conducted (Table 4). Step 1, including all predictor variables, was not significant \( \chi^2 (5, N = 100) = 8.06, p = 0.15 \). None of the predictors were found to be statistically significant. The following step (2), removing relative advantage, remains to not be statistically significant, \( \chi^2 (4, N = 100) = 8.05, p = 0.09 \). Again, none of the individual predictors are statistically significant. Step 3, removal of trialability, presented a statistically significant model, \( \chi^2 (3, N = 100) = 8.04, p = 0.05 \). No predictors were significant. Step 4, removing compatibility, maintained a statistically significant model, \( \chi^2 (2, N = 100) = 6.90, p = 0.03 \). No predictors were significant. Finally, step 5, with removal of observability, yielded a statistically significant model, \( \chi^2 (1, N = 100) = 4.58, p = 0.03 \). Complexity alone was significant \( p = 0.04 \).

Table 4
Backwards Logistic Regression Results for Innovation Characteristics

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>p</th>
<th>Exp (B)</th>
<th>95% CI Exp (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept (constant)</td>
<td>-2.12</td>
<td>1.26</td>
<td>2.83</td>
<td>0.09</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>Complexity</td>
<td>3.49</td>
<td>1.70</td>
<td>4.23</td>
<td>0.04</td>
<td>32.75</td>
<td>1.17 911.96</td>
</tr>
</tbody>
</table>

Note: Summary (Omnibus Tests): Chi-square = 4.58; 2-Log Likelihood = 129.17; df = 1; \( p = 0.03 \); Nagelkerke’s \( R^2 = 0.05 \), Cox and Snell \( R^2 = 0.06 \)

Focus groups. The focus groups (FG) also gave insight into the adoption of the hydraulic injector fertigation technology based on innovation characteristics (compatibility, relative advantage, and observability). Additionally, another theme beyond Rogers’ five characteristics emerged from non-adopters, affordability.

Relative advantage. Participants stated their opinions of the innovation pertaining to the perceived relative advantages. “[Fertigation] reduces expenses...”
and increases production” (FG 1). They spoke about increased production. “...We see there is a profit from its use, good production, and see that there is equal distribution of fertilizer down every irrigation line” (FG 3). “In the long run, there will be more production and less cost” (FG 1). Another participant mentioned long-term gains: “Saving fertilizer will be reflected in the cost and there will be improvement in [my] household livelihood” (FG 1).

Participants mentioned savings as a relative advantage. “We search for something that will save water, save time for production and saves costs. Anything that will give us money saving” (FG 2). Another stated, “I concentrate on the profits of the technology to know if I will adopt the technology” (FG 3). One participant stated why he did not use the technology on his entire farm. “The project came to me, but I have a big farm and it needs more time to use the technology…” (FG 2).

**Compatibility.** In the first focus group with non-adopters, one farmer stated why he would not use fertigation. “We farm like our fathers and grandfathers” (FG 1). The fertigation technology the non-adopters were using was taught to them by their ancestors. “We hear about the hydraulic injector but did not want to use it because the traditional way suits my needs” (FG 1). The new technology was not compatible with their experiences or desired operating methods. Another participant spoke about land ownership and adoption. “If we own the land, we will adopt… If we do not own, we will not adopt the technology. We do not want to invest in land that we do not own” (FG 3). The hydraulic injector requires significant infrastructure and as such is not likely to be adopted by a farmer that does not own the land and would not benefit from the investment should the land owner change their renting policies. Similarly, a different participant stated, “I have heard about fertigation but I do not use it. I farm on shared land” (FGW 4). Sharing the land is not conducive to investing in a technology for land that is not their own.

**Complexity.** Participants mentioned some difficulties in using fertigation. “When I irrigate in winter, it takes too much time working with the fertigation technology. This creates too much humidity in the greenhouse” (FG 2). The farmers believed the hydraulic injector to work too slowly causing excess humidity and potential fungal conditions in the greenhouses. Similarly, another participant stated “if there is no sun, the production is low. The climate must be suitable for the moisture needed” (FG 2). They stated production through the use of fertigation using the hydraulic injector depended on an ideal climactic situation.

**Observability.** Participants stated that seeing the technology influences their adoption. “Before we adopt any new technology, we need to examine this technology and see the benefits before we adopt it ourselves” (FG 3). Farmers felt that hands-on experiences with the technology and visual results help them to make the decision to adopt or not adopt.

**Affordability.** During the non-adopter focus group, participants mentioned the affordability of the technology several times as a factor in adoption. “Fertigation saves 100% of fertilizers but it is very expensive” (FG 1). Despite potential benefits, cost is mentioned again. “We have heard it is excellent, but it is very costly” (FG 1). According to NCARE, the hydraulic injector technology costs about $1000 dinars which is a significant cost for small farmers. One participant mentioned funding. “If there is no [financial] support to help us use these options, how can we use it?” (FG 1). Another participant spoke about the loans for the technology. “There were criteria to
take loan to buy the hydraulic injector. We cannot pay installments. We have other needs to pay” (FG 1).

Conclusions, Implications & Recommendations

Fertigation is not new to Jordanian farmers. Yet, there has not been much research conducted to investigate what they know about it. Farmers in the Jordan Valley seem to be very familiar with fertigation. However, their familiarity and use of the different types of fertigation technologies varied. Data indicated the majority of farmers had some knowledge of each of the different types of fertigation. It is interesting to note that at least two-thirds of the respondents had at least heard of the hydraulic injector and yet the majority stated they only used the water pump suction technology.

Seventeen crops are being produced using fertigation. Farmers in the Jordan Valley grow these crops both under greenhouses and in open fields. For many of the crops (11 of 17 reported), mean productivity in the greenhouses is more than in the open field. Due to the climactic conditions in Jordan, it is fitting that production would be reported to be greater in the greenhouses. Based on both the quantitative and qualitative data, farmers are aware of the benefits of the hydraulic injector fertigation technology stating faster work time, increased productivity, and overall fertilizer and water savings. Despite this, they are also aware of the cost of this technology as a barrier to adoption (to be discussed further below).

Exploring the impacts of innovation characteristics on adoption is not new. However, it has not been explored for this population until this study. The questionnaire provided a glimpse into how farmers in the Jordan Valley view the hydraulic injector fertigation technology.

The focus groups provided additional insights for each characteristic.

Innovation Characteristics

Relative advantage. Respondents moderately agreed the hydraulic injector provides a relative advantage. According to Rogers (2003), relative advantage is expressed in economic profitability or social prestige. This was well demonstrated in the qualitative data. Participants stated they saw profitability through increased productivity as well as savings in fertilizer and water costs. Profitability was also mentioned as a prerequisite for adoption. The potential for increased profitability from an innovation has been noted by other researchers (Lamm et al., 2017). During the focus groups, the moderator and the farmers discussed their challenges with agriculture as a source for their livelihoods. This explains their need to see the profitability before making a decision to adopt. They are willing to make changes to technologies in their farming but want to be somewhat sure they will have a true possibility to make a profit.

Compatibility. Respondents moderately agreed they found the hydraulic injector technology to be compatible with existing practices. Similar to relative advantage, the majority of respondents agree that the hydraulic injector is compatible with their existing values, past experiences, and needs (Rogers, 2003). The focus groups provided different information for the compatibility of the technology. Compatibility is important as it begins to touch on a farmer’s personal frame of reference. Incompatibility has been previously shown as a barrier to adoption (Lamm et al., 2017). The participants of the focus groups were proud to be farmers. Some stated they farm the way they were taught to farm. Therefore, the hydraulic injector was not compatible with their preferred agricultural practices.
Likewise, the hydraulic injector takes investment in infrastructure. This investment is not only costly, but difficult to do when the land is not owned. Farmers spoke about their resistance to use the technology because they rented the land. During the focus groups, participants explained the difficulty with land ownership. Many smaller farmers rent the land, which introduces a level of uncertainty of subsequent land use and/or access. A compatible technology fits more closely with an adopter’s situation. The infrastructure needed for this technology makes it incompatible for certain farmers.

**Complexity.** Respondents moderately agreed that the hydraulic injector technology was relatively easy to use. Rogers (2003) said that complexity relates to how easy a technology is to use and understand. During the focus groups, complexity was not directly mentioned. However, some farmers spoke about difficulties that arose from fertigation use in the greenhouses. Complexity in greenhouse technologies has been previously noted as important for adoption (Lamm et al., 2017). A number of participants stated the technology needed the appropriate temperature to work. They also said it was a slower technology and that this caused there to be too much humidity in the greenhouses that created an environment for mold to grow and harm production. While the technology itself was not seen to be difficult to use, there were difficulties that arose from its use. These difficulties can further reduce the innovation’s perceived relative advantage.

**Trialability.** Farmers neither disagreed nor agreed that the hydraulic injector was available for trial. Some innovations can be difficult to try. The degree to which a technology can be experimented with is important to dispel uncertainty and allow a farmer to see how it works for them (Rogers, 2003). As mentioned before, the hydraulic injector technology needs infrastructure that not all farmers have due to lack of land ownership and financial support. This greatly reduces the trialability of the hydraulic injector. Other opportunities to try the hydraulic injector may not be available.

**Observability.** Respondents somewhat agreed the technology was visible. During the focus groups, one participant mentioned the need to see the results of the technology. Rogers (2003) stated that the results of some technologies are easier to see than for others. The questionnaire directed the inquiry more towards the visibility of the innovation itself rather than its results. In the focus groups, farmers said they know the results of using the technology, however they had not seen the results in person.

**Affordability.** The majority of the participants noted the technology was not an affordable technology. Rogers (2003) mentioned the initial cost of an innovation, as part of relative advantage, which can potentially affect rate of adoption. The costs of new technologies has been previously noted by researchers (Lamm et al., 2017). The sample included respondents who had received loans to help them cover the expenses of the hydraulic injector technology. Those farmers discussed how the loan enabled them to adopt the technology. Affordability, as a part of relative advantage, goes beyond the initial cost. Farmers acknowledged the maintenance and upkeep of the innovation to be an inhibitor of adoption. Despite knowing the benefits, affordability was reiterated as the main factor for non-adoption.

**Overall characteristic indices.** Overall, the indices did not differ greatly between adopters and non-adopters. Complexity and observability both differed by 0.05 (greater for adopters) between the
two groups. However, the complexity mean for adopters was greater than the overall index mean, recognizing that a higher mean for complexity means the respondents found the technology to be less complex. Perceived complexity is negatively related to an innovation’s rate of adoption (Rogers, 2003). Adopters are currently using the technology and thus have had the opportunity to use it and could have potentially rated the technology to be less complex. Likewise, observability was also higher for adopters than for non-adopters. Since the adopters were already using the technology, they could better see it in use and its.

Influence of Innovation Characteristics on Adoption

The binary logistic regression model with all independent variables (relative advantage, compatibility, complexity, trialability, and observability) proved to not be a significant predictor of adoption. Non-significant results here suggest that the odds for adoption are similar regardless of the innovation characteristics. However, to explore innovation characteristics further, a backward stepwise binary logistic regression (Wald) was conducted which did result in complexity as a statistically significant predictor of adoption.

To understand the results, it important to remember: the higher the complexity score, the more that person perceives the technology to be easy to use. The logistic regression coefficient \( B = 3.49 \) demonstrated a positive relationship. As the complexity score increases (ease of use), so does the likelihood of adoption. The more a person perceives the innovation to be easy to use, the more likely they are to adopt (Rogers, 2003; Tomatzky & Klien, 1982). The odds ratio \( \exp (B) = 32.75 \) showed that for every one unit increase in complexity (ease of use), the odds for adoption increase by nearly 33. Finally, the Chi Square has a p-value of 0.03, which indicates that the model, including only complexity, is a good predictor of adoption.

Recommendations & Implications

Extensionists seeking to increase the adoption of new technologies must take into consideration the innovation and their perceived characteristics. However, they are not the only consideration. Adoption of innovations should be viewed as a holistic process. Accordingly, extensionists with NCARE should focus their primary efforts on the complexity and affordability of the hydraulic injector technology, while also acknowledging the relative advantage, compatibility, trialability, and observability.

The innovation can be a sound, worthwhile technology but if it is not perceived to meet the needs, desires, and context of the potential adopters, it is unlikely to be used to the capacity intended. Innovation characteristics as well as adopter categories and diffusion networks should be examined to better understand the dynamics of an innovation’s adoption/diffusion process.

This research provides a foundation for further research to be conducted. A potential study to identify adopter categories for farmers in the Jordan Valley could be useful for further dissemination and adoption of fertigation technologies such as the hydraulic injector. Not all individuals adopt an innovation at the same rate (Rogers, 2003). Adopter categories will help extension agents know what particular groups of people value. In understanding their values and characteristics, targeted interventions to encourage adoption can be planned and executed. The development of different messages administered through different communication channels can help increase the adoption and diffusion of an innovation. With new forms of
communication and continued technology development, further research needs to be conducted.

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A Survey to Determine International Program Growth Areas and Needs to Guide a College of Agriculture International Programs Office

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Abstract

International programs (IP) continue to grow in importance. There is an increased demand from employers and communities for globally competent individuals, yet only 2.3% of Dale Bumpers College of Agricultural, Food and Life Sciences (Bumpers College) students studied abroad in an agriculture-related program during the 2014 and 2015 academic year. This study used descriptive survey methods with University of Arkansas undergraduate students enrolled in Fall 2017 Bumpers College courses (n = 1,758) to determine their perceptions of international experiences. These perceptions included identifying the most influential barriers and benefits to participation. The majority of students were interested in short-term faculty-led programs (n = 1,190, 72.1%), followed by international internships (n = 760, 46%). Students wanted to participate in an IP during summer I (n = 1,138, 69%), followed by summer II (n = 839, 50.8%).

Based on a 5-point Likert-type scale, students reported “cost is too high” (M = 3.83, SD = 1.10) and being “too busy with school” (M = 3.27, SD = 1.18) as the most influential barriers to participating in an IP. Using the same Likert-type scale, students reported an IP being a “life-changing opportunity” (M = 4.49, SD = 1.75) and “sets me apart when applying for grad school/jobs” (M = 4.27, SD = 1.90) as the most influential benefits. The fact that 5.5% of the students surveyed had participated in an IP confirms that the Bumpers College requires more immersion in order to meet the University of Arkansas goal for 25% international participation by 2020.

Keywords: agricultural education, international experiences, international programming, study abroad
Introduction

According to the National Research Council (2009), colleges and universities should prepare students who will one day become employees, managers, leaders, policy-makers, and natural and social scientists to acknowledge and respond to the dynamic world around them. With that in mind, international programs (IPs) have grown in popularity and have increased in importance for colleges of agriculture (Graham, 2012). For the purpose of this study, IPs are synonymous with study abroad. Peterson and colleagues (2011) defined a study abroad as “an education abroad enrollment option designed to result in academic credit” (p. 13). These types of programs help students to become more globally competent, an attribute widely desired by employers today.

Benefits of participation in IPs are not limited to students alone; IPs hold significance for faculty members as well. Dooley, Dooley, and Carranza (2008) noted that faculty members who participated in a program in Mexico experienced the enhancement of academic, social, and cultural skills through internationalizing curricula and wanted to share these outcomes with their students. However, The Open Doors Report published by the Institute of International Education (IIE) with support from the U.S. Department of State’s Bureau of Educational and Cultural Affairs stated that only 2.5% of students who studied abroad were enrolled in an agriculture-related program during the 2015 and 2016 academic year (Institute of International Education, 2017). According to the National Research Council (2009), the term “agriculture” is limited to farming. However, the term means different things to different people and 21st-century agriculture is much broader, encompassing a range of disciplines such as forestry, nutrition, natural resources, environmental science, and life sciences (National Research Council, 2009, p. 14). With that in mind, agricultural company leaders have stated that they need to have college graduates who are globally comfortable and confident (Place, Irani, Friedel, & Lundy, 2004). This presents the need for greater participation from collegiate agricultural students, as well as faculty, to be involved in IPs.

Although there is a need for more student involvement in IPs, barriers still exist. These barriers were categorized as external or internal to participation in IPs (Andreasen, 2003). External barriers included lack of time, lack of financial stability, and conflict with classes (Andreasen, 2003). Internal barriers included fear of lost opportunity, fear of different cultures, lack of desire, and lack of family support (Andreasen, 2003). In addition, Sammons and Martin (1997) stated that barriers to international involvement for graduate students at Iowa State University were lack of awareness, interruption of academic program, and financial considerations. Sammons and Martin (1997) expanded beyond IPs with the term “international involvement”, which included internationalization of agricultural curricula and participation in international activities. However, they explained that a sub-category of “international involvement” was study abroad programs. If colleges strive to see increased IP participation, it is crucial that these barriers be addressed.

Due to the internal and external barriers to study abroad participation explained by Andreasen (2003), it is imperative that more knowledge be gained relating to student preferences for agricultural IP lengths, types, and locations. The Dale Bumpers College of Agricultural, Food and Life Sciences (Bumpers College) International Programs Office (IPO) has a limited amount of funding, approximately $25,000 annually, for grants supporting...
faculty-proposed IPs. The funding provided through this grant program is intended to help reduce the overall financial burden for students. The grant helps faculty to establish IPs by lessening the program cost for students by covering faculty travel expenses such as lodging, meals, and transportation. If the proposed program is not a faculty-led IP, then funding may be used by faculty for an exploratory trip that helps with the development of an IP course syllabus, itinerary, as well as strong connections in country. To ensure funding has an adequate return on investment, it is important that funding proposals be selected based on student interests and needs as identified in this research.

Information regarding student program preferences can be used to develop programs that meet student needs and support students to overcome barriers to IP participation. Harder and Bruening (2008) stated that increasing student IP participation within colleges of agricultural sciences is an ongoing concern for professionals interested in developing these programs. Consequently, it is important to understand students’ perceptions to promote these programs effectively (Harder & Bruening, 2008). There has been a shift from semester- and year- long programs to short-term programs for business students, which embraced advantages such as lower costs and shorter time commitments (Carley, Stuart, & Dailey, 2011). Previous research by Estes, Hansen, and Edgar (2016) found that students’ enrolled in agricultural College courses were most interested in IPs that lasted 4 to 6 weeks in length. Additionally, Lukosius and Festervand (2013) reported numerous program decisions can help to lower the student cost, such as the program location which has a tremendous impact on total program cost.

Nevertheless, students recognized the benefits of IPs even though barriers to study abroad participation existed (Chang et al., 2013; Edgar, Edgar, & Hansen, 2018). Benefits from study abroad experiences have been documented as personal and professional, which promoted changes from increased confidence to increased global competencies in the workplace (Chang et al., 2013; Edgar et al., 2018). Briers, Shinn, and Nguyen (2010) found that students were most motivated to participate in an IP based on how much the experience will contribute to their overall life experience. Zhai and Scheer (2004) found that agricultural college students that had contact with international people had a significant correlation for positive attitudes towards cultural diversity. They recommended that colleges of agriculture enhance their educational programs through study abroad experiences to increase student’s global and cross-cultural competencies. Zhai and Scheer (2002) also found study abroad experiences had a positive impact on students’ attitude towards cultural diversity and 78% of participants reported an increase in self-confidence. The most important motivating factors for students to participate in a study abroad program were personal interest, peer influence, desire for new experiences, along with timing and cost (Zhai & Scheer, 2002). Northfell, Edgar, Miller, and Cox (2013) stated that students enrolled in a three-week summer study tour in Ghent, Belgium experienced self-confidence levels that increased steadily throughout the study-tour. Harder and Bruening (2008) reported students’ perceptions toward the importance of international issues and found that the “ability to function as a citizen in a global society” had the highest mean value, followed by the “ability to interact with people from other parts of the world” (p. 240). The contemplation of barriers as well as benefits plays an important role for students when deciding whether to participate in an IP. The benefits to IPs have
been documented across colleges of agriculture. However, student barriers to international involvement must be studied and addressed in order to increase IP participation.

When selecting an IP, students assess the pros and cons of participating before committing (Estes et al., 2016; Edgar et al., 2018). Universities should examine these decisions, based on advantages and disadvantages of participation, to provide opportunities and resources that align with students’ interests. Understanding students’ perceived barriers and benefits will enable greater focus on efforts to increase the number of students enrolled in IPs (Danjean, Bunch, & Blackburn, 2016). The Bumpers College has worked for the past five years to increase international education participation to keep up with the University of Arkansas goal of 25% international participation by 2020. Yet, Bumpers College has maintained about a 5% student international experience participation rate (Edgar, Edgar, & Hansen, 2018).

Theoretical Framework

This research built on previous work conducted by Estes et al. (2016). Social Cognitive Theory (SCT) guided this and previous studies. Conner (2013) also used SCT to describe study abroad experiences. SCT focuses on human behavior perpetuated by continued motivation and regulation of self-influences (Bandura, 1991). Causal agents for SCT were forethought and self-regulation, which translated to incentives and guided purposive action (Bandura, 1991). The term self-regulation is a multifaceted phenomenon of cognitive processes that included: (1) self-monitoring, (2) standard setting, (3) evaluative judgement, (4) self-appraisal, and (5) affective self-reaction (Bandura, 1991). SCT provides an explanation for learning by expressing that individuals should possess symbolizing and forethought capability, as well as self-regulatory and self-reflective capabilities, when engaging in the learning process (Bandura, 1986). The symbolizing and forethought capabilities are especially important for students deciding whether to participate in IPs, they help the student assign meaning to an experience as well as think about potential consequences of actions before engaging in such behaviors (Estes et al., 2016).

In addition to SCT, theoretical models have been used to describe study abroad experiences by Booker (2001) and Peterson (2003), which were based on Fishbein and Ajzen’s (1975) Theory of Reasoned Action (TRA). Both the TRA and SCT described by Bandura (1991) assumed that individuals were rational beings who used available information to make decisions, form evaluations based on possible outcomes, and ultimately arrive at decisions on the action in question (Minton, 2016). Fishbein and Ajzen (1975) stated TRA is when “a person’s beliefs serve as the informational base that ultimately determines his attitudes, intentions, and behaviors” (p. 14). This research used these theoretical models to determine how IP characteristics and perspectives affect participation.

Purpose & Objectives

The purpose of this study was to collect information from students enrolled in Bumpers College courses at the University of Arkansas that would inform and guide future IP experiences within the agricultural college. Furthermore, the purpose of this study was to gather information in regard to student preferences for IPs, such as location of program, length of program, type of program, time of year for program, and student demographics of those surveyed (college enrollment, major, minor,
classification, honors college status, and previous IP experience).

The following objectives guided this study: (1) describe students’ perceived benefits to participating in an IP, (2) describe students’ perceived barriers to participating in an IP, (3) describe students’ preferences for IPs (program location, program length, program type, and time of year), and (4) describe survey respondents’ demographics.

Methods

Data Collection

This study used descriptive survey methods with primarily undergraduate students enrolled in Fall 2017 Bumpers College courses. The survey population consisted of a random stratified sample of courses by academic level and department (Trochim, 2001). The courses were either large-enrollment or required by major. All freshman orientation undergraduate courses in Bumpers College were included in the sample as well. There were 1,758 students who completed the survey, but not every respondent answered every question. Students not present (no contact) were not calculated in the population because they were not present for the informational presentation therefore they were not able to be controlled for non-response. Students were allowed approximately 10 minutes to complete a paper-form instrument and were asked not to complete the survey more than once during the Fall 2017 semester. Survey administration began 23 August 2017, two days after the start of the Fall semester, and lasted approximately six weeks. The number of classroom visits varied per day with approximately 2,295 (potentially duplicate) undergraduate and graduate students enrolled in these 35 courses. Useable data collected from 1,758 students yielded a response rate of 78%. The survey was administered to students either before, during, or after a PowerPoint presentation that described the IPs offered by Bumpers College. There was variation in when the survey was offered depending on the professor’s classroom time allotment. Classroom participants ranged from 15 students per classroom to over 150. In general, larger class enrollments had a larger range in college majors than smaller classrooms.

Instrumentation

Usable data were collected from students using a 13-question, multi-scale instrument modified from previous research by Estes et al. (2016). Participant responses on the five-point Likert-type scale ranged from “completely disagree” to “completely agree”. Part I of the instrument was an open-response question that addressed students’ preferred IP location(s). Part II addressed students’ interest, knowledge, and motivation to participate in an IP. Part III addressed students’ perceived costs for participating in an IP. Part IV addressed students’ barriers to participating in an IP and Part V addressed students’ benefits to participating in an IP. Parts II and III were not reported in this article, because they are a part of a multi-institutional assessment. The barrier options for this instrument were based on barriers used in research by Wingenbach et al. (2003) Edgar and Edgar (2009), and Estes et al., (2016). Last, Part VI addressed the amount students were willing to pay for an IP, previous IP experience, preferred IP type, preferred IP length, preferred time of year, and academic demographics. Face and content validity were deemed acceptable by the Bumpers College international programs faculty committee comprised of one individual from each academic department.
Data Analysis
Cronbach’s alpha was used to estimate the reliability for the benefits and barriers constructs, which was found to be reliable at .796 (N = 1,679) and .971 (N = 1,642), respectively. Data were analyzed using SPSS to determine frequencies, means, and standard deviations. The researchers calculated the open-response question that addressed students’ willingness to pay for an IP and sorted responses into one of 12 categories. The 12 cost categories were reviewed and determined appropriate for content-related validity by an expert panel.

Findings & Results
Students who reported their classification (n = 1,758) included: 15.8% freshman, 38.4% sophomores, 33.4% juniors, 8.8% seniors, and 3.6% were either graduate students or chose not to respond to this question. Some participants reported they had previously participated in a University of Arkansas international programs (n = 93, 5.5%), while others had not (n = 1,607, 94.5%). There were 86.7% non-honors students (n = 1,464) and 13.3% honors students (n = 224). The majority of students were interested in short-term faculty-led IPs (n = 1,190, 72.1%), followed by international internships (n = 760, 46%), international exchanges (n = 490, 29.7%), University of Arkansas Rome Center campus program (n = 365, 22.1%), international independent study (n = 304, 18.4%), and international research (n = 285, 17.3%) (see Figure 1).

Figure 1. Preferred program types for international participation.
(Note: Students could choose multiple program types.)

The majority of students wanted to participate in an IP during summer I (first 5-week summer session) (n = 1,138, 69%). This response was followed by their second choice being a summer II (second 5-week summer session) (n = 839, 50.8%). The least
preferred participation time was the fall semester ($n = 322, 19.5\%$) (see Figure 2).

![Figure 2](image)

**Figure 2.** Preferred time of year for international program participation. *(Note: Students could choose multiple times of year for programs.)*

In addition to the preferred time of year, the researchers also determined that most students preferred a program that was 4-6 weeks in length ($n = 922, 55\%$). The second most commonly preferred program length was 2-3 weeks ($n = 874, 52\%$). The least preferred program length was two semesters or more ($n = 117, 7\%$) (see Figure 3).

Based on open responses, the top 10 countries students were interested in attending from most to least included: (1) Italy, (2) Australia, (3) Spain, (4) France, (5) Greece, (6) England, (7) New Zealand, (8) Germany, (9) Ireland, and (10) Scotland. A map was generated to display the countries that University of Arkansas students preferred attending (see Figure 4). Being an open response, preferred countries were recorded and cities, towns, etc. were changed to their respective country for coding purposes.
Figure 3. Preferred length for international program. 
(Note: Students could select multiple program length choices.)

Figure 4. The blue shaded area represents the top 10 preferred international program locations and the pins represent active Bumpers College 2018 program locations.
Table 1
Perceived Barriers to Participating in an International Program (IP) (N = 1,758)

<table>
<thead>
<tr>
<th>Barrier</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost is too high</td>
<td>3.83</td>
<td>1.10</td>
</tr>
<tr>
<td>Too busy with school</td>
<td>3.27</td>
<td>1.18</td>
</tr>
<tr>
<td>There are not enough funding opportunities</td>
<td>3.09</td>
<td>1.15</td>
</tr>
<tr>
<td>I do not have the language skills needed to be successful abroad</td>
<td>3.00</td>
<td>1.27</td>
</tr>
<tr>
<td>Too busy with work</td>
<td>2.99</td>
<td>1.32</td>
</tr>
<tr>
<td>IP courses do not fit into my degree plan</td>
<td>2.69</td>
<td>1.26</td>
</tr>
<tr>
<td>An IP will not have an impact on my future career</td>
<td>2.27</td>
<td>1.15</td>
</tr>
<tr>
<td>Academic department does not encourage IP participation</td>
<td>2.27</td>
<td>1.10</td>
</tr>
<tr>
<td>I do not have parental support to participate in an IP</td>
<td>2.21</td>
<td>1.23</td>
</tr>
<tr>
<td>I do not have academic advisor support to participate in an IP</td>
<td>2.16</td>
<td>1.10</td>
</tr>
<tr>
<td>I do not have friend/peer support to participate in an IP</td>
<td>2.15</td>
<td>1.12</td>
</tr>
<tr>
<td>I do not have the skillsets needed to be successful in an IP</td>
<td>2.12</td>
<td>1.00</td>
</tr>
<tr>
<td>I have a fear of traveling outside of the U.S.</td>
<td>1.76</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Grand Mean
2.59 1.70

Note: Scale: 1=Completely Disagree, 2=Somewhat Disagree, 3=Neutral, 4=Somewhat Agree, and 5=Completely Agree.

Participants were asked their perceived barriers to participating in an IP. Based on a 5-point Likert-type scale (1 = completely disagree to 5 = completely agree), students reported “cost is too high” (M = 3.83, SD = 1.10), being “too busy with school” (M = 3.27, SD = 1.18), and “not enough funding” (M = 3.09, SD = 1.15) as the most influential barriers from participating in an IP (see Table 1). The least reported barrier was having “a fear of traveling outside the U.S.” which garnished a relatively low rating (M = 1.76, SD = 1.15).

Using the same Likert-type scale, students reported characteristics of IPs, such as a “life-changing opportunity” (M = 4.49, SD = 1.75), “sets me apart when applying for grad school/jobs” (M = 4.27, SD = 1.90), and providing an “opportunity to work/live abroad” (M = 4.25, SD = 1.95) as the most influential benefits (see Table 2). Grand means were determined for benefits and barriers to IPs. Benefits to IPs (n = 1,730) resulted in a grand mean of 4.24 (SD = 1.72). For barriers, there were 13 individual statements compressed (n = 1,735) for a grand mean of 2.60 (SD = 1.70).

Table 2
Perceived Benefits to Participating in an International Program (IP) (N = 1,758)

<table>
<thead>
<tr>
<th>Benefit</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life-changing opportunity</td>
<td>4.49</td>
<td>1.75</td>
</tr>
<tr>
<td>Socially/Culturally learn more about a host country</td>
<td>4.46</td>
<td>1.75</td>
</tr>
<tr>
<td>Sets me apart when applying for grad school/jobs</td>
<td>4.27</td>
<td>1.90</td>
</tr>
<tr>
<td>Opportunity to work/live abroad</td>
<td>4.25</td>
<td>1.95</td>
</tr>
<tr>
<td>Enhance employment prospects</td>
<td>4.23</td>
<td>1.92</td>
</tr>
<tr>
<td>Positive impact on my future career</td>
<td>4.22</td>
<td>1.91</td>
</tr>
</tbody>
</table>

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Students were also asked an open response question: “If cost is the only barrier keeping you from participating in an international program, what is the most you would be willing to pay for an IP?”.

Responses varied among the total number of respondents (n = 1,195). Some students stated they needed more information in order to answer this question such as the program length, program location, program type, etc. (n = 219, 18%). Students also stated they would be most willing to pay less than $1,000 (n = 191, 16%), followed by $1,501 - $2,000 (n = 177, 15%). Sixteen individual responses were excluded, because they stated other barriers to IP participation other than funding, which was outside of the scope of the question (see Figure 5).

![Figure 5. Amount respondents were willing to pay to participate in an IP experience.](image)

**Conclusions & Recommendations**

The fact that only 5.5% of the students surveyed had participated in an IP confirms that more research needs to be done for Bumpers College programs if the University of Arkansas plans to meet the goal for 25% international participation by 2020. The majority of students surveyed were interested in short-term faculty-led programs during summer I. Respondents noted they “agreed” or “completely agreed” with all nine IP benefit statements (M = 4.24, SD = 1.72), except participating in an IP “to experience the local nightlife (clubs, bars, etc.)” (M = 3.77, SD = 1.25). Students noted that IPs can serves as a “life changing
“opportunity” and can help them “socially and culturally learn more about a host country”. However, there was more variability in responses to the 13 IP barriers statements. This research supports previous work by Estes et al. (2016) and Edgar and colleagues (2018) noting the pros and cons to participating in an international learning experience as reported in barriers and benefits constructs.

When evaluating the findings of this study through the lens of SCT plus TRA and assuming individuals are rational beings (Bandura, 1991) information must be provided to make decisions. Because only a small percentage had participated in an IP the question that begs to be answered is did participants have enough information to determine barriers or benefits? This thought is enlightened by the statement that the informational base held (by individuals) determines attitudes, intentions, and behaviors (Fishbein & Aizen, 1975). It could be argued that cost, funding opportunities, and school schedules being held as top barriers are beliefs which may be short term oriented because the benefits were led with the belief of a “life-changing opportunity”. Thus, TRA and SCT align with the top benefits found in this study because of the ability to form evaluations based on possible outcomes of an experience that change lives due to IP participation. The barriers of cost and time seem most appropriately reasoned due to decisions on the needed action in questions regarding IP experiences.

Understanding students’ perceived barriers and benefits will enable universities and colleges to improve efforts focused on increasing the number of participating students (Danjean et al., 2016). This research is a step toward using data to guide Bumpers College IP development. Data gathered will provide IP leaders and administrators with information that will help address barriers and benefits found. Based on TRA and SCT, information will be provided with costs so students who do believe this is a life changing experience can plan and make educated decisions. With shrinking institutional budgets and the desire to serve students in all educational areas, it is important to focus international programming areas on specific student needs and interests.

Implications

These results have highlighted the need within Bumpers College to direct efforts toward particular program types, program durations, and program locations. Salisbury, An, and Pascarella (2013) stated that the public has demanded greater accountability documenting and demonstrating the educational value from higher education institutions, while policy makers have emphasized the importance for funding decisions to be made from rigorous research studies. The broader implications of this research were to gather information about Bumpers College programs and use that information for program development. This study determined that students were most interested in short-term, faculty-led programs ($n = 1,676, 72\%$) that have a duration between 2 and 4 weeks ($n = 1,676, 52\%$) or 4 and 6 weeks ($n = 1,676, 55\%$). This changed from 2016 when 13.5% of Bumpers College students ($n = 773$) reported they were interested in faculty-led programs (Estes et al., 2016). However, similar to findings in this study Estes et al., (2016) stated that in 2016 and 2017 Bumpers College students reported the greatest interest to participate in IPs during the summer, followed by the spring semester. Furthermore, previous experiences and preferred IP experiences were identified in Europe, which remained consistent in this research. There were commonalities between findings by Estes et al. (2016), Edgar et al. (2018) and findings from this
study; however, the differences in responses confirmed the need to continue IP research in response to the dynamic and continually changing needs of students. Perhaps looking at longitudinal data would assist with deeper program understanding and development.

This research can be used to guide Bumpers College IPs by funding proposals that align with program length, locations, and types in which students were most interested. Findings about costs students enrolled in Bumpers College were willing to pay to participate in an IP as well as preferred program lengths, program types, and preferred time of year will assist in the decision-making process for funding. The alteration of program lengths has attempted to address the external barriers Andreasen (2003) described as lack of time and conflict with classes. Although this study is limited to Bumpers College, other universities should use this study as a model for evaluating the needs of students at their respective institution to create programs that are specific to their students’ needs.

Additionally, future research needs to be conducted to gain more knowledge about the external barriers described by Andreasen (2003) as lack of financial stability. Research could determine how students would like to learn about funding opportunities and more accurately assess how much funding is needed depending on the program length, program location, and program type. Also, it may be useful to include a multiple choice quantitative question to evaluate students’ willingness to pay for IP experience in addition to an open response question. Future research efforts could also focus on the internal barriers stated by Andreasen (2003) such as fear of different cultures and lack of desire that were not directly evaluated through this study.

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Bridging Farmer and Researcher: Extension through the Eyes of Agents in Rural Pakistan

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Abstract
Irrigation and efficient water usage by farmers remain key agricultural problems in Pakistan. Technological approaches to water management specifically irrigation management using cloud technology is a recent innovation currently being trialed in Pakistan through a project conducted by the authors and funded by the Australian Centre for International Research. The paper reports on the perceptions of rural agents in Pakistan involved in the scaling out of new technologies to improve irrigation practices of a large number of farmers. The methodology adopted the use of focus groups with water professionals and extension agents as this approach has been proven to be a key effective method to assist rural agents to gather current information on irrigation problems and the scaling out process. Eight focus groups were assembled with an average of ten participants in each group. The findings revealed the current practices, positive outcomes and challenges to conducting farmer education in Pakistan. The importance of this research is its potential to improving work practices of large numbers of farmers that continue to be highly challenging. The study gives fresh insights on how farmer education methods could be achieved in relation to improving water irrigation through new technological practices of a significantly increased number of farmers.

Keywords: Farmer Field Schools (FFS), adult education, extension, irrigation technology, scaling out
Introduction

Extension is used to describe a range of providers and practices that communicate information and new technologies to farmers and rural communities (Rivera & Sulaiman, 2011). Extension may comprise both public and private systems. Increasingly extension covers a wide range from agricultural production through value addition to securing markets and more broadly community development activities. A key extension challenge in Pakistan is how to scale out the effective application of new technologies over the vast irrigated areas. Irrigation is critical to Pakistan’s food security, poverty reduction and economic development. Irrigation profitability in Pakistan is amongst the lowest in the world (Laghari, Vanham & Rauch, 2012). The use of both conventional irrigation methods and poor agronomic practices leads to overuse of water (Pakistan Agricultural Research Council, 2018). Farmers believe that using more water on their crops results in higher yields. Current irrigation practices are not producing the outputs across Pakistan that are required by farmers and by government.

Developing skills and capacity among farmers to manage and maintain irrigation is critical to Pakistan’s continued economic growth and food security (Azad, Rasheed & Memon, 2003). Extension approaches to farming in Pakistan occur in two ways: the traditional top-down, expert-to-farmer approach; and the interactive Farmer Field School (FFS) approach. The FFS approach has had varying degrees of success. The scale-out to other farmers has been poor (Waddington et al., 2014) and irrigation management has not been a specific focus of either extension services or FFS. Ineffective irrigation practices dominate farming and produce deleterious outcomes for Pakistan’s agricultural sector. These have a flow on effect in terms of exports and profitability and viability of agriculture. The problem and its significance are variously understood and appreciated by agencies and intervention groups who endeavour to improve farming practices in Pakistan (Heaney-Mustafa, 2016).

The Government of Pakistan Ministry of Planning, Development and Reform has as a priority in its Vision 2025 access to an adequate supply of water for all (agriculture, industry and domestic) users. Second of the five goals to achieve this is to “invest in proven methods and technologies to minimize wastage, promote conservation and gain efficiencies through rationalization of pricing” (Ministry of Planning, Development & Reform, 2016, p.62). The Pakistan Agricultural Research Council (PARC) in its 2013-2018 Business Plan set water management at the highest priority for research in irrigated areas particularly for small farmers as the main beneficiaries. On-farm water management ranked ahead of food security and other agricultural matters for research. The practices for extension of technologies to farmers to encourage their adoption requires greater in-depth knowledge of the problems, the perceptions and knowledge of farmers about the effective use of irrigation technologies. Focus groups with water professionals and extension agents is the key method used to assist in gathering this current information.

Review of Literature

Traditional agricultural training practices in Pakistan can be traced to Pakistan’s independence (1947). Detailed knowledge of practices can lead to irrigation practices. Such practices, now commonly known as ‘agricultural extension’, were designed to increase farmers’ knowledge and skills to increase farm production through ‘improved agricultural practices and rural life’ (Mazher, Toheed, Khalid & Shawana, 2009, p.1). Such training practices were delivered through various programs,
including the Village-AID Program (1952-62) and from 1961 to 1978 the Traditional Agriculture Extension System (Mazher et al., 2009; Muhammad et al., 2014). Ultimately, these programs closed due to a myriad of issues but one outstanding inter-connecting issue was the top-down approach adopted within each program. Such top-down approaches often disengaged farmers and did not adequately address their individual needs. In 1978 the Training and Visit (T&V) Extension System was adopted and is still in operation in Pakistan today. In 1999 the program went through a major change to focus more on decision-making at the community level. The present agricultural extension system involves extension work through Extension Field Schools (EFS) but it is still recognized as a top-down system (Mazher et al., 2009; Muhammad et al., 2014).

Participatory Extension Approaches (PEA) emerged in agricultural training in the 1980s as a new way of undertaking extension in developing countries which have been effective in South and North Africa and Myanmar (Cho & Boland, 2002). PEA strengths include integration for community mobilization; equal partnerships between farmers, researchers and extension agents; strengthening farmers decision making; promoting the capacity of farmer to adopt and develop new strategies; encouraging smallholder farmers to learn through experimentation through “action learning”; and the recognition that communities are not homogenous and that equitable and sustainable development needs negotiation (Cho & Boland, 2002).

FFS designed as an innovative approach, were institutionalised in 2001. They promote discovery-based learning among farmers (Khisa, 2003). FFS are used to “transfer specialist knowledge and promote skills and empower farmers” (Waddington et al, 2014, p. 12). They use experiential learning methods to build farmers’ expertise (Pontius, Dilts & Bartlett, 2002). Farmers’ capacity is built by practising various techniques themselves (Khatam, Sher & Ashraf, 2013) such as learning while doing (Muhammad et al., 2014).

FFS are “claimed to be cost effective, client oriented, group based and demand driven” (Bajwa, Ahmad & Tanvir, 2010, p. 260). Strengths of FFS include varied teaching methods such as participatory and capacity building methods, incorporating mixed methods such as group discussion, demonstration, lecture, critical and creative thinking activities and decision making exercises. FFS are used to “transfer specialist knowledge, promote skills and empower farmers” (Waddington et al., 2014, p. 12). They are a form of education that uses experiential learning methods to build farmers’ expertise (Pontius et al., 2002). Farmers’ capacity is built by practicing various techniques themselves (Khatam et al., 2013) and engaging in action learning (Muhammad et al., 2014).

Globally, FFS as an overarching learning system are recognised as successful. Various research studies have been conducted to analyze FFS strengths and weaknesses. Strengths may be the a result of their “discovery-based learning, promoting practical method of education and protecting environment and biodiversity” which has become a mantra (Khatam et al., 2010, p. 686). FFS combine local and scientific knowledge and aim to make farmers better decision makers (Khatam et al., 2010, p. 685). FFS play an important role in farmer capacity building and empowerment and do not rely on highly trained facilitators but on farmers’ own discoveries and reflection (Braun & Duveskog, 2011). Despite such a successful learning system FFS have not adequately dealt with the intransigent problem of
scaling out of knowledge and expertise such as the expert use of information technology for farmers to improve irrigation practices.

Braun, Jiggins, Röling, van den Berg and Snijders (2005, p.25) argue that FFSs are “best suited for problems and opportunities requiring site-specific decisions or management practices and for issues that entail articulation of changes in behaviour within the farm enterprise, household and community or among institutions at varying scales of interaction and situations that can be improved only through development of locally dependent knowledge”.

Khatam et al. (2010, p. 688) argued differently: “many of the strengths were dealt with inappropriately, so they should be reconsidered for improvement of the approach. Prominent weaknesses of the system included the heavy expenses on the implementation of FFS which can be minimized by utilizing the services of locally trained farmers as facilitators”. Research in Punjab showed that group discussion and lectures and literature were cited as the best methods for capacity building and dissemination of information among farmers but that these were used to an average extent. Exhibitions, signboards and slogans were ineffective and time consuming (Bajwa et al., 2010).

Khatam et al. (2010) asserted that FFS is a time consuming process; farmers are required to take large periods of time out of the farming life to attend the school. They concluded that the FFS have much strength but the curriculum and other weaknesses “require proper attention of the facilitators to make FFS more effective” (p. 688). The FFS approach is no doubt a worthy approach but it is not without its problems such as the lack of capacity to scale out learning. The various educational concepts surrounding FFS are echoed in the principles of community development as noted by Ife (2013, p.170) “If people are to participate in decision making they can be expected to do so only if they are well informed about the issues at stake and the likely consequences of particular decisions. …informed decisions require …education in its broadest sense, including consciousness raising”.

Davis (2006) findings on FFS suggest that many of the problems inherent in the approach are not being addressed, even though the approach is being aggressively promoted by donors, governments, and non-governmental organizations. Davis concludes that what is needed is not a “one size fits all” approach to FSS but local solutions for local problems. A study in Punjab reports “FFS prove highly beneficial to the farming community due to its capacity building functions” (Butt, Gao & Hussan, 2015 p. 1164). Analysis of previous FFS in Nepal have shown that over 50 percent had a high rate of adoption (Bhattarai & GC, 2015).

Scaling out or scaling up is a key issue of this paper. In Africa, FFS did not appear to have impact at the broader national level. This reflects the economics of scaling out—mobilizing adequate human and financial resources to replicate the approach at the national level. Farmer-to-farmer dissemination is a key issue in scaling up, that is farmers from the schools diffusing knowledge and technologies to their neighbours. Some studies show that effective farmer-to-farmer dissemination is not taking place (Feder, Murgai & Quizon, 2004; Tripp, Wijeratnee & Piyadasa, 2005). Farmers may be gaining skills and knowledge, but they are not sharing them with their neighbours.

The results of studies on empowerment of farmers are mixed. Participation is another key issue worthy of further exploration as the past research of FFS tends to ignore this important aspect. Do FFS encourage and achieve
inclusiveness and how can this be improved? Training and Visit (T&V) and FFS approaches are donor driven and may not encourage empowerment. FFS focus on sufficient monitoring and evaluation or ex-ante and ex-post assessment to recommend ways to improve empowerment and leadership by Pakistan farmers. FFS tend to have formulaic weekly gatherings during cropping season for experiencing and exploring problems and solutions that did not produce empowerment or yield improvements. They are not simply designed to achieve increased yield. Nor should they be used only to empower and mobilise farmers but to achieve traction and results. Research is lacking that reports on the nuances of FFS that render it effective or not for various goals pursued. It is believed that participatory research can reveal what works when, where, how, and why and how to scale out the approach, if this is warranted.

Scaling out fundamentally concerns social empowerment to use existing human energy and to create new attitudes and approaches including successful new efforts to reduce poverty (Taylor, Taylor & Taylor, 2012). Requiring people to change without consequences for failure seldom achieves much. Instead, support systems are needed that help people change. Components of required support (Taylor et al., 2012) include getting innovators to lead, educating about benefits, building from success, highlighting incentives, and at times applying disincentives through peer pressure or raising difficulties for those who do not comply. Taylor et al. (2012) found that disincentives when applied by a partnership tend to be much stronger than when applied by a control-oriented outside body such as government or an NGO. For example, the community groups in the village of Palin in Northeast India, for whom money is scarce, fine members who miss a training session or they fine members who serve unboiled water to another family’s child. Using incentives and disincentives just once is usually insufficient; behavior change needs repetition to take effect. This is something that communities can implement (Taylor et al., 2012).

**Purpose & Objectives**

The purpose of this study was to explore the levels of knowledge, understanding and appreciation held by government and non-government agents and extension personnel who are private teachers, independent of organizational attachments work with farmers in Pakistan. More specifically, the key objective was to identify the reported effectiveness of the agents’ approaches. The focus groups discussions also sought to identify the development needs of the agents to mount an ongoing education program to improve their effectiveness with farmers. Three key questions we posed:

1. What were agents’ levels of knowledge of irrigation improvement and water usage?
2. Which strategies did agents perceive as effective and mostly use?
3. What are the implications for further developing agents?

**Methods**

The study was part of an Australian Government initiative to improve irrigation practices in Pakistan. This part of the study was preliminary work conducted to assist in the co-development of an education strategy that would be used effectively by agents working with farmers to improve water usage across Pakistan. Focus Groups interviews were conducted in Karachi and Lahore and all participants were reimbursed for their travel expenses. Participants were not paid to participate and did so on a voluntary basis. However, all participants
were reimbursed for their travel expenses. They were provided with an information leaflet explaining the purpose and process and required to give written informed consent.

Focus groups are effective because they stimulate discussion and argument to points of agreement. They produce detailed information about strongly held ideas, perceptions, opinions and feelings. They tend to provide broad range information on a topic and are economical compared to individual case studies and surveys. The advantages of focus groups in this context were that responses were spoken, open-ended, relatively broad, and qualitative (Rubin & Babbie, 2008). In this sense focus groups would give researchers a greater appreciation of the practices surrounding the problem. Group member discussions stimulated new thoughts. Although the challenge of focus groups to score importance of ideas arose, the intensity of conversations revealed the passion of commitment around perceptions and practices.

The method used of conducting the focus groups involved trained leaders who individually guide a small group in focused discussion. Our methods have been built through our experience of what appears to be successful that reflect our views and relevant processes for analyzing qualitative data. These methods are supported by Berg & Lune (2012). Opinions are sought on a designated topic as well as suggestions for future action. Discussions are planned and set in a relaxed environment so that people are encouraged to freely talk and express their opinions. As these groups were in a cross-cultural context, group members were encouraged to use the language with which they were most comfortable.

The recorded data were transcribed and in some cases translated; notes taken were cross referenced and a coding system devised to analyze the collected data. From the codes and the noted repetitions of those codes, within and across different focus groups, emerging patterns and themes were identified. This analysis allowed conclusions to be drawn and shared with participants and other stakeholders so that future actions could be planned.

The following broad questions served the purpose of initiating discussion to answer the three key questions we posed. But as is the nature of focus groups, the questions led to several other areas. The main deviation being around question 4 where challenges of actually working with the farmers in their fields broadened out to a discussion regarding challenges for farmers and those who work with them on issues at a field level and also at an infrastructural and policy level. This is explored more fully below.

1. What extension activities or practices do you currently employ when working with farmers?
2. What do you consider are your strengths to work with farmers?
3. What positive outcomes have you had from the extension activities in which you have been involved?
4. What have been the main challenges for you when working with farmers and how have you overcome or managed these challenges?
5. What opportunities do you see for enhancing the work you do with farmers in the future?

Participants

Eight focus groups were conducted with participants who were assured anonymity in order to encourage open discussions. Each was designated a number FG101, FG304 and so on. Participants were representative of the three provinces.
Balochistan, Punjab and Sindh. They were grouped according to their current roles or organisational associations. In all, 80 participants from Punjab, Balochistan and Sindh participated in an allocated discussion group of 6-12 participants from Pakistan Council for Research on Water Resources (PCRWR), Society of Facilitators and Trainers (SOFT), Agricultural Departments (Balochistan and Sindh), Balochistan Rural Support Program (BRSP), Rural Development Foundation (RDF), Kissan Welfare Association (KWA) Punjab South Asian Conservation Agriculture Network (SACAN), Agricultural Service Providers (ASPs) from SACAN, On Farm Water Management (OFWM), Agriculture Extension and research department, Fruit and Vegetable Department (Punjab), World Wildlife Fund (WWF), Irrigation Department, Environmental Protection Agency (EPA), NESPAK, OFWM, PCRWR, Centre of Excellence in Water Resources Engineering, University of Engineering and Technology and MM Pakistan Ltd from Punjab.

Results

The level of knowledge of irrigation improvement and water usage held by the various agents was intimately entwined with the strategies currently employed. Thus the first and second key questions posed are considered together. Through the discussion it emerged that extension agents have little knowledge of water and irrigation as will be shown. Prior to answering the three research questions the critical state of the water situation was highlighted by one participant “This is not rhetoric, it is bitter reality (in Balochistan) … water is not only a challenge … it has now crossed the frontier of threat for human survival even without agriculture” (FG103).

The main themes emerging from question 1 largely confirmed the current literature (Siraj, 2010) that traditional methods of training and visiting, mass demonstrations, seminars, and lectures are for the most part employed by those working within provincial government Irrigation and /or Agricultural departments. Research is brought into the field though demonstrations: "I am the bridge between the researcher and the farmer" (FG304). A top-down training approach was used, albeit sometimes creative such as the use of theatre to demonstrate new technologies. Mass media such as mobile phones and pamphlets were widely used.

Non-government organizations, such as SOFT, BRSP and RDF used the more holistic approaches of FFS, broad community consultation, problem identification and consultative problem-solving. "Insect zoos," "seeing is believing" and "learn by doing" were encouraged by these organizations to engage farmers in their learning. “… the main theme is to switch over farmers from traditional cropping methods to a proven method … in this way they can see the mechanism … they will go to a method where there is more profit … but changing culture will take time" (FG202). A highlight of these organizations is their working with farmers throughout the whole cropping season on a regular basis, visiting them and problem solving with them at least fortnightly. They also maintain contact with the farmer in the next season to provide support and information as needed. Respondents noted that the Fruit and Vegetable Department within Punjab Agriculture extension and Research Department were working with farmers in a manner similar to FFS. However, the departments visit the farmer only three times during the season and their remit is only working in the field with farmers around a predetermined curriculum and as such could be described as a "pseudo FSS" methodology.
Agriculture Service Providers (ASP) trained by the South Asian Conservation Agriculture Network (SACAN) work with farmers as providers of new technologies such as Laser Land Levelling (LLL) and teach them about the benefits of new techniques. The ASP consists mainly of a local farmer who has used the technology on his land so that farmers have the benefit of seeing how it might be effective. Of the eight groups, SOFT and BRSP were the only ones who work specifically with women. SOFT works with Women Open Schools (WOS) on topics of income generation skills including kitchen gardening and engaged in programs related to the safe use of pesticides. BRSP have similar programs and women are involved in the whole of community decision-making processes.

Agreement among all participants across the range of groups was that the most effective teaching comes about using demonstration plots. When farmers "see" that the new technology increases profitability they "believe" and are more willing to adopt the new technology.

The information from question 2 indicated that relationship building and nurturing, active associations and educating capacity were the three key themes emerging when participants were asked to consider their strengths in working with farmers. Relationships with individual farmers, their families and communities that build trust, honesty and loyalty were paramount. These relationships were built through knowing the local language and culture. As one participant in Sindh commented "I use the T&V methods to transfer technology … I have a language problem I only speak Urdu" (FG306). He felt his language limitations precluded him from a closer relationship with the farmers. Working with local associations and farmer groups was also regarded as a strength as it allowed a broader reach as well as a more holistic approach to be taken. One participant referred to it as a "farmer for farmer" (FG603) approach. This built confidence among the farmers that extension agents and facilitators were concerned for them as villagers, not just individual farmers.

The knowledge base and education level of those working with farmers was also seen as a strength, although when discussing challenges this was at times undermined as farmers doubted motivations of those giving them information and not knowing from whom they were getting correct information. With particular reference to water several participants commented that while they have “expert knowledge … it is poor in water” (FG306). Passion, compassion, trust, honesty, loyalty were the most frequently used words by participants when asked about their strengths. Simple things such as ‘dressing like the farmer', ‘having local knowledge' and ‘respecting the farmers' knowledge and skills' were echoed in all groups by participants of both genders and all disciplines.

Several anecdotal stories of small successes were offered to illustrate success relating to changes in farmer practice resulting in higher yields for example: a switch from growing soya beans for which there were limited market opportunities to growing vegetables; using raised beds for bananas improved production and reduced water use; use of direct seeding reduced seed usage from 40kg by broadcast method to 15kg. Use of tunnels for vegetable production has increased from 360 to 45,000 acres over the past decade. With respect to water management practice, there were several anecdotes of the effectiveness of LLL, bund constructions, and watercourse lining. A spin-off effect of bund construction and watercourse lining included the reduction of unemployment of landless labourers. One participant commented
“farmer to farmer success stories lead to sustainability” (FG504). So, stories from the field show that farmers can and do adopt or adapt new ideas and technologies but the research indicates adoption remains poor on the larger scale (Knowler & Bradshaw, 2007; Pender, 2008; Sheikh, Rehman & Yates, 2003).

In considering the third research question, the implications for further developing agents, challenges faced and opportunities available were discussed. Challenges related to change and trust were identified as key but essentially the challenges lay outside the farmers’ fields. There was agreement in all focus groups that farmers are willing to change and increasingly it is the farmers who approached the various Government departments seeking help. The key challenge identified was the inability to make change when confronted with impediments. Other key challenges identified in all focus groups included poverty, market access and storage, loss of farmer trust, infrastructure/institutional level issues, lack of relevance of research to farmers’ problems and “hand out” mentality of farmers. Farmers do not see the value in increasing production if they cannot get their product to market and get a reasonable price or if they do not have storage facilities to hold the surplus until the price is right.

Across all groups, the notion of trust was raised with several commenting that farmers do not know whom to trust. Different groups give them conflicting information and there is a perception that the various agents have a vested interest. “When the FFS man comes to the farmer he thinks the FFS guys are doing it in their own vested interest … takes time to build trust” (FG204). Participants reported farmers as saying: “this guy was just born yesterday and he is telling us what to do” (FG505).

Small and medium farmers largely lacked the means to adopt new technologies due to poverty, lack of financial resources, no ownership of the land, dependence on landlord’s decisions and inability to obtain low or no interest loans. Participants in all groups also commented on farmer attributes which limit uptake of technologies as being related to low education levels of farmers, rigid attitudes – “they don’t shift easily” (FG502). The reliance of farmers on participation incentives was raised by several groups and the notion of the “hand out” mentality is still common among many. The relevance of research was highlighted in all groups as was the poor linkage between research and extension. "Research is not farmer-driven … it is researcher driven" (FG103). Farmers did not regard the research as being directed to their in-the-field problems; the high technology equipment did not address their needs or was too complex for them to operate. At the Institutional level many factors impacted on farmers’ learning and subsequent adoption of technologies. Issues of policy and poor governance around fair and equitable water distribution was either lacking or being poorly implemented. A siloed approach was limiting a holistic manner to address issues.

As one water engineer agent commented when others spoke of the whole of value chain approach to address issues: “...we are scientists and engineers we can only talk to farmers about technologies” (FG701). A lack of resources leads to poor quality extension services. An example was cited of having a vehicle but “no tyres for it” (FG204) and so unable to go to the field to do the extension training. Numerous other examples were cited such as inadequate budgets in extension services and lack of support and training for extension officers.

The general feeling was that extension agents lacked knowledge, particularly regarding water management and hence
often gave poor information to farmers which further compounded the lack of trust highlighted above. These matters impacted on and eroded the trust of the farmers in researchers, extension agents and engineers to provide them with relevant, suitable, manageable and effective technologies. Rebuilding trust was common across all groups and all participants. All groups agreed on the importance of taking a more holistic approach with a focus on problem-solving of the "real issues" identified by farmers.

Adopting new attitudes was considered a requirement for taking a whole of community approach to build village level capacity involving women and youth and encouraging farmers to work in groups such as WUAs, Village and Union Councils, Kissan Welfare groups and the like: "… until and unless farmers as groups are organized we cannot get results from any projects … groups should be focusing on water or production, then service can be supplied to them regarding markets and other things" (FG405). There were also perceived opportunities and a need to tap into existing indigenous knowledge and communication networks: “…need to explore naturally existing community based/indigenous organization for technology dissemination through it” (FG803). Untapped opportunities existed to work more with women for example in nursery and seedling raising, silage making and animal health: “Women respond better than men!” (FG503). There were additional opportunities to encourage youth engagement through entrepreneurship, use of young graduates in teaching farmers most recent technologies.

Addressing infrastructural and institutional issues was raised as an untapped opportunity for agents to enhance their own knowledge base and to acquire more resources and support for extension agents: "without mobility and support, we cannot do anything" (FG202). Other opportunities were cited to enhance relations within and between government and nongovernment sectors: "… more investment in civil society organizations … more work should be done by them as they have expertise and proven outcomes" (FG403). More needed to be done to encourage better use of Information Communication Technologies especially as android adoption was becoming more common with farmers.

Conclusions, Recommendations & Implications

The study described one attempt to appreciate more deeply the perceptions of agents who educate increasing numbers of farmers to move forward more productively and creatively with water usage practices through improved technologically related irrigation behaviours. Overall the research clarified that there was limited knowledge among external agents as irrigation had not been a specific focus among them. Farmers understood that irrigation occurs either from a canal or from tube wells. When supplied via a canal then farmers rely heavily on the cycle with the knowledge of when water will flow into the canal for their use. This has led to an inefficient practice of flooding their fields which led to further deleterious effects of nutrients leaching from their farms. If irrigation depends on tube wells then extraction from the wells depletes the aquifers and produces high content salt in the water making the water less than optimally useful.

Second, agents emphasized farmers’ love of discovery learning. It was difficult for agents to follow this method as access to farmers was extraordinarily difficult requiring traversing rough terrain over large areas. Third, FFS continued to be popular due to a more interactive and fluid approach
rather than adopting the extension agent system. The hierarchical nature of all extension services where researchers work with extension agents who work with field agents who work with farmers was obviously entrenched and resistant to innovation. The fourth salient feature to emerge from the focus groups is the paucity of resources, outdated knowledge and lack of self-development. The development need occurs across the hierarchy of personnel and the hierarchical teaching system. Interaction and dynamic learning was lacking across the hierarchies which slows communication and action and suffocates creativity and innovation. In several groups both those from government departments and private enterprise and non-government agencies, there was a strong sentiment that extension work should be handed over to civil society organizations not only because they had the expertise and proven outcomes as cited above but more importantly because they had the trust and confidence of the farmers.

Key insights emerging from the study can be encapsulated in the words of two of the participants. Firstly, from an agent in a non-government organization who worked with farmers daily in their fields, "Empowered communities will lead to reduced government expenditure … less management of minor matters" (FG406). Second, the idea came from one government water engineer who also worked daily in the field with farmers: "we have two ears and one tongue only - go to the farmer to listen … this will boost trust … and lead to root of problem" (FG103). Both of these comments reflect the ancient wisdom of the Chinese philosopher Lao Tzu who said "go to the people, live with the people, work with the people and when you leave they will say we have done it by ourselves" – an empowered and trusting community. Field agents recognize their mission at a deeper level beyond the provision of skills and knowledge. The work of agents is a sacred level of ‘empowering’ the community and reflects on the obligation to expand their own knowledge, strategies, skills and development.

A key limitation of the research was the small sample of convenience and this may not have been representative of the entire country of Pakistan. Further, this study delved into one perspective only: that of the agents where there was almost unanimous agreement and so there was no opportunity for contesting the observations and conclusions of the agents.

Further research could explore how extension agents are trained on water irrigation and water management especially using new technology. The way extension agents learn and deliver their services is still largely not appreciated and the quality and effectiveness of the training materials on the approaches used have not been evaluated.

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