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From the Executive Editor

This issue wraps up my two-year term as Executive Editor of your journal. It has truly been a privilege to have served our association in this role, as I have learned so much about the unique contributions of our many talented members to agricultural and extension education. I am proud of the work you do and am pleased *JIAEE* continues to offer you an outlet for sharing your quality scholarship.

Moving forward, *JIAEE* will be lead by Dr. Robert Strong of Texas A&M University, submissions will be managed by Dr. Kristina Ricketts of University of Kentucky, and I will move into the Past Editor position. Our new editorial team is committed to improving all aspects of journal production. We have updated descriptions of article types and submission guidelines to improve clarity for interested authors. We are working to be more cognizant of the international nature of our journal; we have already adopted a format that includes country information for every author, moving away from a format that only included country for non-U.S. authors. In this issue, you will notice another change. Moving forward, issues will be labeled by month instead of by season, as the season labels were only accurate for half of the world at any given point in time.

We recognize quality research is the result of quantitative and qualitative approaches; for that reason, we are happy to share the Editorial Board voted in favor of a revised page limit guideline that states submissions must be 20 double-spaced pages *excluding* references. We feel this will create new opportunities for qualitative researchers to demonstrate the effective use of thick description. Be sure to revisit the submission guidelines before uploading your next manuscript so that you are following the most recent version.

Dr. Strong will be leading an effort to solicit articles that position agricultural and extension education at the leading edge of addressing critical global issues. This will include more invited commentaries and the potential for theme-based issues. Our Editorial Board has called for more conceptual articles that articulate the linkages and contributions of agricultural and extension education to broader disciplines such as economics, sociology, and psychology. Publishing this type of scholarship will lead to increased visibility and opportunities for agricultural and extension educators to apply their expertise in meaningful ways.

It has been with the best interest of our membership in mind that we, the editorial team, have decided against pursuing indexing of *JIAEE* at this time. The requirements for being indexed would significantly add to the time needed to manage our journal, which is comprised of editors and an Editorial Board who conduct their roles as service functions. Also, indexing is more easily accomplished when a journal has a large pool of readers. Agricultural and extension education is such a narrow professional focus that it is unlikely we will ever reach the critical capacity necessary to generate a worthwhile impact factor for *JIAEE*, even if we meet all the other requirements for indexing. Past attempts at indexing the journal by previous editors support this belief. As a result, we

recommend continuing on our current path and will continue identifying strategies to improve the processes that protect the quality and integrity of *JIAEE*.

I thank you for entrusting me to lead *JIAEE* over the past two years.

Sincerely,

A handwritten signature in black ink that reads "Amy M. Harder". The signature is written in a cursive style with a large, prominent 'A' and 'H'.

Amy Harder
Executive Editor, *JIAEE*

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Capacities of Extension Personnel within the Pluralistic System of Post-Conflict Liberia

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Abstract

Agricultural extension can play a major role in stimulating development, reducing hunger and poverty, and promoting stability in post-conflict Liberia. Consequently, the nation has prioritized extension to increase agricultural productivity and enhance livelihoods. However, the capacities of Ministry of Agriculture personnel and NGO workers have considerable impacts on the quality of extension services. This study sought to (a) describe the human resource capacity of Ministry of Agriculture personnel and NGO workers to deliver extension services to small-scale farmers, and (b) identify organizational barriers impacting the capacity of extension personnel. A qualitative design and purposive sampling were used, and the study included perspectives from 13 MoA and 16 NGO extensionists along with 39 farmers.

Results showed MoA officers possessed lower technical and andragogical capacities than their NGO peers. Capacity deficiencies were especially acute among older MoA personnel employed prior to the conflict. Both the MoA and NGO sector advocated professional development, yet only larger international NGOs (INGOs) could provide these opportunities to their personnel. Inclusion of MoA and domestic NGO officers in INGO trainings helped develop basic capacities, although these opportunities were not maximized. Operational barriers such as high farmer-to-officer ratios, inadequate funding for extension programming, and challenges in modernizing the workforce further compromised officer capacity. Recommendations included prioritizing efforts to maximize the benefits of INGO trainings to the public sector, attracting skilled extensionists from the NGO sector to the MoA, incorporating and promoting younger officers and female extensionists to meet modern demands, and using low-cost methods to improve coverage.

Keywords: Human Resource Capacities, Organizational Barriers, Post-Conflict, Liberia

Introduction

Agricultural extension is recognized as crucial to agricultural development (Swanson, Bentz, & Sofranko, 1997), a catalyst for economic growth (Cervantes-Godoy & Dewbre, 2010), and a driver for rural livelihood development and poverty reduction (Food and Agricultural Organization [FAO], 2013). As such, establishing effective and stable extension services are goals of many agricultural development strategies (Swanson & Rajalahti, 2010). Agricultural extension is particularly valuable to countries emerging from conflict, with immediate needs to re-establish food supplies to address acute food insecurity, provide livelihoods to rural populations in extreme poverty, and promote stability and social cohesion (Collier, 2006).

However, public systems in developing countries face significant challenges. Institutional capacity is often low, funding is inadequate to properly conduct activities and pay officers, and personnel are poorly trained and lack current technical information (Feder, Willett, & Zijp, 1999). These circumstances are worsened for nations emerging from conflict and rebuilding institutions and extension systems. As a result, the quality, relevance, and sustainability of extension services suffer and agricultural development stagnates (World Bank, 2012).

Effective extension services are crucial for the government of the Republic of Liberia. Liberia is a post-conflict country recovering from 25 years of conflict that left the nation and its people devastated. Immediately following the cessation of conflict in 2003, the Human Development Report ranked Liberia 164 of 168 countries globally (United Nations Development Program, 2005). Hunger, poverty, and other social indicators reached critical levels while Liberia's economy, albeit fairly underdeveloped before the conflicts, was

virtually destroyed (Humphreys & Richards, 2005).

With other sectors decimated, agriculture's role increased significantly in the post-conflict period. Immediately following the conflict, agriculture accounted for 76.9% of Liberia's GDP, the highest rate in Africa, and employed 70% of the labor force. These numbers have remained high, at 38.8% and 48.9% respectively, by 2013 estimates (World Bank, n.d.). Food crop production is still identified as "the most important source of livelihood" (MoA, 2007, p. 13) in the country. About 74% of Liberians list food crop production as their primary income source, and rates are higher in rural counties. Still, food insecurity affects 80% of rural populations, with smallholder households the most vulnerably food insecure (MoA, 2007).

Given the role and importance of agriculture, the sector is anticipated to heavily contribute to overall development, peacebuilding, and poverty reduction in Liberia. The Liberian government has placed agriculture "at the center of reconstruction and development efforts" (MoA, 2007, p. 1). Agricultural extension is central to these efforts, yet the capacity of extension providers in post-conflict Liberia is viewed as a limitation to successful development (McNamara, Swanson, & Simpson, 2011). The human resource capacity of extensionists in post-conflict settings commonly declines as professional development is suspended, access to current technical information is interrupted, and the inability to operate during the conflict period leads to skill deterioration (Collier & Duponchel, 2013). However, these factors affect different countries and extension systems in different ways. A better understanding of the current human resource capacity of extension personnel and organizational barriers affecting that capacity is therefore needed in order to

successfully increase agricultural productivity, improve food security, and enhance livelihoods for Liberians.

Conceptual Framework and Review of Literature

Conceptual frameworks in the development field are often addressed as models that show linkages and causalities (Birner, Cohen, & Ilukor, 2011). Figure 1 demonstrates the relationship between agricultural extension, development, and productivity, and how these areas represent causal linkages to poverty and hunger that ultimately contribute to stability or the emergence of conflict. To illustrate these dynamics, effective agricultural extension promotes successful agricultural development and productivity, which in turn stimulates improvements in poverty and hunger indicators that can help promote stability, while failure in agriculture can exacerbate these same areas and create the conditions for conflict.

The relationship between extension and productivity/development is evidenced by extension's central role in promoting agricultural growth (Cervantes-Godoy & Dewbre, 2010). In contrast, poor agricultural extension contributes to low development and productivity, as seen in Africa where extension systems are often weakest (Feder et al., 1999) and per capita food production has actually declined in the past half century (FAO, n.d.; Wiggins & Leturque, 2010).

The conceptual model also shows causal linkages between agriculture and poverty and hunger indicators, which are interconnected (FAO, 2013). Regional

agricultural productivity trends that closely mirror changes in both poverty and hunger provide evidence of this relationship. For example, while productivity gains in several regions led to improvements in poverty and hunger, minimal productivity increases in Sub-Saharan Africa corresponded to minor reductions in poverty (-17.3%) and in hunger (-28.5%) since 1990 (FAO, n.d.; World Bank, 2015).

Finally, agriculture, poverty, and hunger all contribute to nations' paths towards stability or conflict. Many armed conflicts occur where dependence on agriculture is highest, and sizeable decreases in the sector often prompt violence (Zaur, 2006). Also, countries with lower poverty and hunger indices show greater stability and those with higher poverty and food insecurity are historically more likely to experience conflict (Wiggins & Leturque, 2010).

Conflict itself creates a vicious cycle. Countries in conflict suffer further setbacks in agricultural extension and development as institutions collapse, extension workforces are unable to work, and services to farmers disappear. Agricultural productivity declines as farmers are displaced and crops are destroyed or looted, and poverty and hunger indicators worsen due to internal displacement and interruptions in the food supply (Wiggins & Leturque, 2010). When conflict is halted, the need for immediate progress in agricultural development heightens the importance of rebuilding weakened agricultural extension services to avoid further violence and escape the same cycle.

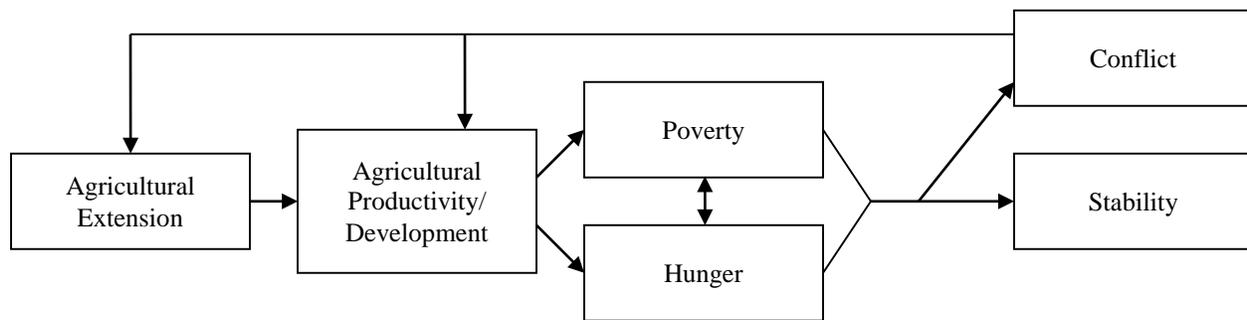


Figure 1. Relationships between agricultural development, poverty and hunger, and conflict.

Many post-conflict countries face significant challenges in restarting national economies, during which time agriculture becomes the de facto occupation for many people while other sectors recover (Collier, 2006). As a complementary factor, extension is essential to overall development and economic growth (Obwona & Guloba, 2009), along with food security and poverty reduction (Cunguara & Moder, 2011; Moore, Dormody, VanLeeuwen, & Harder, 2013), especially in the early post-conflict period. Extension also benefits peacebuilding and stability by representing governmental commitment to public services and building trust in new governments and institutions (Collier, 2006), while strengthening the agricultural sector's ability to reabsorb displaced rural peoples (Tizikara & Lugor, n.d.) and reintegrate former fighters (Blattman & Annan, 2012; Humphreys & Richards, 2005).

Despite its positive potential, post-conflict extension is compromised by poor institutional and human resource capacity. Conflict drastically alters or completely destroys institutions, which results in a breakdown of services during conflict and significant challenges restarting services in the post-conflict period. Post-conflict institutions are exceptionally weak, often operate in a context of reduced funding, and

suffer from a lack of human and physical resources (Aron, 2003; Geda, 2011).

The need to rebuild extension workforces following conflict is complicated by shortages of qualified individuals. Agricultural colleges are the main producer of potential extensionists, yet these institutions' abilities to function and/or provide quality instruction are also compromised by conflict. In post-conflict Mozambique, Davis, Ekboir, and Spielman (2008) found graduates of agricultural colleges were not prepared to serve stakeholders or help facilitate agricultural development. Graduates were only competent in traditional and non-participatory teaching methods that used the technology transfer model of extension. Without a trained supply of extensionists to fill vacancies, overall service provision is compromised.

Extension personnel who remain through conflict and resume activities post-conflict often suffer a process of skill deterioration that places them at a disadvantage when services are restarted. Collier and Duponchel (2013) termed this phenomenon "forgetting by not doing" (p. 67), whereby public servants (including extensionists) lose capacity during conflict due to lack of application opportunities through disruption of extension

responsibilities and displacement from work. Similarly, officers' knowledge base is frequently out-of-date due to time spent without in-training. In post-conflict Iraq, extension officers cited decreased capacity and lack of training due to conflict as an impediment to effective extension services (Abi-Ghanem et al., 2013). Kwapong and Nkonya (2012) examined the perspectives of officers from a range of extension providers in post-conflict Uganda, including officers from the public system, the public-private National Agricultural Advisory Service (NAADS), NGO providers, and private extension officers. Again, officers in all schemes reported capacity building and in-service training to improve service delivery as their biggest needs, with gaps related to post-conflict conditions. Similar instances were found in Mozambique (Cunguara & Moder, 2011) and Timor Leste (Moore et al., 2013).

Purpose and Objectives

This research was part of a larger study that examined challenges and opportunities to improve service delivery to small-scale farmers in post-conflict Liberia. The purpose of this study was to explore the capacity of Ministry of Agriculture personnel and NGO workers. Specifically, the objectives were to: (a) describe the human resource capacities of Ministry of Agriculture personnel and NGO workers to deliver extension services to small-scale farmers, and (b) identify organizational barriers impacting the capacities of Ministry of Agriculture personnel and NGO workers to deliver extension services to small-scale farmers.

Methods

This study used an interpretivist theoretical perspective, constructionist epistemology, and basic qualitative design under the umbrella of qualitative inquiry.

This research design allowed the study to focus on the meanings that respondents ascribed to experiences within Liberia extension and to better understand the overall system and services (Creswell, 2013).

The population for this study included Ministry of Agriculture and NGO personnel in Liberia. The population for the MoA consisted of 134 extension staff that included administrative personnel located in Monrovia, regional subject matter specialists, along with County Agricultural Coordinators (CACs) and District Agricultural Extension Officers (DAOs) in each of Liberia's 15 counties (MoA, 2007). At the time of reporting, 60 international and domestic NGOs provided extension services to Liberian farmers and operated in all counties (McNamara et al., 2011). The total number of NGO personnel was fluid even during data collection, which made it impossible to quantify this portion of the study's population.

Purposive sampling and the maximum variation method were used to generate a sample that represented all hierarchical levels of the MoA and key INGOs and domestic NGOs. INGOs included USAID's Food and Enterprise Development (FED) program along with ACDI/VOCA and ZOA, two of FED's partners. Domestic NGOs included the Community of Hope Agricultural Project (CHAP), Farmers' Union Network of Liberia (FUNL), the United Methodist Compound Agricultural Project (UMCAP), and 4-H Liberia. Farmers were identified via convenience sampling to provide contextual perspectives (Ary, Jacobs, & Sorensen, 2010).

MoA respondents representing all 15 Liberian counties were accessed at a centralized training in Bong County, expanding the study's scope and allowing for respondents to provide a range of

perspectives on the delivery of services. Similarly, presence at a centralized training allowed inclusion of NGO representatives from all 15 counties. The MoA, all INGOs, and several domestic NGOs sampled provided a national perspective, while CHAP and UMCAP only contributed input from Montserrado and Nimba Counties respectively. The final sample included 13 Ministry of Agriculture and 16 NGO personnel representing seven NGOs, along with 39 farmers.

A questionnaire for semi-structured interviews was created to guide data collection, and content was determined by several sources (e.g. McNamara et al., 2011; MoA, 2007). The questionnaire included eight open-ended and five closed-ended questions grouped into sub-themes of agricultural background, extension background, extension service delivery, participatory extension, pluralistic extension, and the future of extension. The questionnaire was reviewed by faculty from a U.S. university and representatives of the Liberian Ministry of Agriculture and the FED program. The final questionnaire was approved by the Institutional Review Board (IRB) at the University of Florida.

Semi-structured interviews were primarily conducted at respondents' workplaces, although both groups of respondents were also interviewed at in-service trainings and in the field to accommodate their schedules and responsibilities. Interviews lasted between five minutes and one hour depending on the respondents' willingness to converse with the lead researcher. Data were audio-recorded and hand-written notes were also taken on the instrument. Per IRB regulations, identifiers were removed from all data, and respondents were then assigned a code number to signify their category (e.g. MoA personnel as M01, NGO worker as N01, farmer as F01) (Ary et al., 2010). The

study also gathered data through observations, research note-taking, memoing, and daily research journaling during data collection (Creswell, 2013).

Data analysis was conducted using the Straussian (1987) approach to traditional grounded theory. Following transcription, data were analyzed using a three-step coding process to identify the principle themes and show commonalities from a range of respondent perspectives (Creswell, 2013).

Lincoln and Guba's (1985) trustworthiness framework was used to establish rigor. A variety of strategies helped to maximize credibility, including data triangulation by interviewing multiple respondents representing different organizations at different administrative levels, member-checking responses through a summary meeting with MoA stakeholders, prolonged periods (two months) of close engagement with respondents in the field, and peer debriefing (Lincoln & Guba, 1985). Transferability was achieved through thick description that included extensive descriptive narrative and representative quotes with the study's findings. Extensive memoing and research journaling were used to maximize dependability and confirmability and allow for auditing (Lincoln & Guba, 1985).

Findings

Human Resource Capacities of Ministry of Agriculture Personnel and NGO Workers

This category was divided into two sub-categories: (a) technical and andragogical capacities, and (b) professional development of field staff.

Technical and andragogical capacities. Liberia extension workers required both knowledge of technical information and teaching methodologies to effectively serve small-scale farmers. "There's the technical component and also

there's the communication aspect of relaying that technical information to the farmer," explained N15. Officers with strong technical and interpersonal skills provided quality services to farmers while less knowledgeable officers struggled to serve their clientele. However, the human resource capacities of extension personnel differed between the MoA and NGO sector.

In general, MoA extension personnel lacked both technical knowledge and andragogical training. While some field-level officers were quite knowledgeable, the majority of officers were ignorant of modern production methods and lacked up-to-date technical information (M01, M02). For example, one DAO had never heard of intercropping (M12) while a MoA rice specialist was ignorant of the System of Rice Intensification (M04). This knowledge gap also caused an inability to adequately answer farmers' questions (F15). "They don't know the questions," complained F17. As a result, farmers were unlikely to consult Ministry officers with technical issues (F05, F13).

While most MoA officers lacked technical capacities, many demonstrated high andragogical knowledge. Respondents talked about the need for trust-building (M04), accommodating different learning styles (M01, M13), and utilizing different teaching methods (M05, M07). However, findings suggested officers developed andragogical knowledge through individual experience and study, not through planned MoA trainings. This left less motivated officers deficient in teaching skills. Finally, field-level MoA officers who displayed above-average technical and andragogical skills were often drawn away by better-paying INGOs, further lessening the capacity of the MoA officer base (M01, N02, N06).

Lack of technical knowledge and andragogical capacity was most acute

among CACs and older DAOs who were educated prior to the war and demonstrated a severely outdated understanding of modern agricultural issues. For example, CACs demonstrated total ignorance of even the basic principles of climate change and potential adaptation strategies, and one CAC described the "new extension model we call the Farmer Field School," even though the approach has existed for decades.

In contrast, NGO extension personnel were far more knowledgeable and educated than their MoA counterparts. Many Liberian FED officers (e.g. N03, N04, N12) possessed Bachelors-level agriculture degrees or higher, mainly from Liberian universities, with years of experience in extension. Officers also received intensive pre-service training on the technical aspects of the value chain to which they would be assigned along with training on adult and non-formal education principles (N09). One FED officer (N03) described using a "randomized complete block design" on farmers' demonstration fields, suggesting an understanding of research and evaluation methods.

Even domestic NGO personnel demonstrated high knowledge and skill levels. Officers at UMCAP (e.g. N13) described up-to-date and modern agricultural practices learned from international partners, while the FUNL (N10) showed a strong understanding of andragogy and used participatory extension approaches called "listening clubs" to serve female farmers.

Professional development of field staff. Technical capacity was also found to be highly tied to the practices of professional development. Most respondents agreed that officers needed in-service training to work effectively with Liberian farmers. "You have to be updated. So you need, at least every three months, to be taken to another training, to have every type of

improved knowledge to carry back to the farmer,” explained N07.

The MoA heavily emphasized in-service professional development to address gaps in technical knowledge among their personnel, although the Ministry itself lacked the capacity to provide this service (M01). Instead, through collaboration with INGOs and specifically the FED program, MoA officers were able to receive technical training along with their NGO peers (M04, M08). Many trainings were open to extension personnel from multiple agencies (N01), as observed in a cassava workshop that included officers from ACDI/VOCA, FED, ZOA, and the MoA. Smaller NGOs (e.g. FUNL, UMCAP) also sent personnel to INGO trainings (N10, N13).

Also, field-level NGO officers often included MoA extension personnel as learners in workshops they taught. Several respondents (e.g. F15, N06) indicated that MoA officers and technicians did take advantage of these opportunities. However, one extension administrator (N15) questioned the value of these trainings in preparing extensionists because the technical content taught was simplified for consumption by farmers.

Beyond facilitating in-service training, the MoA was successful at supporting exemplary DAOs and field-level officers (M05, M13). Commonly this involved sending personnel abroad to receive advanced degrees in priority areas. “We got six to seven persons out there getting their Masters and PhDs in different aspects of [agricultural science],” explained a MoA administrator (M03). MoA personnel granted this opportunity described benefitting personally and professionally (M04, M12). Farmers working under these individuals (e.g. F15, F16, F32, F35) were also much more positive about the services they received and their collaborations with the MoA than other farmers interviewed.

Organizational Barriers Impacting Capacity of MoA Personnel and NGO Workers

Organizational factors also affected the capacity of extension workers. Several respondents (e.g. M01, M13, N15) indicated that poor coverage placed an additional burden on officers, who were each tasked with serving between 1,000 and 5,000 farmers. Again, this issue was most acute within the MoA. “We have limited manpower in the field. . . We need to hire other people,” stated M04. However, financial limitations within the Ministry were a constraint to expanding the number of field-level officers (M01, M04).

Respondents also cited the possibility to increase the number of field-level MoA staff by incorporating NGO extension officers after NGO contracts expire (M01, M13). “At the end of the project maybe if the Ministry has the capacity we can absorb those people,” stated M02. Respondent N01 believed this would provide a supply of ready-trained extensionists with high levels of expertise and practical experience, thereby improving both coverage and institutional capacity. Some NGO respondents expressed support for a move to the Ministry. “If I had the opportunity I want to work with the Ministry, because when you are working with the Ministry you are permanently employed,” stated N04. Other NGO officers were reluctant to move to the MoA due to bureaucracy, low salaries, and a lack of upwards mobility (N03, N07).

While addressing the quantity of field-level officers was extremely important, the Ministry of Agriculture was also found to be in need of re-examining ways to contemporize their workforce. Many MoA extension administrators were older, had worked in extension from before the war, and had remained in their positions over the long-term (M02, M13). Other administrators

and CACs were political appointments not based on capacity in the field of agriculture or extension (M01). For example, one CAC was moved from the Ministry of Planning and appointed to lead Liberia's most populous county despite having no agricultural background.

Mechanisms to promote and reward outstanding extension personnel were also lacking (N02). This limited the upwards mobility for young, promising public extension workers but also compromised the ability of the MoA to successfully develop modern technical and andragogical capacities (M13, N14). Over the long-term and especially as INGOs leave, respondents believed this could create a problematic dichotomy between older, entrenched MoA personnel and younger, progressive NGO personnel who will become increasingly involved in the sector (N15).

In addition to increasing the involvement of younger extensionists, respondents felt the MoA should also incorporate more women into its operations (M01, M02, M13). At the time of data collection, NGOs employed more female officers (~30%) than the MoA (10.7%) even as both service providers increasingly worked with female farmers. Efforts were being made to balance the gender disparity. "We are really trying to encourage the employment of more female extension workers," explained one MoA administrator (M02). These factors suggested the greater female employment could be seen in the near future.

Conclusions, Implications, and Recommendations

Officers showed both positive and negative professional characteristics that may influence the present and future delivery of extension services in Liberia. Technical knowledge was a constraint for many officers, but especially for those

employed by the Ministry of Agriculture. Inclusion in INGO training did appear to provide a basic level of technical knowledge to MoA officers, although low access to up-to-date information, competing priorities, and high farmer-to-officer ratios negatively affected their ability to serve farmers. This left many officers unable to answer producers' questions or to solve farmers' problems in a timely manner.

Beyond technical abilities, field-level officers operating in an increasingly participatory extension need high andragogical, facilitation, and interpersonal capacities, especially to implement the Farmer Field School model (Ganpat, 2013; Sulaiman & Davis, 2012). Positive interpersonal skills were demonstrated by both the MoA and NGO sector, although the MoA lacked andragogical abilities relative to NGO counterparts.

Overall, these differences resulted in low technical and training capacity of MoA officers compared to NGO officers. Capacity differences also repositioned MoA officers as deferential to their more-capable peers, even as they were often partners in implementing programs. However, the long-term success of farmer training will depend on MoA officers' ability to develop the skills needed to lead these programs following INGOs' transition away from service delivery.

The implications for Liberia are two-fold. First, low officer capacity can lead to disenfranchisement with agricultural extension and farmers not seeking advisory services for production needs (World Bank, 2012). Large-scale farmers instead find information through producer organizations or input suppliers, although this is unlikely given the state of the private sector in Liberia, while small-scale farmers seek family, neighbors, or elders for agricultural advice (Feder et al., 1999). Second, farmers may return to traditional methods with lower

production potential, leading to lessened impacts on poverty, hunger, and development (FAO, 2013; Swanson et al., 1997). Additionally, farmers may leave the sector and become food consumers rather than producers, which would further increase the demand on Liberian farmers and creates greater importation and food insecurity (Tsimpo & Wodon, 2008).

The Ministry of Agriculture should rebalance its personnel to represent modern extension realities. This could include increasing the percentage of female personnel, especially at the field level, along with the incorporation of younger officers into positions with upwards mobility. One possibility is to incorporate former NGO officers, although retention will require competitive salaries, achievable advancement opportunities, and support for transportation and basic work-related needs that reduce the amount of money officers spend of their own salaries towards operations, making their take-home pay more appealing (Kutilek, 2000).

The Ministry of Agriculture should also pursue solutions to improve coverage and improve service quality at low cost. Streamlining officers' planning and reporting responsibilities could create more time to do actual extension work (World Bank, 2012). Also, training farmer leaders in technical as well as extension skills could better prepare them as informal extensionists to expand coverage at minimal cost to service providers (Sulaiman & Davis, 2012). Finally, efforts to improve print material dissemination and increase the use of radio and other information communication technologies could improve services and address coverage gaps (Swanson & Rajalahti, 2010).

Extension service providers should also focus heavily on building the capacity of field-level personnel. Sending exceptional DAOs abroad to receive advanced degrees

should continue, but with a mandate that returning DAOs train their peers with the technical skills they learn. Also, the Ministry must fully invest in utilizing INGO partners to train their own officers by removing financial and logistical barriers that currently limit participation. Failure to take advantage of these professional development opportunities will cost far more in the long term as the MoA will need to find other ways to develop the capacity of its officers. At the same time, INGO support for MoA officers' professional development should be more deliberate as a feature of their mandate to build institutional capacity. Rather than educating MoA officers as a side-effect of participation in trainings for other audiences, the NGO sector could create and implement unique trainings designed to address the specific technical deficiencies of the MoA.

Improving extension skills in andragogy and interpersonal relations are also recommended for both MoA and NGO officers. Transitions towards participatory extension models reposition officers as facilitators rather than technical experts (Ganpat, 2013; Sulaiman & Davis, 2012). Developing officers' skills in these areas is therefore essential to operating a pluralistic and participatory extension system in Liberia.

References

- Abi-Ghanem, R., Carpenter-Boggs, L., Koenig, R. T., Ullman, J. L., Murphy, K. M., & Pannkuk, C. (2013). Access to agricultural inputs, technology and information, communicating with farmers, and the role of women in agriculture: Perceptions of Iraqi extension agents. *Journal of International Agricultural Extension Education*, 20(1), 6-18.
doi:10.5191/jiaee.2013.20101

- Aron, J. (2003). Building institutions in post-conflict African economies. *Journal of International Development, 15*, 471-485. doi:10.1002/jid.997
- Ary, D., Jacobs, L., & Sorensen, C. (2010). *Introduction to research in education* (8th ed.). Belmont, CA: Wadsworth.
- Birner, R., Cohen, M. J., & Ilukor, J. (2011). *Rebuilding agricultural livelihoods in post-conflict situations: What are the governance challenges? The case of Northern Uganda* (USSP Working Paper 07). Retrieved from the IFPRI website: <http://www.ifpri.org/sites/default/files/publications/usspwp07.pdf>
- Blattman C. & Annan, J. (2012). *Reintegrating and employing high risk youth in Liberia: Lessons from a randomized evaluation of a Landmine Action agricultural training program for ex-combatants*. Report of Innovations for Poverty Action. New Haven, CT: Yale University.
- Cervantes-Godoy, D. & Dewbre, J. (2010). *Economic importance of agriculture for poverty reduction* (Food, Agriculture, and Fisheries Working Paper No. 23). Paris, France: Organization for Economic Cooperation and Development [OECD] Publishing.
- Collier, P. (2006). *Angola: Options for prosperity*. Retrieved from <http://users.ox.ac.uk/~econpco/research/pdfs/Angola-OptionsforProsperity.pdf>
- Collier, P. & Duponchel, M. (2013). The economic legacy of civil war: Firm-level evidence from Sierra Leone. *Journal of Conflict Resolution, 57*(1), 65-88. doi:10.1177/0022002712464847
- Creswell, J. W. (2013). *Qualitative inquiry and research design* (3rd ed.). Thousand Oaks, CA: Sage.
- Cunguara, B. & Moder, K. (2011). Is agricultural extension helping the poor? Evidence from rural Mozambique. *Journal of African Economies, 20*(4), 562-595.
- Davis, K. E., Ekboir, J., & Spielman, D. J. (2008). Strengthening agricultural education and training in Sub-Saharan Africa from an innovation systems perspective: A case study of Mozambique. *Journal of Agricultural Education and Extension, 14*(1), 35-51.
- Feder, G., Willett, A., & Zijp, W. (1999). *Agricultural extension: Generic challenges and some ingredients for solutions*. Retrieved from the World Bank website: <http://elibrary.worldbank.org/docserv/er/download/2129.pdf?expires=1382229344&id=id&accname=guest&checksum=2102F4C9B9A69D2307CC70DEDD9187E8>
- Food and Agriculture Organization [FAO]. (2013). *The state of food insecurity in the world 2013: The multiple dimensions of food security*. Retrieved from the FAO website: <http://www.fao.org/docrep/018/i3434e/i3434e.pdf>
- Food and Agricultural Organization [FAO]. (n.d.). *FAO Stat* [database]. Retrieved from the FAO website: <http://faostat.fao.org/site/339/default.aspx>
- Ganpat, W. (2013, February). *Competencies needed for future extensionists*. Presentation at the University of Florida, Gainesville, FL.
- Geda, A. (2011). Capacity building in fragile and post-conflict states in Africa. *World Journal of Entrepreneurship, Management, and*

- Sustainable Development*, 7(2/3/4), 217-266.
- Humphreys, M. & Richards, P. (2005). *Prospects and opportunities for achieving the MDGs in post-conflict countries: A case study of Sierra Leone and Liberia*. Retrieved from <http://www.columbia.edu/~mh2245/papers1/HR.pdf>
- Kutilek, L. M. (2000). Learning from those who leave. *Journal of Extension* [Online], 38(3). Retrieved from <http://joe.org/joe/2000june/iw2.html>
- Kwapong, N. A. & Nkonya, E. (2012). *Agricultural extension reforms and development in Uganda*. Retrieved from <http://edoc.hu-berlin.de/dissertationen/kwapong-nana-afranaa-2012-07-24/PDF/kwapong.pdf>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.
- McNamara, P., Swanson, B., & Simpson, B. (2011). *Rebuilding and strengthening the pluralistic extension system in Liberia*. Report of the Modernizing Extension and Advisory Services [MEAS] project. Urbana-Champaign, IL: University of Illinois.
- Ministry of Agriculture [MoA]. (2007). *Comprehensive assessment of the agricultural sector in Liberia*. Retrieved from the FAO website: <ftp://ftp.fao.org/docrep/fao/010/ai562e/ai562e00.pdf>
- Moore, A., Dormody, T., VanLeeuwen, D., & Harder, A. (2013). Agricultural sustainability of small-scale farms in Lacluta, Timor Leste. *International Journal of Agricultural Sustainability*, 11(1), 1-16.
- Obwona, M. & Guloba, M. (2009). Poverty reduction strategies during post-conflict recovery in Africa. *Journal of African Economies*, 18(1), 77-98.
- Strauss, A. L. (1987). *Qualitative analysis for social scientists*. Cambridge, UK: Cambridge University Press.
- Sulaiman, R. & Davis, K. (2012). *The “new extensionist”: Roles, strategies, and capacities to strengthen extension and advisory services*. Retrieved from the Global Forum for Rural Advisory Services [GFRAS] website: <http://www.gfras.org/en/gfras/157-the-new-extensionist.html>
- Swanson, B. E., & Rajalahti, R. (2010). *Strengthening agricultural extension and advisory systems: Procedures for assessing, transforming, and evaluating extension systems*. Retrieved from the World Bank website: http://siteresources.worldbank.org/INTARD/Resources/Stren_combined_web.pdf
- Swanson, B. E., Bentz, R. P., & Sofranko, A. J. (1997). *Improving agricultural extension: A reference manual*. Rome, Italy: FAO. Retrieved from the FAO website: <http://www.fao.org/docrep/W5830E/w5830e00.htm#Contents>
- Tizikara, C. & Lugor, L. G. L. (n.d.). *Post-conflict development of agriculture in South Sudan: Perspectives on approaches to capacity strengthening*. Retrieved from http://www.erails.net/images/fara/secretariat/kigali-movement/file/Kigali%20Movement/Post-Coflict%20Agriculture_South%20Sudan.pdf
- Tsimpo, C. & Wodon, Q. (2008). *Rice prices and poverty in Liberia* (Paper 4742). Retrieved from the World Bank website: [18](http://www-</p>
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- wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2008/10/01/000158349_20081001141906/Rendored/PDF/WPS4742.pdf
- United Nations Development Program [UNDP]. (2005). *Human development report 2005: International cooperation at a crossroads*. Retrieved from the UNDP website:
http://hdr.undp.org/en/media/HDR05_complete.pdf
- Wiggins, S. & Leturque, H. (2010). *Helping Africa feed itself: Promoting agriculture to reduce poverty and hunger*. Retrieved from the Overseas Development Institute [ODI] website:
<http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/6265.pdf>
- World Bank. (2012). *Agricultural innovation systems: An investment sourcebook*. Retrieved from the World Bank website:
<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTARD/0,,contentMDK:23129039~pagePK:148956~piPK:216618~theSitePK:336682,00.html>
- World Bank. (2015). *Poverty and equity data*. Retrieved from the World Bank website:
<http://povertydata.worldbank.org/poverty/home/>
- World Bank. (n.d.). *Agricultural Data*. Retrieved from the World Bank website: <http://data.worldbank.org/>
- Zaur, I. (2006). *Agriculture and conflict: A conceptual framework for development* (Master's thesis). Retrieved from
<http://dl.tufts.edu/catalog/tufts:UA015.012.DO.00148>

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Applicability of APSIM in Decision-Making by Small-Scale Resource-Constrained Farmers: a Case of Lower Gweru Communal Area, Zimbabwe

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Abstract

This study assessed the applicability of APSIM, a crop simulation model, to decision-making by small-scale resource-constrained farmers in Lower Gweru, Zimbabwe. Input data for APSIM were collected from 30 farmers through focus group discussions and resource allocation mapping. APSIM simulations were run to simulate the farmers' farming systems to establish model credibility and validate the model with the local data and to explore "what if" questions to discuss ways to improve maize yields in a below-normal season. After two years interacting with model outputs, semi-structured interviews were conducted with the farmers to assess their continued use of APSIM in decision-making, the form of information they value the most, and preferred sources of information. The study found a greater willingness to consider computer-based modeling because of the pressures of climate change and the waning adequacy of their indigenous systems. However, the study also found that farmers used APSIM when they saw for themselves its accuracy and relevance to their farming systems and found it useful for making decisions relative to climate variations. The study confirmed APSIM's limitations as the lack of accurate data, the need for expert support and access to computers, and found that indigenous indicators, although waning in reliability and accuracy, can be strengthened when revisited through a deliberate learning program designed to engage farmers in scientific enquiry. While preferring to obtain information from extension agents, farmers will not readily adopt significant changes unless they have hard facts that they themselves have participated in generating. Whether introducing a model like APSIM or other technologies, unless farmers are directly involved with its testing in the field they are unlikely to adopt what is offered.

Keywords: APSIM, Climate Variability and Change, Decision-making, Small-scale Farmers, Experiential Learning

Introduction

This paper presents the findings of a study conducted among resource-constrained, small-scale farmers in Gweru, Zimbabwe to test the applicability of the Agricultural Productions Systems Simulator (APSIM) to their decision-making. Lower Gweru is a developed communal settlement in the Midlands province of Zimbabwe. Gweru's climate is semi-arid to arid with summer rainfall ranging from 450mm to 600mm annually but experiences periodic seasonal droughts and severe dry spells. Thus decision-making capacity to cope with these climatic fluctuations is critical to successful, profitable farming. Farmers traditionally use, almost exclusively, indigenous methods to predict weather and to inform their production decisions. If it is applicable to their farming and farm management systems, APSIM offers these farmers – and others like them – the opportunity to strengthen their decision-making capacity. This will, in turn, reduce risk and their vulnerability to climate variations.

Theoretical Framework

The context of this study was small-scale resource-constrained farmers. Specifically it was concerned with their decision-making processes relative to climate. It sought to learn how to engage these farmers with APSIM and to determine the extent to which farmers would be willing and able to engage with it as a part of their decision-making.

Small-Scale Resource-Constrained Farming Systems

Small-scale, resource-constrained farming systems are characterized by low productivity and widespread persistent poverty (Centro Internacional de Mejoramiento de Maíz y Trigo [CIMMYT], 1999; Selvaraju, Meinke, & Hansen, 2004).

Their mixed cropping systems are characterized by small farm sizes, low investment in farming inputs, and intensive labor. Most of these farmers often fail to produce enough food to meet their own household needs (CIMMYT, 1999). They are faced with a number of challenges that threaten their livelihoods. Chief among them are infertile marginal soils and climate variability (Altieri & Koohafkan, 2008). Climate change has marked effects on the yields of crops produced on dryland small-scale, resource-constrained farming systems (Cline, 2007).

Small-Scale Farmer Decision-Making Processes Relative to Climate

Small-scale farmers often have their own local climate indicators to predict the nature of the season (whether it will be a good or poor rainfall season). These indicators include the position of the moon, wind direction, plants flowering at certain times, the color of the gathering clouds and changes in wells and springs (Mapfumo, Chikowo, & Mtambanengwe, 2010; Ziervogel, 2001). This local (indigenous) knowledge of indicators is relevant to rain-fed agriculture practiced by small-scale, resource-poor farmers in developing countries (Wang, 1988, as cited in Prasad, Kesseba, & Singh, 1996). It provides a platform for decision-making by small-scale farmers, related to both known and unknown problems affecting their farming systems and livelihoods (Beckford & Barker, 2007; Hurni, 1996). Local knowledge has been developed informally and is entrenched in local culture and traditions. Thus making it accessible and understood by all members of the community regardless of the level of education of farmers. Although this tried and tested forecast has been able to guide them for many years, it is emerging that this forecast's accuracy has been reduced due to climate change these indicators were not

designed to predict (Roncoli, Kirshen, Ingram, & Flitcroft, 2000, as cited in Ziervogel, 2001). In other words, indigenous forecasting has not been updated and tested under the current climate variability and change.

Despite the limitations of these indigenous indicators in the face of current climatic issues, small-scale farmers continue use them to guide their decisions leading to the adoption of conservative risk management strategies. Such strategies usually result in the inefficient utilization of the few resources they have, thereby leading to reduced productivity (Hansen, 2002; Hansen & Sivakumar, 2006).

Worth (2002) argued one of the functions of extension is to engage farmers in scientific enquiry. Drawing on this framework, Nyiraruhimbi (2012) posited indigenous knowledge can be categorized as local memory, local practice or local science. Local memory is the collection of practices handed down from predecessors but which, although remembered, have been discarded or substantially modified. Local practice is knowledge garnered over some period of time from various second-hand sources (including ancestors, extension agents and messages, and sales representatives) and/or through unstructured trial and error. Local science is knowledge and practices currently in use or not a result of deliberate and conscious innovation and experimentation conducted by the farmer(s) who use/do not use the practice (Nyiraruhimbi, 2012). Local science would result from an extension engagement that employs a learning posture with the primary aim of building capacity of farmers to learn, innovate and experiment (Worth, 2006) systematically, methodically and deliberately.

The persistent use of indigenous climate indicators by small-scale farmers in the face of their declining accuracy and

veracity suggests that this indigenous system falls into the category of local practice. It is a system that has evolved to a point, based largely on handed-down knowledge and some trial and error. This being the case, it opens the door to engaging farmers in a learning dynamic to challenge their local practice through deliberate engagement in scientific enquiry. APSIM affords a practical, topical and timely opportunity to take steps in this direction.

Official seasonal climate forecast (OSCF) information can be used to move from reliance on increasingly unreliable local practice to fostering better risk management through better-informed decision-making (Hansen, 2002; Hansen & Sivakumar, 2006) founded on a conscious program of learning and experimentation. Such a program will help farmers have confidence in seasonal climate forecasts and other new technology needed if they are to fully embrace the information in their decision-making. If, through a learning process, the farmers perceive the benefits of the innovation, it will evoke remarkable resourcefulness among the farmers (Hansen, 2002; Stroeken & Knol, 1999). However, this will be the case only if the innovations (in this study, APSIM and OSCF) can be adapted to suit the farmers' unique circumstances and are found to fit their farming and farm management systems.

The methods of dissemination of the OSCF include use of radio, television, and newspapers and through extension agents. According to Chikoore and Unganai (2001), the most efficient method of disseminating seasonal forecast information to small-scale, resource-constrained rural communities in Southern Africa is by radio broadcast. However, in a study by Ziervogel (2001) in Lesotho, most farmers preferred to get the forecast from the extension agents, citing that they do not have radios and also that the agents will even help them understand

through demonstrations and explanations in their mother language. This again suggests the preparedness of farmers to learn in collaboration, rather than blindly adopt. Good extension practice will develop a “facilitated learning agenda” (Worth, 2006, p. 189) to engage the farmer in a conscious process of “investigation, application...and sharing” (Worth, 2006, p. 189), to determine the veracity of the innovation.

Agricultural Productions Systems Simulator (APSIM)

APSIM is a farming systems model designed to simulate various processes taking place in the soil during crop production under a range of management options in different climates (Probert & Dimes, 2004). The model requires long-term daily climatic data in the form of rainfall, radiation, and minimum and maximum temperatures. The model is set up in such a way that it has numerous templates where all the data can be entered against pre-determined start and end dates of the simulation. It accommodates climatic and soil description data and crop management data. APSIM has been used in different parts of the world for applications ranging from interpretation of on-farm experiments to risk assessment of a range of alternative management options. It aids farmers in decision-making by exploring various scenarios involving different management practices based on known climatological data. Dimes, Twomlow, and Carberry (2003) found APSIM simulations to be highly accurate in estimating yield and risk for the different application rates of nitrogen fertilizer. Similarly, Carberry, Gladwin, and Twomlow (2004) found the model to be credible as the simulated outputs match the actual yields reasonably well and because the farmers’ own data were used in running the simulations. APSIM does, however, have limitations. In particular, its use is

hampered by an absence of capable users as well as lack of reliable input data, especially in poor regions of Africa (Struif-Bontkes & Wopereis, 2003). Additionally, it does not include effects of pests and diseases (Holzworth et al., 2006). Finally, it is dependent on having or having access to a computer to run the model.

Purpose of the study

This study sought to achieve three objectives. Firstly was to determine small-scale resource-constrained farmers’ perceptions of climate change. The second objective was to determine the farmers’ crop management decision processes including what they used to guide their decision-making. Finally, after being introduced to official seasonal climate forecasting and APSIM simulations, the study sought to evaluate whether these farmers would use APSIM to guide their crop management decision-making after a two-year study period during which they were exposed to the model and its outputs.

Methods

The study was conducted from 2008 to 2010 in two wards of Lower Gweru Communal area: Nyama and Mdubiwa. These wards were selected based on their accessibility, their representativeness of the whole Lower Gweru Communal area, and because of their contrasting nature with regard to wetness/water availability. Nyama ward is wetter as it has a higher water table; Mdubiwa is located at a higher altitude with less water availability.

Lower Gweru is a developed communal settlement in the Midlands province of Zimbabwe. It is located about 40 km north west of the City of Gweru, and stretches a further 50 km to the West. The area falls in the natural region (agro-ecological zone) IV of Zimbabwe, which is described as semi-arid to arid and receives

rainfall from October to April ranging from 450mm to 600mm annually, with frequent droughts. The rainfall season is characterized by periodic seasonal droughts and severe dry spells.

To eliminate bias and ensure representivity from the two study areas, Nyama and Mdubiwa, stratified random sampling was used to select the study sample of 30 small-scale, resource-constrained farmers. Fifteen farmers were selected from each ward. These farmers participated throughout the two-year duration of the study.

Data were collected using four data collection tools: focus group discussions, resource allocation mapping, APSIM simulations, and semi-structured interviews. These methods were used sequentially, each building on the results of the previous data collection exercise, permitting validation of the data of the previous session. Further, data gathered at each session were reviewed with the relevant extension personnel to validate the data. The data were found to be consistent with information available to the extension personnel. The use of multiple methods and triangulating as outlined provided the framework for the validity and reliability of the data.

Focus Group Discussions (FGD)

Four focus group discussions (Krueger, 1994; Merton, Gollin, & Kendall, 1956) were used to gather information about climate change and seasonal climate forecasting – including the farmers' perceptions of climate change in their area. Facilitated by the lead researcher, the selected 30 farmers participated in each session. The first FGD explored climate changes they had experienced and introduced crop simulation modeling (APSIM) and OSCF as alternative guides to crop management decision-making. The second FGD developed resource maps and

explored what guided their crop management decisions. The third FGD, held after the simulations were run, determined the on-farm experiments to be conducted in the 2009/10 season based on the APSIM simulation results and other climate data. The fourth FGD explored feedback from the on-farm experiments and farmer perceptions on APSIM as a decision-making tool. In each FGD, data were captured by the farmers and the researcher on flip charts.

Resource Allocation Mapping

Resource Allocation Mapping (RAM) is an interactive process in which farmers draw maps to represent their homesteads, their fields and how they allocate resources (Rudebjer, 2001). The information collected was used as input into the APSIM model to establish a baseline and validate the model with local data. RAM also helped in gaining an insight into farming systems and resources of different farmers. The baseline data included information on farming systems, farmers' fields, soil types, crops grown, allocation of resources (for example, fertilizer and seed), timing of farm operations and yields. Most importantly, RAM assisted in the formulation of "what if" questions to be explored using the APSIM model.

After the first FGD, all 30 farmers were asked to draw a map of their homesteads and fields showing how they had allocated their resources for the 2007/2008 season. The research leader outlined to the farmers the range and type of information to include in the map, for example, soil type, size of fields, varieties grown, dates of field activities and the actual yields obtained from each field. The other team members (including the extension agents) moved amongst the groups to assist the farmers.

APSIM Simulations

Introducing a new technology is often supported using approaches involving visual aids. Carberry et al. (2004) used hand drawn images on a flipchart to show all the agricultural processes involved during the rainy season as a part of introducing computer simulated crop production. In that study, images were used to show the link between the growth process and rainfall. The same approach was used in this study to help explain how APSIM simulates all the growth processes. Visual imagery, as a representation of reality, helped the participants understand the use of simulated production using the same information that would be used in a real-world setting (Carberry et al., 2004).

During the first and again the fourth FGD, it was explained further to the farmers that APSIM could simulate their various field practices from sowing to harvesting, but that it “performs” these operations faster and without committing any actual resources such as inputs or time. Through this exercise, the farmers understood that APSIM could show instantaneously the effect of actions or decisions. Thus it can be a useful tool to explore various strategies and alternatives before actually implementing them – learning by simulation rather than by actual outcome. To consolidate their learning, farmers took turns to work through a demonstration of how the model works on a laptop. Learning by simulation is an effective way of engaging farmers in learning (Carberry et al., 2004). In this instance it supports the notion of engaging farmers in scientific inquiry (Worth, 2006).

APSIM was run with all 30 participating farmers collectively, that is, as one group with the researcher explaining all the steps while simultaneously entering data into the model on a laptop. The outputs were drawn on a flip chart for farmers to visualize

the results clearly. The crop management information used came from the RAMs presented by the six representatives of the groups discussed earlier. The accuracy of the information was verified by the local extension agents who reside in the same villages with the participating farmers. The climatic data used were from Thornhill Met station in Gweru, which was the nearest station to the study site. In the absence of actual soil description data, the soil descriptions used were modified from the soils already in the model, based on the experience of the extension agents and the lead researcher. This is consistent with the practice that in cases where simulations are done without actual testing, the effectiveness of the simulation will be dependent on the partnership between the farmers and the extension agents (J. P. Dimes, personal communication, October 13, 2008). The modified parameters were the Plant Available Water Content (PAWC), initial soil nitrogen content and initial soil water. Initial soil nitrogen content was set at 6kg/ha in the form of nitrates and 3kg/ha as urea. The initial water content was set at 10% filled from the top layer. The simulation template used was the Continuous Maize and Weeds Simulation. The date range for the simulation was set at 1 October 2000 to 31 May 2008, although the 2007/2008 season was the only season used for the RAM session. The other simulated years had been included in the event that farmers might remember the yield they got during those years and how they compare to the simulated ones.

Semi-Structured Interviews

Following the FGDs, the lead researcher conducted semi-structured interviews (SSIs) (Barriball & While, 1994; Champion, Pursell, & Brown, 1988) with 24 farmers of 30 farmers who participated in the FGDs selected through stratified random

sampling-; the reduced number was informed by the practical arrangements with the SSIs and based on previous experience which anticipated data saturation. The purpose of the SSIs was to solicit information from individual farmers (taking into consideration the socio-economic factors affecting them) about their application of the APSIM model to decision-making as well as their perceptions of climate forecasting and how they cope and adapt to climate variability and future change. The SSIs covered questions about current decision-making processes on crop management and climate, farmers' perception of climate change, the climatic and crop management information they value the most and their preferred source of this information, farmer perceptions of seasonal climate forecasts and APSIM as well as applicability of the model to decision-making.

Data Analysis

Data from the FGDs were straightforward in creating themes to be used for the SSIs, and, thus, did not require detailed analysis (Stewart, 2007). The data from the SSIs were analyzed using summarizing content analysis to surface critical issues in a manageable text (Mayring, 2004). Data from the on-farm trials were analyzed using the Genstat statistical package. Data from the RAMs, analyzed in the style of Rich Pictures, were "mined more for their explicit rather than implicit content" (Bell & Morse, 2010, p. 9) to help create the parameters for the simulation and planning of the on-farm trials.

Results and Discussion

Keys findings are reported and discussed under three major themes: farmers' perception to climate change, decision-making processes and APSIM use as a decision-making tool, as outlined below.

Farmer Perceptions of Climate Change

All the farmers noted that the climate of their area is changing. Their evidence was indicators they noted over the last 15 years living and farming in the area. From these observations, they were able to depict the following changes: increased number of seasons without adequate rains, increased rainfall extremes in the last 10 years, long dry spells during the rainy season, rains starting late into the season, rains ending earlier than what they used to do, temperature extremes, and drying up of perennial streams and rivers. This unreliability of rains, in terms of amount, start and end dates of the rainy season led farmers to be more interested in the OSCF. Further they would demand such climate information from extension agents earlier in the season to guide them on crop management decisions (including crop choice and varieties, fertilizer type and amount).

Decision-Making Processes

At the beginning of this study, in early focus group discussions, all the farmers highlighted that they exclusively used their knowledge of indigenous indicators to make crop management decisions. These farmers had, over many years of farming, actually developed indicators which signal both a low rainfall season and a good rainfall season as shown in Table 1.

Table 1

Indigenous Indicators of a Good and Poor Rainfall Season

Indicators of a Good Rainfall Season	Indicators of a Poor Rainfall Season
Plenty of raindrops from <i>Thithamuzi</i> (raining tree)	No raindrops from the tree
High temperatures towards onset of rainfall season	Low temperatures towards onset of rainfall season
Early ripening of indigenous fruit trees like <i>mugan'atsha</i> , <i>muchakata</i> , wild grapes (<i>tsambatsi</i>)	No or less fruiting
Presence of dew on trees	Less or no dew at all
Birds (<i>madendera</i>) arriving early in the season	Late arrival or total absence of birds
Prevalence of north-easterly winds in October-November	Absence of north-easterly winds in October-November

The indicators presented in Table 1 are similar to findings by Mapfumo et al. (2010) and Ziervogel (2001) that farmers can use their own indicators to predict nature of the season with regard to rainfall amount. Despite the small-scale farmers admitting their indigenous indicators were now failing to deal with the changes in climate they identified, they highlighted there were two major reasons why they continued using them. Firstly, they did not have any reliable alternatives. Secondly, their system had been tried and tested. Whilst they acknowledged that this indigenous local knowledge has not been updated to cater for current climate changes, they indicated that it would take some time for them to establish what works for them – given the fact that climate is becoming more variable. This corresponds with the risk-averse or conservative nature of small-scale farmers noted by Hansen and Sivakumar (2006). Further, only a small percentage (11%) of the farmers knew of the OSCF, which they said they got from the radio. However, they were not sure of the OSCF and how to apply the information and hence were not using it to guide decision-making.

During the SSIs all of the farmers acknowledged they were now able to use the OSCF and other alternatives like APSIM model outputs after they were introduced to them in this study. The information obtained from climate forecasting, whether in the form of official or indigenous seasonal forecasting, is used for aiding crop management decision-making and planning coping or adaptation strategies for their farming. For example, indications of a poor rainfall season prompt farmers to look for early maturing varieties, avoid use of fertilizer or use fertilizer in low amounts, use ridges to keep the little moisture and weed regularly. With forecasts for a good season farmers prepare land early, invest in fertilizers and high yielding varieties while a few farmers (17%) indicated that they would dry plant (usually in October) in anticipation of good rains.

Identified Sources of Agricultural and Climatic Information

Sources of farming and climatic information identified were extension agents, other farmers through their farmers' clubs and, to a small extent, radio. The

extension services were highly valued as farmers said they offered demonstrations and were much better trained than other farmers in their clubs, who sometimes did not have accurate information. All the farmers (100%) preferred the extension services (AGRITEX) as a source of information to radio and other farmers. This conflicts with a study in India where small-holder, poor farmers turned most often to other progressive farmers, followed by input dealers and the radio – with extension ranking sixth as a source of information (Birner & Anderson, 2007). However, it concurs with findings by Ziervogel (2001) that most farmers preferred to get the official forecast information from the extension agents, citing mainly that agents helped them understand by explaining in their mother language using units of measurements they understood and through demonstrations. It also concurs with Cavane and Donovan (2011) who found farmers who had obtained information from, “extension had stronger positive attitudes than farmers who learned... from neighbors” (p. 13). They argued “personal contacts between extension agents and farmers are more effective for delivering specific information to farmers” (Cavane & Donovan, 2011, p.13).

While the farmers acknowledged they received technical information about production, they all indicated that the extension agents had not been supplying them with any climatic information, with the exception of the last two years under this study. This was because the extension agents were themselves not familiar with the OSCF until they were trained in how to use the service during this study.

Further, 90% of the farmers stated they preferred or valued climatic information over soil treatment and agronomic information. They argued without climatic information one could not

adequately plan or make decisions on crop choice and varieties, which fertilizers to invest in, and when to sow or carry out other farming operations.

Using APSIM as a Decision-Making Tool

The findings of the SSIs revealed 92% of the farmers remembered the model. Of those recalling the model, 86% chose to continue using it. Their reasons were that it helped in planning, offered quick testing opportunities without committing resources, guided farm resource allocation and helped in quantifying the risks of management strategies.

The farmers’ reasons for using APSIM are consistent with earlier findings that APSIM does not pursue a single best management strategy, but rather aids the assessment of an array of alternative options suited to different seasons and priorities of the farmer (CIMMYT, 1999). APSIM creates a lot of (simulated) experience without the actual risk of real implementation of alternative strategies (Dimes et al., 2003).

The findings suggest small-scale farmers are really concerned about their livelihoods (farming) and can and will utilize help, including modern technologies, once convinced that they are useful and beneficial to their farming and fit their farming system. This confirms the view noted by Hansen (2002) and Stroeken and Knol (1999) that people are inclined to learn once they have seen the outcome of a practical experience in which they were personally involved or engaged. Furthermore, the farmers aim to make informed decisions provided they have relevant information, tangible evidence or experience, in this case, simulation outputs.

Fourteen percent (14%) of the farmers, who remembered using the APSIM, stated they would not be using it. One of

these farmers was very clear that he would continue to use the indigenous indicators and method as he had managed to survive well without modern technologies like APSIM. However, for the rest who would not be using APSIM, the reasoning was conflicted. On the one hand, the main reason for not using APSIM was that they did not have access to computers to run the model. Beyond this, they did not really understand the science behind, or the complexity of, the model. And they do not have the confidence to use the model on their own without “experts.” This aspect of their reasoning is consistent with the limitations noted earlier that APSIM use is hampered by absence of capable users as well as lack of reliable input data, especially in poor regions of Africa (Struif-Bontkes & Wopereis, 2003).

On the other hand, the remaining farmers who would not be using APSIM also said they understood the usefulness and advantages of the model. They acknowledged the farmers who really understand and will be using the model in decision-making will be better off due to its usefulness and advantages. They further pointed out that if given another opportunity to interact with the model and its outputs they might want to use it. This is consistent with views of Ngomane (2010) of supporting the use of envisioning approaches to developing technology – or in this case making technology decisions – which “incorporates the collective knowledge of key role players” (p. 66) and “increases the likelihood that research results shall be applied” (p. 66).

Overall, the study found APSIM is useful and, within specific limitations, an appropriate aid to decision-making for smallholder farmers. APSIM adds value to OSCFs since it predicts crop yields for any given forecast. This contrasts with the farmers’ indigenous indicators, which, in essence, only give an indication of the

amount of rainfall received and can also misinform farmers and might not be clear. The study, however, also suggests there is need for encouraging the combination of exogenous (like crop simulation modeling) and local knowledge.

Given the increased access to and confidence in using OSCFs, there is potential for engaging farmers in an exercise of revisiting their indigenous indicators alongside the data from OSCFs to strengthen their reliability and accuracy. Given that reliability of data is a key limitation in using APSIM, more reliable indicators developed through a process of scientific enquiry could contribute to overcoming this limitation in areas where data from OSCFs are less available or less accurate due to distance between the source of the data and the place of their application. Such an approach is consistent with the view of Prasad et al. (1996) that some small-scale farmers use modern climatic and market information obtained from radios and extension agents, in addition to indigenous knowledge. It is more broadly consistent with Okorley, Gray, and Reid (2009) who argued that by understanding the indigenous knowledge of farmers better positions extensions to meet farmers’ needs “because it can build on what they already know” (p. 39).

Conclusions, Recommendations, and Implications

The study suggests an interplay between local knowledge and so-called modern technologies, in this case APSIM. It found continued reliance by small-scale farmers on local knowledge and indicators that are admittedly unreliable and ill-suited to interpret current climate change conditions is due to a lack of clear proven alternatives that are understood and tested by the farmers through first-hand experimentation. The study found a greater willingness to consider computer-based

modeling because of the pressures of climate change and the waning adequacy of their indigenous systems. However, the study also found farmers used APSIM when they saw for themselves its accuracy and relevance to their farming systems and found it useful for making decisions relative to climate variations.

The study further suggests APSIM cannot and should not replace or displace the use of local indicators or OSCF, but can add value by quantifying risks associated with strategies identified to manage climate change. It acknowledges APSIM is a model that requires trained personnel, modelers and access to computer technology. However, farmers can actively participate in identifying and otherwise developing the input data and running the simulations. And they can, of course, use the information outputs to aid them in making decisions relative to more accurately predictable changing climatic conditions. As Birner and Anderson (2007) and Worth (2002; 2006) suggested, engagement is the key; when farmers are genuinely engaged and working within their indigenous framework will create the demand (Birner & Anderson, 2007) and foster learning (Worth, 2006). It requires “intimate interaction with farmers” (Vreyens, 1999, p. 44) and “facilitating the farmers’ innovation decision process” (Vreyens, 1999, p. 44), to advise farmers effectively and effect change.

Similar to George, Birch, Clewett, Wright, and Allen (2005) who submitted that “exercises, which simulated a ‘real’ problem are...seen as beneficial” (p. 25), this study confirmed the willingness of the majority of the farmers to use APSIM together with OSCFs data to support their decision-making. Thus it showed working first-hand with new technologies – even sophisticated computer-based technologies – enables farmers to learn in their individual contexts the value of those technologies and

their applicability to their farming systems. In this case their experience and learning with APSIM - changed the farmers’ perceptions of the risk they attributed to fertilizer use in semi-arid environments by showing that yields are guaranteed when fertilizers are used, whereas when fertilizers are not applied, in some seasons yields cannot be guaranteed.

The APSIM model on its own does not guarantee good decision-making. However, it does give insights into the potential results of a number of alternatives in quantifiable terms which are easy for farmers to understand once they have had first-hand experience with it. Use of APSIM should be supported by other tools, such as cost benefit analysis, and enterprise and partial budgeting, to enable farmers to predict crop yields as well as determine their impact on profit and thereby select their best option(s) from a number of alternatives.

The study confirmed farmers value the services they get from the extension agents and are willing to learn from them particularly if they farm in their area. Thus extension agents are critical in the uptake and adoption of new technology by farmers, and they are most effective when they engage the farmers in a program of experiential-based learning. When the new technologies are complex, as in the case of APSIM, it is also important that the extension agents are well trained in the operation and use of the new technology before it is introduced to the farmers.

Finally, the study demonstrated farmers’ keen interest and willingness to learn when their livelihoods are at stake. However, being risk-averse and perceiving themselves as highly vulnerable to the many influences on their farming activities, including climate change, the farmers proceed with caution and wisdom. They will not rush to adopt any significant change unless they have hard facts that they

themselves have participated in generating. This again supports a learning approach to extension which deliberately engages farmers with experimentation and scientific enquiry.

The implications are fairly straightforward. Farmers are unlikely to adopt what is offered. Whether introducing a model like APSIM or any other technology, unless the farmers are directly involved with its testing in the field – preferably on their own farms. The question remains as to whether extension practitioners are adequately trained to approach farmers in an iterative process of inquiry, rather than to inform and otherwise demonstrate and promote the use of any given technology. Research into such capacity in iterative engagement with farmers, among existing extension practitioners is recommended, as is an investigation into the training and education of extension practitioners to ensure that they have the necessary knowledge, skills, attitudes and behaviors to implement this kind of extension among small-scale resource-constrained farmers. As Veryens (1999) argued, such approaches would require extension service, systems and practitioners to develop new competencies.

References

- Altieri, M. A., & Koohafkan, P. (2008). *Enduring farms: Climate change: Smallholders and traditional farming communities*. Malaysia: Third World Network.
- Barriball, K. L., & While, A. (1994). Collecting data (using a semi-structured interview: a discussion paper). *Journal of Advanced Nursing*, 19, 328–335.
- Beckford, C., & Barker, D. (2007). The role and value of local knowledge in Jamaican agriculture: adaptation and change in small-scale farming. *Geographical Journal*, 173(2), 118-128. doi: 10.1111/j.1475-4959.2007.00238.x
- Bell, S., & Morse, S. (2010). Rich pictures: A means to explore the 'Sustainable GroupMind'?. *Proceedings of the 16th annual International Sustainable Development Research Conference, Hong Kong, China*. Retrieved from http://www.kadinst.hku.hk/sdconf10/Papers_PDF/p56.pdf
- Birner, R., & Anderson, J. R. (2007). *How to make agricultural extension demand driven—The case of India's Agricultural Extension Policy* (Discussion Paper No. 00729). Washington, DC: International Food Policy Research Institute (IFPRI).
- Campion, M. A., Pursell, E. D., & Brown, B. K. (1988). Structured interviewing: Raising psychometric properties of the employment interview. *Person Psychology*, 41, 25-42.
- Carberry, P., Gladwin, C., & Twomlow, S. (2004). Linking simulation modelling to participatory research in smallholder farming systems. In R. Dolve, & and M. E. Probert (Eds.), *Modelling nutrient management in tropical cropping systems* (pp. 32-46). Australia: ACIAR Proceedings No. 114.
- Cavane, E., & Donovan, C. (2011). Determinants of adoption of improved maize varieties and chemical fertilizers in Mozambique. *Journal of International Agricultural and Extension Education*, 18(3), 5-21. doi: 10.5191/jiaee.2011.18301
- Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT). (1999). Risk management for maize farmers in drought-prone areas of Southern Africa. *Proceedings of a workshop*

- held at Kadoma Ranch, Zimbabwe. Mexico: CIMMYT.
- Chikoore, H., & Unganai, L. (2001, October). *Integrating climate forecast information in agricultural management. A perspective from Southern Africa*. Paper presented at the Open Meeting of the Global Environmental Change Research Community, Rio de Janeiro. Retrieved from http://www.fsedac.ciesin.org/openmeeting/downloads/005837863_presentation_hchikoore_riopaper1.doc
- Cline, W. R. (2007). *Global warming and agriculture: Impact estimates by country*. Washington, DC: Centre for Global Development and the Peterson Institute for International Economics.
- Dimes, J., Twomlow, S., & Carberry, P. (2003). *Application of new tools: Exploring the synergies between simulation models and participatory research in smallholder farming systems. Global Theme 3: Water, soil and agrodiversity management for ecosystem resilience* (Report No. 5.). Bulawayo, Zimbabwe and Queensland, Australia: CSIRO Sustainable Ecosystems/APSURU.
- George, D. A., Birch, C., Clewett, J. F., Wright, A., & Allen, W. (2005). Major issues and solutions to applied climate education in Australia. *Journal of International Agricultural Education and Extension*, 12(3), 21-31. doi: 10.5191/jiaee.2005.12302
- Hansen, J. W. (2002). Realizing the potential benefits of climate prediction to agriculture: issues, approaches, challenges. *Agricultural Systems*, 74, 309-330.
- Hansen, J. W., & Sivakumar, M. V. K. (2006). Advances in applying climate prediction to agriculture. *Climate Research*, 33, 1-2. Retrieved from http://www.int-res.com/articles/cr_oa/c033p001.pdf.
- Holzworth, D., Meinke, H., DeVoil, P., Wegener, M., Huth, N., Graeme, H., ... Murphy, C. (2006). *The development of a farming systems model (APSIM) – a disciplined approach*. Australia: CSIRO Sustainable Ecosystems/APSURU. Retrieved from <http://www.iemss.org/iemss2006/papers/w4/Holzworth.pdf>
- Hurni, H. (1996). *Precious Earth: From soil and water conservation to sustainable land management. Generating and disseminating knowledge: The role of science, local knowledge and education*. Berne: International Soil Conservation Organisation and Centre for Development and Environment.
- Krueger, R. A. (1994). *Focus groups. A practical guide for applied research*. Thousand Oaks, CA: Sage Publications.
- Mapfumo, P., Chikowo, R., & Mtambanengwe, F. (2010). *Lack of resilience in African smallholder farming: Exploring measures to enhance the adaptive capacity of local communities to climate change*. Final Technical Report to the IDRC-DfID Climate Change Adaptation in Africa (CCAA) program. Harare: University of Zimbabwe.
- Mayring, P. (2004) Qualitative Content Analysis. In U. Flick, E. von Kardorff & I. Steinke (Eds.), [Translated by B Jenner], *A Companion to QUALITATIVE RESEARCH* (pp. 266-269). London: Sage Publications.
- Merton, R. K., Gollin, A. E., & Kendall, P. L. (1956). *The focused interview: A*

- manual of problems and procedures*. New York: The Free Press.
- Ngomane, T. (2010). From a deficit-based to an appreciative inquiry approach in extension programs: Constructing a case for a positive shift in the current extension intervention paradigm. *Journal of International Agricultural Education and Extension*, 17(13), 57-68. doi: 10.5191/jiaee.2010.17305
- Nyiraruhimbi, A. (2012). *Indigenous approaches to maize production and soil management in Msinga KwaZulu-Natal, Province* (Unpublished master's thesis). University of KwaZulu-Natal, Pietermaritzburg, South Africa.
- Okorley, E. L., Gray, D. I., & Reid, J. I. (2009). Improving agricultural extension human resource capacity in a decentralized policy context: A Ghanaian case study. *Journal of International Agricultural Education and Extension*, 16(2), 35-46. doi: 10.5191/jiaee.2009.16203
- Prasad, C., Kesseba, A. M., & Singh, S. P. (1996). *Extension strategy for resource poor farmers in rainfed agriculture*. India: Macmillian India limited.
- Probert, M. E., & Dimes, J. P. (2004). Modeling release of nutrients from organic resources using APSIM. In R. Dolve, & and M. E. Probert (Eds.), *Modelling nutrient management in tropical cropping systems* (pp. 25-31). Australia: ACIAR Proceedings No. 114.
- Rudebjer, P. G. (2001). *Training course on participatory on-farm experimentation and integrated approaches to land management*. Indonesia: International Centre for Research in Agroforestry Southern Asian Network for Agroforestry Education.
- Selvaraju, R., Meinke, H., & Hansen, J. W. (2004). Approaches allowing smallholder farmers in India to benefit from seasonal climate forecasting. In R. A. Fischer (Ed.), *New directions of a diverse planet: Proceedings for the 4th International Crop Science Congress*. Australia: Australian Society of Agronomy.
- Stewart, D. W. (2007). Analyzing Focus Group Data. In D. W. Stewart, P. N. Shamdasani & D. W. Rook (Eds.), *Focus Groups: Theory and Practice*. (pp. 109-133) London: Sage Publications
- Stroeken, J. H. M., & Knol, W. H. C. (1999). *The stimulation of the diffusion and adoption of information technology in small and medium-sized enterprises through IT scenarios*. Research report of Eindhoven Centre for Innovation Studies, Netherlands: Eindhoven University of Technology.
- Struif-Bontkes, T. E., & Wopereis, M. C. S. (2003). Opportunities for the use of decision support tools for smallholder agriculture in Sub-Saharan Africa. In T. E. Struif-Bontkes, & M. C. S. Wopereis, (Eds.), *Decision support tools for smallholder agriculture in Sub-Saharan Africa. A practical guide, 1-23*. Shoals, USA: International Centre for Soil Fertility and Agricultural Development.
- Vreyens, J. R. (1999). Facilitating change in Senegalese rice production: Learning Serer women farmers' decision making. *Journal of International Agricultural and Extension Education*, 6(2), 39-46.
- Worth, S. (2002). Sustainable extension: Not transformation but renewal.

- Proceedings of the 18th Annual Conference of Association for International Agricultural and Extension Education (AIAEE)*, Durban, South Africa. pp. 118-120.
- Worth, S. (2006). Agriflection: A learning model for agricultural extension in South Africa. *The Journal of Agricultural Education and Extension*, 12(3), 173-193. doi: 10.1080/13892240600915488.
- Ziervogel, G. (2001, October). *Global science, local problems: SCF use in a Basotho village, southern Africa*. Paper presented at the Open Meeting of the Global Environmental Change Research Community, Rio de Janeiro. Retrieved from http://sedac.ciesin.columbia.edu/openmeeting/download/1002573617_presentation_riopaper.doc.

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Impact of Experience and Participation in Extension Programming on Perceptions of Water Quality Issues

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Abstract

Water is an essential resource for human activities and the global ecosystem. However, issues related to water quality have been reported internationally for quite some time with little to no action taken by the public to alter practices to ensure a future sustainable water supply. International extension educators have taken a role in educating about water quality but issues continue to exist. In order to understand current public perceptions of water quality issues and the influence of extension programming, an online survey was conducted in Florida, a part of the U.S. where water is readily accessible but water quality issues are pervasive, leading to a disconnect between what the public thinks about water and the realities of the water scarcity situation. Individuals' experiences with water quality issues, participation in extension programs, perceptions on water quality, and the importance of clean water were collected and the relationships were examined. The findings indicated respondents who had experienced water quality issues perceived water quality was getting worse and that clean water was important. However, the respondents who had participated in extension programs perceived water quality was getting better, but their perceptions of the importance of clean water were inconsistent based upon their extension programming engagement. Recommendations provide insight into how international extension educators can enhance public awareness of water quality issues globally through programming designed to drive behavior changes that will result in enhanced water quality around the world.

Keywords: Water Quality, Public Awareness, Experience

Introduction

Water is essential to maintaining the global ecosystem and supporting human life and activities. A growing global population is increasing water demands, raising the number of activities that require water, and even leading to global climate change (Friedman, 2011; Vörösmarty, Green, Salisbury, & Lammers, 2000). Water is needed for agricultural production, industry, recreation, public use, and transportation. All of these activities are increasing pressure on this precious commodity and creating water issues (Levy & Sidel, 2011; Oki & Kanae, 2006).

Water related issues have been reported internationally including water pollution and contamination, water scarcity, degradation of water quality, waterlogging, and increased water salinity levels due to increasing populations and associated demand, climate change, and mismanagement of land use (Friedman, 2011). In certain areas of developing countries, safe drinking water was even limited due to mishandling of household water consumption leading to illness (Hartstone, Knight, & Riley, 2006).

Water issues have been discussed on a global level for quite some time. In 1992, conversations around the development of a global coalition to solve the world's water problems began at The International Conference on Water and the Environment held in Dublin, Ireland where contemporary water issues and recommendations for actions in order to mitigate existing problems and sustain global water resources were discussed (International Conference on Water and the Environment, 1992). Since then, global conversations around water have continued, including the United Nations working diligently to make the public more aware of water issues. Around the world, international extension educators have played an important role in enhancing

public awareness of water issues and educating various groups about the need to conserve water (Swanson & Rajalahti, 2010; Young & Dhanda, 2013) and the use of water regulations to control water use and protect water quality has increased.

Water is regulated by national environmental protection agencies in many countries (The World Bank, 2014). In the U.S., water regulations designed to address quality and quantity issues, started as early as 1948 when the U.S. government started regulating water quality control by passing the Water Pollution Control Act. The U.S. government took further action by enacting the Clean Water Act in 1972 (Environmental Protection Agency, 2012). Drinking water quality was then protected by the Safe Drinking Water Act passed in 1974 (Environmental Protection Agency, 2012). In terms of agriculture, water quality has been managed in the U.S. by regulations and management of fertilizer use, sediment, waste, and pathogens through the cooperation of eligible farmers and ranchers with their local agencies (U.S. Department of Agriculture, 2014). While the U.S. government and policy makers have noticed the increased need for water quality management, public awareness is falling behind and further education is needed to change the public's behavior around water quality issues (Stave, 2003; Young & Dhanda, 2013).

Increased awareness of environmental issues are known to impact public perceptions, attitudes, and behaviors. Tunstall (2000) found public awareness of environmental issues was an important step in influencing subsequent decision-making in a study related to coastal and estuary protection. However, Rahman (2003) found that while awareness can be formed by visible environmental issues, it is more difficult to form awareness around invisible threats. For example, it is difficult for the

public to understand they may run out of water when it is available every time they go to their sink. Despite this challenge, studies have shown public awareness can be enhanced by educational initiatives, including extension educational programs (Escalada & Heong, 1993; Radhakrishna, Leite, & Hill, 2003; Rahman, 2003; Singletary & Daniels, 2004; Swanson & Rajalahti, 2010). Therefore, the opportunity for international extension educators to increase public awareness of water quality issues globally exists, but there may be a need to focus on making threats more visible in an effort for people to feel water issues are personally relevant. Participation in water-focused international extension programs can lead to positive perceptions, such as improved competency in practices individuals can apply leading to improved environmental sustainability (Heaton, Barnhill, & Hill, 2012; Kanté, Edwards, & Blackwell, 2013). By more fully understanding public perception of water quality issues and how engagement with extension programming influences public perceptions, and consequent behavior, recommendations for future programming can be offered.

Theoretical Framework

The theoretical framework for this study was the theory of cognitive dissonance (Festinger, 1957). The theory of cognitive dissonance addresses inconsistencies between an individual's experience and cognition. Herein, cognition is defined as "any knowledge, opinion, or belief about the environment, about oneself, or about one's behavior" (Festinger, 1957, p. 3). In the context of conflict between one's experience and cognition, an unpleasant feeling can influence behavior through the need to reduce the inconsistency and increase the consistency of what has been experienced with what is known. Stone, Singletary, and

Richmond (1999) described the suggestions of this theory by stating, "dissonance is psychologically uncomfortable enough to motivate people to achieve consonance, and in a state of dissonance, people will avoid information and situations that might increase the dissonance" (p. 183). According to the theory, a motivation of change from a dissonance situation to a consonance situation would be generated under the unfavorable context with inconsistency (Festinger, 1957).

Research on public perceptions of water related issues has been connected to the theory of cognitive dissonance for quite some time. Dickerson, Thibodeau, Aronson, and Miller (1992) conducted a psychological experiment on water conservation behavior and provided the recommendation to use "cognitive dissonance as means of changing behavior in applied settings, especially those in which people already support the desired goal, but their behavior is not consistent with those beliefs" (p. 841). In another study investigating beach users' perceptions and behaviors as indicators for beach welfare measures, cognitive dissonance was used to find that beach users with children tended to present more care for water quality and were more willing to engage in water conservation activities due to their relatively higher level of frequency of beach use when compared to beach users without children (Hilger & Hanemann, 2008). In addition, Arcury and Christianson (1990) found people in a certain location, who had experienced environmental issues, and people facing critical environmental events, used their shared experiences to generate a social paradigm towards their concern about the environment. These findings were supported by Fielding, Spinks, Russell, McCrea, Stewart, and Gardner's (2013) results when they found individuals' experiences with severe drought led to the formation of a norm around water

conservation in their community.

Escalada and Heong (1993) also found that awareness of issues and perceptions of importance can be formed or altered by participating in educational programs. Participants of international extension programs have been found to obtain knowledge, awareness, and even skills according to the program topics, and their willingness of involvement in problem solving has also been found to increase (Singletary & Daniels, 2004; Vommi, LaVergne, & Gartin, 2013). Therefore, it is expected dissonance will be minimized through extension education programs that increase participants' knowledge and awareness of water quality issues, leading to changes in attitudes and behaviors towards the issue (Shaw, Hazel, Bardon, & Jayaratne, 2012).

Purpose and Objectives

The purpose of this study was to identify how water quality experiences and participation in extension programs related to perceptions of water quality issues in order to provide guidance for international extension educators to facilitate extension programming. The objectives sought to describe the (a) respondents' place of residence, experiences with water quality issues, and participation in extension programs; (b) respondents' perceptions of water quality and the importance of clean water; and (c) the relationships between respondents' place of residence, experiences with water quality issues, participation in extension programs, and perceptions on the importance of clean water.

Methods

This study was descriptive and correlational using a web-based survey design to collect place of residence, associated level of importance of clean water, previous experiences with water

quality issues, perceptions of water quality, and level of participation in extension programs from Florida residents. Florida residents were chosen because of the geographical location and characteristics of the state, issues with water quality in the Florida water supply, and the stressed importance of clean water. Rapid population growth in Florida over the past several decades has negatively impacted the quality of water available for consumption, recreation, natural resource sustainability, and agricultural enterprise (Odera, Lamm, Dukes, Irani, & Carter, 2013). While the need to ensure a clean water supply has recently become more apparent to Florida residents, behaviors associated with ensuring a future quality water supply have not been rapidly adopted (Syme, Nancarrow, & Seligman, 2000). Therefore, the two sections of the survey instrument germane to the findings of this study were respondents' place of residence within the state, personal experiences with water quality issues, their previous participation in extension programs, perceptions on the importance of clean water, and associated level of importance of clean water.

To determine place of residence, respondents were asked their postal code. They were then identified as either directly on the coastline or inland and marked as one or the other classification with a binomial variable. Since the location of the study was in a state surrounded by water on three sides, living on a coastline was expected to directly impact the respondents' experiences with water issues and therefore was included as a germane part of this study.

Respondents were then asked to indicate whether or not they had experienced five water quality issues within the past year. Respondents were assigned a point for each issue they indicated they had experienced. The points were summed to create an overall experience with water

quality issues index that could range from zero to five.

Respondents were also asked to indicate whether they had participated in five specific statewide extension programs addressing water quality issues in certain part of the programs. Respondents were assigned a point for each program they indicated having participated. The points were summed to create an overall participation in Extension programs index score that could range from zero to five.

Respondents' perceptions on water quality were collected using a researcher-developed scale where respondents were asked to indicate how they perceived the water quality has changed in seven different water bodies on a scale of -1 = *Better*, 0 = *No Change*, 1 = *Worse*. Respondents were allowed to indicate they were unsure and were not assigned a value if they responded in this manner. The overall index score for perceptions of water quality was calculated by averaging the responses to the seven water bodies. The range of the overall index score could range from a negative one to a positive one. Reliability for the overall water quality perception index was calculated *a priori* with the result in a Cronbach's α of .94.

Respondents' associated level of importance of clean water was captured through a researcher-developed scale requesting respondents indicate the level of importance they associated with a list of nine items on a five point Likert-type scale with 1 = *Not at All Important*, 2 = *Slightly Important*, 3 = *Fairly Important*, 4 = *Highly Important*, 5 = *Extremely Important*. The responses to the nine items were averaged to create an overall importance of clean water index score ranging from one to five. Reliability was calculated *a priori* for the overall clean water index resulting in a Cronbach's α of .85.

A panel of experts with a

background in water quality issues, public opinion research, and survey design validated the survey. The panel of experts included the Director of the UF/IFAS Center for Public Issues Education the Director of the UF Water Institute, the Director of UF/IFAS Center for Landscape Conservation and Ecology, and a professor with a focus on survey design.

A purposive sampling was obtained by using non-probability sampling with opt-in procedures. The researchers collaborated with a public opinion research company to recruit a sample of Florida residents who were 18 years and older. Post-stratification weighting methods were used (Kalton & Flores-Cervantes, 2003) to overcome the limitations of non-probability sampling. Limitations may include non-participation biases, selection, and exclusion (Baker et al., 2013). Post-stratification weighting procedures ensured respondents' demographic characteristics were balanced so the sample was representative of the population. In this case, specific demographic variables including gender, race, ethnicity, age, and community size were weighted according to the 2010 census statistics.

Five hundred and sixteen individuals were invited to participate in the study. Responses that were complete and useable were collected from 469 individuals resulting in a 90.9% participation rate. Descriptive and correlational statistics using SPSS ® 21.0 were run to achieve the objectives of the study.

Complete demographics of the respondents can be viewed in Table 1. Gender was equally distributed with 240 (51.1%) of the respondents indicating they were female and 229 (48.9%) male. The largest group of respondents was Caucasian/White (Non-Hispanic) (77.1%, $n = 362$), followed by African American (17%, $n = 80$). Ethnicity was broken out

separately with 22.5% ($n = 106$) of the respondents indicating they were Hispanic. Lastly, 26.3% of the respondents were less than 39 years of age, 27.7% between 40 and

59, and 23.4% reported being 60 years of age or older.

Table 1

Demographics of Respondents

Characteristic	<i>n</i>	%
<i>Sex</i>		
Female	240	51.1
Male	229	48.9
<i>Race</i>		
African American	17	17.0
Asian	14	3.0
Caucasian/White (Non-Hispanic)	362	77.1
Native American	1	0.2
<i>Hispanic Ethnicity</i>	106	22.5
<i>Age</i>		
18 - 29	66	14.1
30-39	57	12.2
40-49	67	14.2
50-59	63	13.5
60-69	52	11.1
70-79	35	7.4
80 and older	23	4.9

Results

Place of Residence, Experience with Water Quality Issues and Participation in Extension Programs

The results from the survey indicated 11.5% of the respondents lived directly on the coastline, while 88.5% lived inland. The issue experienced most often by the respondents was poor home drinking water, and the issue experienced the least was algae

blooms at closed springs, rivers, or lakes (see Table 2). When asked about participation in extension programs (see Table 3), the Florida Friendly Landscaping™ Program was the extension program with the highest participation rate, and the Master Beekeeper Program and the Entomology and Nematology Online Resources had the lowest participation rates.

Table 2

Respondents' Experience with Water Quality Issues

Water Quality Issues	<i>f</i>	%
Poor quality of home drinking water	103	22.0
Poor water quality at closed beaches	94	20.1
Prohibition on eating caught fish	51	10.8
Low water levels at closed springs, rivers, or lakes	49	10.4
Algae blooms at closed springs, rivers, or lakes	39	8.3

Table 3

Respondents' Participation in Extension Programs

Extension Programs	<i>f</i>	%
Florida Friendly Landscaping™ Program	80	17.0
Online Resource Guide for Shellfish Aquaculture	39	8.3
Master Gardener Program	26	5.5
Master Beekeeper Program	12	2.5
Entomology and Nematology Online Resources	12	2.5

Perceptions on Water Quality and the Importance of Clean Water

When asked about their perceptions on water quality in various water bodies, most respondents indicated they believed there was no change in the water quality in lakes, estuaries, rivers, groundwater,

springs, and oceans (see Table 4). However, the largest number of respondents felt the water quality in bays was getting worse. The overall score averaged over the seven water bodies was $-.15$ ($SD = .61$).

Table 4

Respondents' Perceptions of Water Quality Change Associated with Different Water Bodies

Water Bodies	Perceptions of Water Quality (%)				<i>M</i>	<i>SD</i>
	Better	No Change	Worse	Unsure		
Springs	17.9	42.7	18.9	20.6	-0.01	0.68
Rivers	15.1	35.5	31.7	17.2	-0.20	0.73
Oceans	14.6	35.0	33.9	16.5	-0.23	0.73
Bays	13.4	32.6	34.4	19.2	-0.26	0.73
Groundwater	13.1	37.2	29.1	20.4	-0.20	0.70
Lakes	11.9	36.6	32.8	17.5	-0.26	0.70
Estuaries	10.8	37.4	25.0	26.8	-0.19	0.67

Note. Scale: 1 = Better, 0 = No Change, -1 = Worse.

When asked about the importance of water quality on a five point Likert-type scale (1 = Not at All Important, 2 = Slightly

Important, 3 = Fairly Important, 4 = Highly Important, 5 = Extremely Important), respondents indicated they considered clean

water to be extremely important across all the descriptive items (see Table 5). Respondents perceived clean drinking water, clean lakes, rivers, and springs, clean beaches, clean groundwater, and clean oceans as extremely important. However,

hypoxia in the Gulf of Mexico was only considered fairly important. The overall perceptions of the importance of clean water index score was 4.54 ($SD = .61$).

Table 5

Respondents' Perceptions of the Importance of Clean Water Associated with the Description Items

Description Items	Perceptions of the Importance of Clean Water (%)					M	SD
	1	2	3	4	5		
Clean drinking water	0.2	1.2	4.0	11.0	82.4	4.76	0.60
Clean lakes, rivers, and springs	0.2	0.9	8.8	24.9	64.0	4.53	0.71
Clean beaches	0.8	1.8	6.0	25.1	65.4	4.54	0.76
Clean groundwater	1.4	1.1	7.8	22.5	65.8	4.52	0.81
Clean oceans	0.4	1.4	7.7	28.1	61.3	4.50	0.73
Clean bays and estuaries	0.5	1.6	7.5	28.4	60.7	4.49	0.75
Clean water for shellfishing	0.9	3.1	9.8	26.0	58.2	4.40	0.86
Saltwater intrusion	2.7	7.1	14.7	18.2	35.0	3.98	1.15
Hypoxia in the Gulf of Mexico	16.3	21.1	23.5	17.5	21.6	3.07	1.38

Note. Scale: 1 = Not at All Important, 2 = Slightly Important, 3 = Fairly Important, 4 = Highly Important, 5 = Extremely Important.

Relationships between Variables of Interest

The relationships between the variables of interest were described using Davis' (1971) convention with $.01 \geq R \geq .09$ = Negligible, $.10 \geq R \geq .29$ = Low, $.30 \geq R \geq .49$ = Moderate, $.50 \geq R \geq .69$ = Substantial, $R \geq .70$ = Very Strong. Respondents living on the coast showed negligible relationships with both their perceptions of water quality ($r = -.08$) and with their perceptions of the importance of clean water ($r = .01$). Correlations between experiences with water quality issues and perceptions of water quality, and the

importance of clean water were examined by using the listwise score averaged over the water bodies and clean water items (see Table 6). Respondents who experienced poor home drinking water had a low negative correlation with their perceptions of water quality which means they were more likely to believe water quality was getting worse ($r = -.18$). In addition, the more respondents had experienced poor home drinking water the more important clean water was an important issue to them, although the magnitude of this correlation was also low ($r = .12$).

Table 6

Relationships between Experiences with Water Quality Issues, Perceptions of Water Quality, and the Importance of Clean Water

Poor Water Quality Experience	Perceptions of Water Quality <i>r</i>	Importance of Clean Water <i>r</i>
Poor quality of home drinking water	-0.18	0.12
Poor water quality at closed beaches	-0.10	0.07
Prohibition on eating caught fish	-0.11	0.02
Algae blooms at closed springs, rivers, or lakes	-0.05	0.07
Low water levels at closed springs, rivers, or lakes	0.04	0.02

Relationships were also examined between participation in extension programs and perceptions of the importance of clean water (see Table 7). Respondents who had attended the Master Gardener Program, Master Beekeeper Program, or Florida Friendly Landscaping™ Program, were

more likely to believe water quality was getting better. However, a low negative correlation between the belief that clean water was important and participation in the Master Gardener Program was found.

Table 7

Relationships between Experiences with Extension Programs and Perceptions of Water Quality, and the Importance of Clean Water

Extension Program Experience	Perceptions of Water Quality <i>r</i>	Importance of Clean Water <i>r</i>
Master Gardener Program	0.19	-0.11
Master Beekeeper Program	0.15	-0.08
Florida Friendly Landscaping™ Program	0.14	0.04
Online Resource Guide for Shellfish Aquaculture	0.11	-0.05
Entomology and Nematology Online Resources	0.04	-0.09

Conclusion

The findings of this study described the relationships between place of residence, experiences with poor water quality and participation in extension programs, and their perceptions of water quality issues and importance of clean water. Given the population of interest used in this study was residents in the state of Florida, the results

cannot be generalized beyond this population, however, the results do provide insight into the influence of experience on perceptions.

In this study, the findings did not show an association between place of residence and people's perceptions of water quality issues and importance of clean water. Meaning those living on the coastline,

and most often confronted with water quality issues, did not perceive water quality issues differently from those living inland, nor did they perceive that clean water was more important than those with less exposure. This is contrary to the findings from Brody, Zahran, Vedlitz, and Grover's (2008) study which indicated residential area was associated with people's perceptions of an environmental issue.

Overall, poor drinking water quality was the issue most respondents had experienced, and clean drinking water was considered extremely important with the highest score across all items in the survey. Respondents who had experienced poor home drinking water quality also perceived water quality was getting worse and clean water was an important issue. This finding supports de França Doria's (2010) findings that indicating people's perceptions of water quality were associated with their experiences with poor water quality. One difference was that in this study, the water quality issues listed in the survey were all visible issues but with different reachability and accessibility depending upon the activities individuals participated in related to water. This is similar to the findings from Rahman (2003) indicating that visible environmental issues can affect the level of awareness an individual has of environmental issues. Therefore, people's negative perceptions of water quality and positive perceptions of the importance of clean water can be described by their experiences with visible water quality issues.

When investigating the impact of participation in extension programming, the participation rates were not very high, indicating extension programs listed in this study are only reaching a small portion of the public in Florida. While low-level relationships were discovered, the findings indicated there is the possibility that

participation in extension programs can positively influence perceptions of water quality. These findings are similar to other studies that have shown the positive effects of participation in extension programs on perceptions of environmental issues (Escalada & Heong, 1993; Singletary & Daniels, 2004; Vommi et al., 2013). However, the difference between this study, and the studies by Singletary and Daniels (2004) and by Vommi et al. (2013) was in the purposes of the extension programs studied. The listed extension programs in this research were well-recognized statewide programs that incorporated water quality discussions in the programming but are not directly focused on water quality issues. Instead, the extension programs identified in previous studies were directly associated with the environmental issues they studied, which may explain the low level relationships found in this study. For example, Vommi et al. (2013) studied the pest management practices farmers used in association with an extension program on integrated pest management. The extension programs participants attended in Singletary and Daniels' study (2004) were for the water conflict issues currently occurring in California and Nevada. Contrarily, for residents who had participated in the Master Gardener Program, the result revealed they did not consider clean water as an important issue in a low magnitude. This is contradictory to Vommi et al. (2013) that found participation in education programs develop perceptions of importance around an issue.

The findings from this study can be tied back to the theoretical framework of the theory of cognitive dissonance (Festinger, 1957) and the relationship between experience and cognition. In this study, the experience included respondents' experiences with poor water quality issue and extension program participation, with

the cognition including respondents' perceptions of water quality and the importance of clean water. Cognitive dissonance was found within respondents who had experienced poor quality in their home drinking water, closed beaches and prohibitions on eating caught fish and their cognitive thoughts about water quality getting worse and their associated importance with clean water. However, respondents' experiences with extension program participation did not reduce the dissonance between experiences and perceptions as expected. Respondents who participated in the Master Gardener Program, Master Beekeeper Program, or Florida Friendly Landscaping™ Program perceived water quality was getting better; and those who participated in the Master Gardener Program did not consider clean water as an important issue.

Implications

The area of the world examined in this study offers abundant water resources and its residents are active users of water, therefore the variation in attitudes and perceptions related to experiences with water could be enhanced when compared to areas where water is less abundant and should be recognized as a limitation. However, because of the chosen location, the findings can be used with caution as a foundation for the development of extension programs in other parts of the world, especially those that are similar in nature such as island countries.

This research shed light on how personal experiences with water quality issues reduces cognitive dissonance within target audiences. This finding implies that emphasizing personal relevance of water issues within extension programs could activate interest in water protection, ultimately leading to behavior change. Poor quality of home drinking water was the

water quality issue experienced most often by respondents. In addition, clean drinking water was identified as the most important water issue examined. When comparing the characteristics of home drinking water to the other water quality issues provided, home drinking water can be characterized with the highest reachability and accessibility because it is something used every day around the world. In addition, home drinking water is associated with human water intake that may be related to human health. These findings imply that people are aware of issues that are more closely related to their daily life and health than issues less directly applicable.

When the relationships between water quality issues, perceptions of water quality and the importance of clean water were examined, the findings indicated perceptions of water quality can be negatively influenced by experiences with poor water quality issues. Brody et al. (2008) found negative experiences with environmental issues could influence perceptions on these issues, supporting this finding. Moreover, it also implies people who have experienced poor water quality issues may be willing to take action when it comes to learning and engaging in water quality programs and activities (Festinger, 1957).

Respondents who had participated in extension programs indicated their perceptions on water quality were positively influenced at a low level. The similarity of this finding and previous research by Singletary and Daniels (2004) and by Vommi et al. (2013) implies that participation in extension programs may influence perceptions, although the inconsistency in the results within this study and previous literature needs to be further examined.

Recommendations

The findings from this study revealed extension programs focused on water quality issues should be developed with personal relevance in mind to maximize their influence on changing behaviors. As part of this, extension educators should consider using personal experiences with water issues as a factor in program participant recruitment. For example, extension educators could examine their target audiences to identify areas where water issues may be more relevant, such as low-income areas or areas where utility companies or the local government has historically had trouble supplying clean water resources. The individuals living in these areas will feel more personal relevance and therefore be more interested in water quality-focused educational experiences. Should they participate, individuals in these areas would also be more likely to change their behavior if they receive education about the protection of water resources.

Since personal experience has been found as a behavior change motivator, program context and content should be developed and tailored to provide a sense of personal experience. For example, international extension educators developing water quality programs should consider integrating simulations into their programs that provide a real-life experience emphasizing the realities of poor water quality so participants want to change their behaviors. Note that issues and experiences can be diverse depending on the location. Therefore, extension programs should be developed in a localized manner to address relevant issues optimizing program outcomes (Monroe & McDonell, 2012). For example, an extension program about proper lawn fertilization could be conducted in an urban area where potential participants experienced poor drinking water quality caused by a polluted aquifer where an

extension program about proper animal waste management would be appropriate in an agricultural community where non-point source runoff has resulted in watersheds becoming impaired.

Future research is also recommended based on the results of this study, which indicated inconsistencies in the effects of different extension programs on perceptions of water quality and the associated importance of water. Since previous research examined extension programs directly related to a specific environmental issue, additional research focusing on perceptions of water quality issues in association with participation in extension programs related to water management should be examined for a more thorough explanation. A promising approach could be targeting localized small-scale programs directly related to water protection efforts, which can provide more specific results indicating the effectiveness of extension programs.

Lastly, a similar study should be conducted in a different country with similar water issues to the one in this study to explore the possible existence of cultural differences and the impacts of extension programming on water quality perceptions under different cultural situations. A comparative study could also be conducted to determine the similarities and differences in these two locations to further explore if the findings of this research are specific to this part of the world or relevant broadly.

References

- Arcury, T. A., & Christianson, E. H. (1990). Environmental worldview in response to environmental problems: Kentucky 1984 and 1988 compared. *Environment and Behavior, 22*, 387-407.
- Baker, R., Brick, J. M., Bates, N. A., Battaglia, M., Couper, M. P., Dever,

- J. A., et al. (2013). *Report of the AAPOR task force on non-probability sampling*. American Association for Public Opinion Research. Retrieved from <http://www.aapor.org/AM/Template.cfm?Section=Reports1&Template=/CM/ContentDisplay.cfm&ContentID=5963>
- Brody, S. D., Zahran, S., Vedlitz, A., & Grover, G. (2008). Examining the relationship between physical vulnerability and public perceptions of global climate change in the United States. *Environment and Behavior, 40*(1), 72-95.
- Davis, J. A. (1971). *Elementary survey analysis*. Englewood Cliffs, NJ: Prentice-Hall.
- de França Doria, M. (2010). Factors influencing public perception of drinking water quality. *Water policy, 12*(1), 1-19.
doi:10.2166/wp.2009.051
- Dickerson, C. A., Thibodeau, R., Aronson, E., & Miller, D. (1992). Using cognitive-dissonance to encourage water conservation. *Journal of Applied Social Psychology, 22*(11), 841-854.
- Environmental Protection Agency. (2012a). *Water quality standard history*. Retrieved from <http://water.epa.gov/scitech/swguidance/standards/history.cfm>
- Environmental Protection Agency. (2012b). *Safe Drinking Water Act (SDWA)*. Retrieved from <http://water.epa.gov/lawsregs/rulesregs/sdwa/>
- Escalada, M. M., & Heong, K. L. (1993). Communication and implementation of change in crop protection. *CIBA Foundation Symposia, 177*, 191-207.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Evanston, IL: Row, Peterson.
- Fielding, K. S., Spinks, A., Russell, S., McCrea, R., Stewart, R., & Gardner, J. (2013). An experimental test of voluntary strategies to promote urban water demand management. *Journal of Environmental Management, 114*, 343-351.
doi:10.1016/j.jenvman.2012.10.027
- Friedman, M. J. (Ed.). (2011). *Global water issues*. Washington, DC: U.S. Department of State, Bureau of International Information Programs.
- Hartstone, L. C., Knight, J., & Riley, J. J. (2006). Water in Tanzania: A role for extension. *Journal of International Agricultural and Extension Education, 13*(1), 59-71.
doi: 10.5191/jiaee.2006.13106
- Heaton, K., Barnhill, J., & Hill, R. (2012). Strengthening Armenian irrigation capability through extension education and mentoring. *Journal of International Agricultural and Extension Education, 19*(3). doi: 10:5191/jiaee.2012.19303
- Hilger, J., & Hanemann, W. M. (2008). *The impact of water quality on southern California beach recreation: A Finite Mixture Model Approach*. CUDARE Working Papers, University of California, Berkeley.
- International Conference on Water and the Environment. (1992). *The Dublin statement on water and sustainable development*. Report of the International Conference on Water and the Environment, World Meteorological Organization, Dublin, Ireland. Retrieved from <http://www.wmo.int/pages/prog/hwrrp/documents/english/icwedece.html>
- Kalton, G., & Flores-Cervantes, I. (2003). Weighting methods. *Journal of Official Statistics, 19*(2), 81-97.

- Kanté, A., Edwards, M. C., & Blackwell, C. (2013). An assessment of the Sasakawa Africa Fund for Extension Education's (SAFE) training program in Mali: Graduates' perceptions of the program's impact on their professional performance. *Journal of International Agricultural and Extension Education*, 20(3), 6-20. doi: 10.5191/jiaee.2013.20301
- Levy, B. S., & Sidel, V. W. (2011). Water rights and water fights: Preventing and resolving conflicts before they boil over. *American Journal of Public Health*, 101(5), 778-780. doi:10.2105/AJPH.2010.194670
- Monroe, M. C., & McDonell, L. (2012). Flexible Training Program Builds Capacity for Diverse Challenges. *Journal of Extension*, 50(5). Retrieved from <http://www.joe.org/joe/2012october/a4.php>
- Odera, E., Lamm, A., Dukes, M., Irani, T., & Carter, H. (2013). *Water issues in Florida: How Extension can facilitate stakeholder engagement and involvement* (WC151). Gainesville: University of Florida Institute of Food and Agricultural Sciences. Retrieved December 8, 2015, from <http://edis.ifas.ufl.edu/wc151>
- Oki, T., & Kanae, S. (2006). Global hydrological cycles and world water resources. *Science*, 313(5190), 1068-1072. doi:10.1126/science.1128845
- Radhakrishna, R., Leite, F. C., & Hill, R. J. (2003). Relationships between global awareness and understanding and participation in international activities. *Proceedings of the 19th Annual Conference of the Association for International Agricultural and Extension Education (AIAEE), April 8-12, 2003*, Raleigh, NC. 550-559.
- Rahman, S. (2003). Environmental impacts of modern agricultural technology diffusion in Bangladesh: an analysis of farmers' perceptions and their determinants. *Journal of Environmental Management*, 68(2), 183-191. doi:10.1016/S0301-4797(03)00066-5
- Shaw, J., Hazel, D., Bardon, R., & Jayaratne, K. S. U. (2012). Landowners' knowledge, attitudes, and aspirations towards woody biomass markets in North Carolina. *Journal of Extension*, 50(4). Retrieved from <http://www.joe.org/joe/2012august/a9.php>
- Singletary, L., & Daniels, S. E. (2004). Assessing the impacts of collaborative-based extension programs to address natural resource conflicts. *Proceedings of the 20th Annual Conference of the Association for International Agricultural and Extension Education (AIAEE), May 23-29, 2004*, Dublin, Ireland. 802-812.
- Stave, K. A. (2003). A system dynamics model to facilitate public understanding of water management options in Las Vegas, Nevada. *Journal of Environmental Management*, 67(4), 303-313. doi:10.1016/S0301-4797(02)00205-0
- Stone, G., Singletary, M., & Richmond, V. P. (1999). Cognitive dissonance. In G. Stone, M. Singletary, & V. P. Richmond (Eds.), *Clarifying communication theories: A hands-on approach* (pp. 181-189). Ames, IA: Iowa State University Press.
- Swanson, B. E., & Rajalahti, R. (2010). *Strengthening agricultural extension and advisory systems: Procedures for assessing, transforming, and*

- evaluating extension systems*.
Washington, DC: The International
Bank for Reconstruction and
Development/The World Bank.
- Syme, G. J., Nancarrow, B. E., & Seligman,
C. (2000). The evaluation of
information campaigns to promote
voluntary household water
conservation. *Evaluation Review*,
24(6), 539-578. doi:
10.1177/0193841X0002400601
- The World Bank. (2014). *Environmental
Regulations and Standards*.
Retrieved from
[http://water.worldbank.org/shw-
resource-
guide/institutions/regulations-and-
standards/environment](http://water.worldbank.org/shw-resource-guide/institutions/regulations-and-standards/environment)
- Tunstall, S. (2000). Public perceptions of the
environmental changes to the
Thames Estuary in London, UK.
Journal of Coastal Research, 16(2),
269-277.
- U.S. Department of Agriculture. (2014).
National Water Quality Initiative.
Retrieved from
[http://www.nrcs.usda.gov/wps/portal
/nrcs/detailfull/national/programs/fin
ancial/equip/?cid=STELPRDB104776
1](http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/financial/equip/?cid=STELPRDB1047761)
- Vommi, H. K., LaVergne, D. D., & Gartin,
S. A. (2013). Growers' perceptions
and adoption practices of integrated
pest management in West
Virginia. *Journal of
Extension*, 51(2). Retrieved from
[http://www.joe.org/joe/2013april/rb5
.php](http://www.joe.org/joe/2013april/rb5.php)
- Vörösmarty, C. J., Green, P., Salisbury, J.,
& Lammers, R. B. (2000).
Global water resources: vulnerability
from climate change and population
growth. *Science*, 289(5477), 284-
288.
doi:10.1126/science.289.5477.284
- Young, S. T., & Dhanda, K. K.
(2013). *Sustainability; essentials for
business*. Thousand Oaks, CA:
Ringgold Inc.

doi:10.5191/jiaee.2015.22304

Agricultural Extension in Sub-Saharan Africa During and After Its Colonial Era: The Case of Zimbabwe, Uganda, and Kenya

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Abstract

Agricultural extension services the world over have been instrumental in ensuring agriculturists stay abreast of new developments to improve their productivity and economic livelihoods. This historical study describes the origin and practice of agricultural extension in the former British colonies of Zimbabwe, Uganda, and Kenya before their independence and during the decades afterward, and identifies some of the challenges impacting extension services in these countries. Over time, in a bid to improve their agricultural sectors, these countries employed a number of approaches to providing extension/advisory services. Some methods, however, were coercive and little more than the enforcement of laws and customs prejudicial to the nations' Black farmers. This often resulted in cruel treatment, exploitation, and oppression of these farmers, especially during the colonial era. In the post-colonial era, no single approach to extension delivery has been without shortcomings (Davis, 2008). To that end, a pluralistic paradigm has shown promise in mitigating the limitations of any single approach. Additional research should be conducted to determine the longstanding impact of using chiefs and other law enforcers as extension agents on individuals' present-day perceptions about extension and its potential for meeting the needs of smallholder, resource-poor farmers in the future.

Keywords: Africa, Agricultural Extension, British Colonies, Exploitation, Pluralistic Approaches

Introduction and Background

Agricultural extension predates the Renaissance period when people advocated for practical education and science that could be used to fulfill their basic human needs (Swanson & Claar, 1984; True, 1929). According to Swanson and Claar (1984) as well as True (1929), Rabelais (1483 to 1553) was among the pioneers to advocate for practical education by teaching children about nature and encouraging them to use the knowledge acquired in their daily lives.

“[I]t took nearly three-quarters of a century after George Washington was inaugurated as our first president to establish the land-grant university system and another half-century to establish extension” (Rasmussen, 1989, p. 16) in the United States. However, the idea of agricultural extension was borne by the American people long before passage of the Smith-Lever Act of 1914 to improve the lives of rural citizens and their communities (Rasmussen, 1989; Scott, 1970). Passage of the Land-Grant College Act of 1862, which established land-grant institutions, coupled with emergence of the farmers’ institute movement about the same time, had a profound impact on development of the U.S. extension system (Jones & Garforth, 1997; Scott, 1970). Thereafter, the Hatch Act of 1887 and the Smith-Lever Act of 1914 led to the creation of agricultural experiment stations and the Cooperative Extension Service, respectively, and this completed the tripartite mission of land-grant universities, i.e., teaching, research, and extension (Herren & Edwards, 2002; Jones & Garforth, 1997; Scott, 1970).

It should be noted, however, that *antecedents* to agricultural extension or advisory services existed in other parts of the world long before the idea was conceived in the United States. For example, according to Swanson and Rajalahti (2010) as well as Jones and Garforth (1997),

advising farmers and teaching them to adopt better farming practices was reported to have occurred in Mesopotamia, China, and Egypt thousands of years ago. In Egypt, advice was given to farmers on how to protect their crops and save lives from the Nile’s annual floods, and in Mesopotamia farmers were often provided advice on how to irrigate their crops to control infestations of rats as early as 1800 B.C. (Jones & Garforth, 1997).

According to True (1929), toward the end of the 18th century, several agricultural schools were established in different parts of Europe to promote agricultural development. For example, “the Georgicon Academy at Kezthely, founded in 1797 [was considered a] model agricultural college of Europe” for more than 50 years (True, 1929, p. 3). However, extension became more pronounced in the 19th century after the outbreak of potato blight in Ireland in 1845, and the attack of aphids in vineyards in Europe, especially in Germany, which led to the appointment of agriculture teachers to conduct demonstrations for farmers (Jones & Garforth, 1997; Swanson & Claar, 1984; Swanson & Rajalahti, 2010). By the end of the 19th century, many countries in Europe had developed their extension systems based on the German model of *Wanderlehrer* (migratory teacher); for example, in Denmark from 1870, and in the Netherlands during the 1840s and 1850s (Jones & Garforth, 1997).

The term *extension* itself was first used to describe adult education programs organized by Oxford and Cambridge universities in England starting in 1867; these educational programs helped extend the work of universities beyond the[ir] campus[es] and into the neighboring communities. This term was later formally adopted in the United States in conjunction with the land[-]grant

universities that were originally established as teaching institutions during the 1860s. Research activities were added in 1887, and extension activities were started in the 1890s and then formally added in 1914 as part of each university's official mandate. (Swanson & Rajalahti, 2010, p. 1)

Depending on the country, different words are used to describe *extension* (Swanson & Rajalahti, 2010; Van den Ban & Hawkins, 1996). For example, in the United States and in Canada the term *extension* is used but countries such as Britain and Germany refer to extension as "advisory work or [*Beratung* in the case of the latter], which implies that an expert can give advice on the best way to reach your goal, but leaves you with the final responsibility for selecting the way" (Van den Ban & Hawkins, 1996, p. 8). In developing countries, the term used to describe agricultural extension is mainly influenced by the funding agency, although use of *advisory services* is now more common in Sub-Saharan Africa (Swanson & Rajalahti, 2010). Further, unlike in developed countries such as the United States, where extension is part of land-grant university systems, in many developing countries most extension services are linked to their ministries of agriculture (Oladele, 2011; Swanson & Claar, 1984). In addition, the role played by extension agents varies among countries. In the United States extension serves more of an educational role, in European countries extension is more about solving problems, and in most developing countries extension is aimed at encouraging the adoption of new technologies by farmers to foment better farming practices for increased yields (Van den Ban & Hawkins, 1996).

Although substantial literature exists describing the evolution and role of extension in many of the *developed countries*, this is not the case with so-called *developing countries*. This study sought to examine the evolution of agricultural extension and the role it played in developing the agriculture sectors of three former British colonies in Sub-Saharan Africa, Zimbabwe, Uganda, and Kenya, with attention to implications for future extension delivery. Historical research enables us to understand how past events shaped the present phenomenon as well as learn about events that may continue to have influence in the future (McDowell, 2002). Further, knowledge of the past helps us to not only appreciate historical events that have shaped the present, but also to avoid previous mistakes and to plan for the future with some degree of certainty (McDowell, 2002). In addition, Peters (2002) posited knowledge of how extension was conducted historically enables us to understand better the role of extension today.

Purpose and Objectives of the Study

The primary purpose of this historical study was to describe the origin and practice of agricultural extension in the former British colonies of Zimbabwe, Uganda, and Kenya before their independence and during the decades afterward. In addition, the study sought to identify challenges facing agricultural extension in the three countries. Three objectives guided the investigation: (a) describe the origin and practice of agricultural extension in Zimbabwe, Uganda, and Kenya while under British Colonial rule; (b) describe the development of agricultural extension in Zimbabwe, Uganda, and Kenya after becoming self-governing, independent states; and, (c) identify challenges and recommendations for the future delivery of agricultural

extension in Zimbabwe, Uganda, and Kenya.

Methodology

Historical research methods were used to obtain information and data to achieve the study's research objectives. Borg (1963) defined historical research as "the systematic and objective location, evaluation, and synthesis of evidence in order to establish facts and draw conclusions about past events" (p. 188). Although historical research may be quantitative, in most cases, it is qualitative (Cohen, Manion, & Morrison, 2007) and increases "awareness and interest in the past, [helps us to] understand its complexity, and appreciate the forces which have brought about change in society" (McDowell, 2002, p. 5). When investigating historical events, Levstik (1997) asserted "there [are] no such thing[s] as *just the facts*. Someone sorts through the available data, perceives some facts as more relevant than others, organizes those facts, and assigns them a place" (p. 1). Thies (2002) posited what are viewed as facts may be subjective depending on the information a researcher seeks to discover. Further, Gaddis (2001) opined "*there is no such thing as a definite account of any historical episode* [emphasis original]" (p. 308).

This inquiry examined primary and secondary sources to achieve the study's objectives (Cohen et al., 2007; McDowell, 2002; Swan & Hofer, 2008; Thies, 2002). Historical research relies on evidence already in existence and, therefore, researchers must sift through and examine the available literature to identify the data most appropriate for their use (Cohen et al., 2007). Unlike secondary sources, primary sources contain the actual ideas of the author and have not been subjected to interpretation by others (Cohen et al., 2007; McDowell, 2002; Thies, 2002). Cohen et al. (2007), however, posited sometimes secondary

sources may have more authentic information than primary data sources. "There are numerous occasions where a secondary source can contribute significantly to more valid and reliable historical research than would otherwise be the case" (Cohen et al., 2007, p. 194).

This study examined information derived from peer-refereed journals, books, reports, official publications, monographs, dissertations and theses, newspaper articles, documents cited by other authors, as well as papers presented at scholarly and professional conferences (Cohen et al., 2007; McDowell, 2002; Thies, 2002). It is also imperative that historical researchers compare multiple sources of information to gain a better understanding of the phenomenon (Swan & Hofer, 2008). Cohen et al. (2007) and Thies (2002) urged researchers to triangulate data by comparing it with information from multiple sources to avoid *selection bias* and ensure accuracy of the evidence analyzed. The study's sources of information were also subjected to internal and external criticism by the researchers (McDowell, 2002; Thies, 2002).

The researchers relied mainly on primary and secondary sources available on the Internet and through search engines provided by Oklahoma State University's main library. Due to lack of funding, the researchers were not able to visit historical archives, libraries, or universities in Britain, Zimbabwe, Uganda, or Kenya where other relevant sources of information and historical evidence may have been found; such is a limitation of the study.

Evolution of Extension in the Former British Colonies of Zimbabwe, Uganda, and Kenya

Before 1914, most of the extension activities in Africa were conducted by missionaries who established demonstration farms alongside *spreading the gospel* (Jones

& Garforth, 1997). After colonization, however, and before nations gained their independence, agricultural extension in most of the British colonies in Sub-Saharan Africa was aimed at encouraging the rural populace to adopt new technologies and practices to improve production for the benefit of their *colonial masters*, i.e., for export (Alonge, 2003; Birmingham, 1999; Davis, 2008; Schwartz & Eicher, 1991; Swanson & Claar, 1984; Wichramasinghe, 1981). The supposition was that *all innovations were useful to all farmers* irrespective of their economic, cultural, and social orientations. The farmers had little input and their views were not often considered. According to Wichramasinghe (1981), a “centre-periphery extension model” (p. 15) was followed. The extension process was a top-down approach and often characterized by *coercion* if the farmers did not adhere to what was expected in regard to adopting new practices (Schwartz & Eicher, 1991). In addition, Shah (1999) asserted that “[i]n Africa, both former French and English colonies inherited highly centralized systems of governance geared [toward] command and control and against responsiveness to [the] public at large” (p. 2).

By 1914, departments of agriculture had been established in most British colonies (Jones & Garforth, 1997). Zanzibar, i.e., Tanzania, was one of the first to have a director in charge of agricultural research and extension as early as 1896 (Birmingham, 1999; Jones & Garforth, 1997). Before 1914, during the *Scramble for Africa*, most of the colonial governments’ ministerial departments of agriculture were more involved in administration and less focused on agricultural extension (Jones & Garforth, 1997). Where extension was implemented in the British colonies of Sub-Saharan Africa, it was mainly targeted on farming and animal production with little

effort directed to other aspects of rural development (Schwartz & Eicher, 1991).

Zimbabwe

Although steps were taken by the British to establish formal extension services in Zimbabwe, then known as South Rhodesia (Marshall, 2001), as early as 1907 (Qamar, 2013), extension did not take root until 1927. In that year, an American missionary, Emory D. Alvord, started extension for Black farmers to address the food demands of a growing population on the *allocated land reserves* (Hanyani-Mlambo, 2000; Kramer, 1997; Qamar, 2013). This meant the colonial government allotted the Black farmers specified plots of land to settle. However, Alvord was criticized by “the Industrial Missionary at the mission who did not see the need for agricultural instruction” (Kramer, 1997, p. 169). These farmers had been forcibly removed from their ancestral lands by the colonial government to settle White farmers in their place. Because the colonial government was unwilling to allocate more land for food production to those it had displaced, increasing the carrying capacity of the allotted land was their only option, and it was thought that could be done by providing extension services (Kramer, 1997). Närman (1991) explained demonstration farms were used (1930 to 1940) to teach the displaced farmers better agricultural practices to increase crop yields. Further, according to Närman (1991), during the 1920s, when Alvord initiated agricultural extension for Black farmers, he used “the Master farmer scheme” (p. 82) to provide services, which led to increased farm productivity.

The colonial government in Zimbabwe established a dual-system approach to provide separate extension services for White and Black farmers (Cobbett, 1985; Hanyani-Mlambo,

2000, 2002; Närman, 1991; Ndlela & Robinson, 2007; Schwartz & Eicher, 1991). For example, “the Department of Conservation and Extension [CONEX]” provided extension to White commercial farmers, and “the Department of Agricultural Development [DEVAG]” was mandated to provide extension services to the small-scale farmers who were predominantly Black (Hanyani-Mlambo, 2002, p. 3). Further, Schwartz and Eicher (1991) as well as Moyo, Mutuma, and Magonya (1987) asserted that, in the case of Black farmers, extension was more about maintaining law and order, but for White farmers it was geared toward adoption of new technologies and improvements in marketing. Moyo et al. (1987) stated that for the Black farmers the “extension services provided [a form of c]ommunity development, which was essentially directed at social engineering communities under traditional chiefs with a view of maintaining ‘law and order’ and [to] develop subservient ‘development skills’ promoting colonial rule” (p. 21). In addition, Whiteside (1998) asserted that, during the colonial period, “[a] carrot and stick approach was used to ‘improve’ agricultural practices by Black Farmers” (p. 16), and those who did what was approved were awarded with “a Master Farmer[']s Certificate and the opportunity to obtain land in a small-scale commercial farming area” (p. 16).

By the time Zimbabwe achieved independence from Great Britain in 1980, two separate systems of extension were operating for two forms of agriculture:

A high-yielding commercial sector with the capacity to produce a national surplus operated, on the one hand, and was managed by White farmers; alongside this affluent production power, a large [and almost entirely Black] African population of subsistence peasants

struggled for small yields on poor land. (Närman, 1991, p. 26)

After independence, the two extension departments, CONEX and DEVAG, were merged to form “the Department of Agricultural, Technical and Extension Services (AGRITEX)” (Hanyani-Mlambo, 2002, p. 3). The main objectives of this merger were to integrate the various extension personnel and harmonize them into one system as well as to reduce the racial segregation that existed under the former governmental system (Cobbett, 1985; Närman, 1991). Further, more resources were allocated toward the purchase of commercial farms to resettle individuals who had participated in Zimbabwe’s liberation struggle (Whiteside, 1998).

In 1988, AGRITEX with support from the German Organization for Technical Cooperation (GTZ) started a project called Conservation Tillage (ConTill) to help farmers with soil conservation efforts (Hagmann, Chuma, Connolly, & Murwira, 1997). In a bid to help farmers adopt new farming practices, it required interaction between farmers and the extension staff, as well as sharing information with others in the community (Hagmann et al., 1997). However, as a result of this interaction and community involvement, it further led to a transformation in the delivery of extension services, i.e., “from the rigid, linear, top-down extension model, to a more process-oriented approach, where farmers’ needs provided the framework for the extension service” (Hagmann et al., 1997, p. 3).

AGRITEX initially employed a top-down extension approach to train and disseminate new technologies to increase food production (Hanyani-Mlambo, 2000). According to de Jong (as cited in Närman, 1991), this was espoused in its main objective to implement “the agricultural policy of government through the provision

of agricultural, technical and extension services, which stimulate the adoption of proven agricultural practices, leading to increased, sustained and profitable production” (p. 77). However, in 1994, AGRITEX embarked on the Participatory Extension Approach (PEA) (Hagmann et al., 1997). And, according to Närman (1991), in the 1990s Zimbabwe was credited as having some of the best extension services in Sub-Saharan Africa. But later,

[i]n 2002, AGRITEX and the Department of Research and Specialist Services (DR&SS) were merged to form the Department of Agricultural Research and Rural Extension (AREX). In 2007, the research arm of AREX was separated to form the Department of Agricultural Research for Development (DAR4D). [And i]n 2009, the extension arm was separated from AREX to once again form AGRITEX. Similarly, the DAR4D was renamed as before, that is, [the] Department of Agricultural Research and Specialist Services (DR&SS). (Qamar, 2013, para. 5)

Of note, in 2000, Zimbabwe implemented a process of fast-tracking land reform “to address the racially skewed land distribution pattern inherited at independence in 1980” (Zikhali, 2008, para. 1, abstract). In the process of land redistribution, agricultural extension workers played a role in demarcating land to the smallholder farmers (Manby, 2002). The land was not only distributed to the landless farmers and “war veterans (for whom government policy officially reserves 20 percent), but also to the police, army, CIO [Central Intelligence Organization], civil servants such as agricultural extension workers (who are involved in demarcating plots), and traditional leaders” (Manby, 2002, p. 29). Roodt (2012) concluded the

redistribution of land was done haphazardly and this led to the collapse of most commercial farms that were replaced by a large number of small-scale farms, mainly producing food for consumption, i.e., subsistence farming, which adversely affected the country’s economy. The high influx of small-scale farmers also increased the ratio of farmers-to-extension workers, leading to a decline in the availability of extension services (Scoones et al., 2011). A 10-year study by Scoones et al. (2011) about effects of the land reform initiative reported “that the story is not simply one of collapse and catastrophe; it is much more nuanced and complex, with successes as well as failures” (p. 967) in Zimbabwe.

Uganda

In Uganda, during the colonial era (1920 to 1956), extension was mainly conducted by *chiefs* with the help of a few trained agricultural personnel (Bukenya, 2010; Kidd, 2001; Semana, 2008). The chiefs were often clan heads or elders in their communities and appointed by the colonial government to govern a specific area and to collect taxes on behalf of the central government (Ojambo, 2012; Tumushabe, Mushemeza, Tamale, Lukwago, & Ssemakela, 2010). These chiefs together with their aides were entrusted with the responsibility of distributing planting materials for cash crops, such as cotton and coffee, as well as giving instructions to their farmers on how to grow crops (Bukenya, 2010; Kidd, 2001; Semana, 2008). In addition, during the colonial period, extension was often coercive and aimed at producing cash crops to raise revenue for the colonial government (Bukenya, 2010; Kidd, 2001; Semana, 2008). From 1956 to 1963, however, the role of chiefs became less pronounced and extension was transformed to a support model for progressive farmers in their respective communities. It included

the provision of inputs as well as credit to expand and finance the progressive farmers' operations with the hope they would be viewed as demonstration farms or *models* from which the local populace could learn and thereby seek to emulate (Kidd, 2001; Semana, 2008; Tibeziinda, 1996).

In the post-independence era, especially during the 1960s and early 1970s, most of the extension services were provided by the national governments of developing countries with support from the United States Agency for International Development (USAID) and were aimed at farmer empowerment (Semana, 2008; Swanson & Claar, 1984). However, the political upheavals experienced during the 1970s and early 1980s in Uganda rendered its extension services ineffective (Bukonya, 2010; Kidd, 2001; Semana, 2008). But, in the 1980s, a demand for market-driven extension systems became more pronounced (Alonge, 2003; Kibwika, Wals, & Nassuna-Musoke, 2009; Swanson, 2011) in many countries. Despite this increased emphasis on market-driven extension services through the 1990s, extension in Uganda continued to emphasize the diffusion of new technologies (Bukonya, 2010) with little input from farmers.

The extension services provided by Ugandan government agents in the 1960s were top-down. Innovations from research stations were delivered to farmers without their input (Anderson, 2007; Bashaasha, Mangheni, & Nkonya, 2011). However, to mitigate the shortcomings of the top-down approach to extension, the agricultural knowledge and information systems model was introduced in the 1990s and “[more] recently, the innovation systems concept” (Rivera & Sulaiman, 2009, p. 64). As a result, the flow of information and innovations became more of a two-way process involving both farmers and government researchers; extension agents

became go-betweens or the facilitators of collaboration (Bashaasha et al., 2011). To this end, Swanson and Rajalahti (2010) outlined four different models used to deliver extension services in many developing countries during the 1970s, 80s, and 90s, including more decentralized and demand-driven, market-based approaches. The extension system used in most areas of Uganda, beginning in the 1990s, was intended to be comprehensive to address a wide range of areas such as animal production, crops, and aquaculture (Venkatesan & Kampen, 1998).

Moreover, in 2001, Uganda formally changed its extension services system from the traditional top-down approach to a farmer-driven/demand-driven model, as provided by its National Agricultural Advisory Services (NAADS), whereby farmers received public funds to contract private firms to provide extension services, thus replacing the traditional system (Benin et al., 2011; Lumu & Kiwuuwa, 2014; Swanson & Rajalahti, 2010). However,

NAADS in Uganda, which started in 2001, has struggled with serious management and resource problems; therefore, it is in the process of being reestablished as a public agricultural extension system, but with representative farmers continuing to shape extension programs and in setting priorities. (Swanson & Rajalahti, 2010, p. 97)

In 2014, the president of Uganda ordered a restructuring of NAADS and the firing of all its district coordinators, who were in charge of supervision and implementation of NAADS' programs, and replaced them with personnel from the Uganda Peoples Defense Forces [UPDF] (Lumu & Kiwuuwa, 2014; Rwakakamba & Lukwago, 2014; The State House of Uganda, 2014; Uganda Media Centre, 2014a). The personnel from UPDF

underwent two weeks of intensive training at Makerere University on the basic concepts underlying agriculture production (Anyango, 2014) so they would be able to effectively monitor and implement the NAADS' programs at the district level to ensure prosperity of the local populace (Uganda Media Centre, 2014b). The NAADS' coordinators were accused of a number of issues, including corruption, inefficient use of allocated resources, lack of proper accountability, failure to follow stipulated procurement guidelines, and poor monitoring (Lumu & Kiwuuwa, 2014; Uganda Media Centre, 2014b).

Kenya

Although the provision of extension services began during the early 1900s in Kenya, it did not yield much in terms of tangible results until the late 1960s and early 1970s when hybrid maize was diffused (Gautam, 1999). According to its National Agricultural Sector Extension Policy [NASEP] (2012), during the colonial era, as was the case of Zimbabwe, Kenya also had two separate extension delivery arms. A system for White settlers that was "well-packed" (NASEP, 2012, p. 6) and "combined extension services with credit and subsidized inputs" (p. 6) and another for the indigenous Africans considered "coercive in nature" (p. 6). Similar to Uganda and Zimbabwe, after achieving independence, agricultural extension in Kenya was mainly a responsibility of the national government through its Ministry of Agriculture (Davis & Place, 2003; Nambiro, Omiti, & Mugunier, 2006). Kenya, however, had and has a bifurcated extension system, i.e., an approach focused on food production, or a whole farm approach, provided primarily by the government, and a commodity-based model supported by the private sector, including parastatals and corporations producing commercial crops

(Muyanga & Jayne, 2006, 2008). Davis and Place (2003) posited "[r]esearch and extension [in Kenya] were focused mainly on [serving] large-scale farms or smallholders in high and medium-potential areas. Trials and demonstrations were [held] mostly on research stations" (p. 747).

After having gained independence in 1963, and through the 1970s, Kenya, with support from donors, adopted "the whole farm approach, and use of [the] integrated agricultural development approach" (NASEP, 2012, p. 6). Further, the government of Kenya, between 1965 and 1980, established extension services targeting small-scale farmers and this gave rise to what was called the "Farming Systems Research and Extension (FSR/E) model" (Nambiro, Chianu, & Murage, 2010, p. 5). The FSR/E model was decentralized with on-farm trials and farmers' involvement, and it provided a "three-way linkage between farmers, researchers, and extension providers" (Nambiro et al., 2010, p. 5). In the beginning, however, Kenya used a number of extension approaches to deliver services, and most of them were top-down in their modes of operation (NASEP, 2012). For example, the "whole farm extension approach, integrated agricultural development approach, and training and visit approach" were more prevalent in the 1980s and 1990s (NASEP, 2012, p. iv). According to Mcmillan, Hussein, and Sanders (as cited in Davis & Place, 2003 and in Nambiro et al., 2010), extension agents in Kenya used a "cookbook" model (p. 746 and p. 4, respectively) to deliver services through a top-down approach. In the early 1980s, the World Bank helped fund reforms to extensions systems in Sub-Saharan Africa and Kenya was the first beneficiary (Venkatesan & Kampen, 1998).

In the 1990s, a shift from the top-down scheme to a more horizontal or farmer-driven, participatory approach began

in Kenya and that led to a decentralization of its extension services (Nambiro et al., 2006). The decentralization included “structural reforms with the objective of shifting extension to other institutions and improving accountability and responsiveness” (Nambiro et al., 2006, p. 2), as well as increasing the participation of farmers in decision making with “the end-users assuming greater responsibility for designing appropriate curricula, and dissemination [of] information” (p. 2). In addition, the decentralization of extension services facilitated the entry of other organizations, especially from the private sector, to deliver extension services, including community-based organizations, cooperatives, faith-based organizations, non-governmental organizations (NGOs), parastatals, and private companies (Muyanga & Jayne, 2006, 2008; Nambiro et al., 2006; NASEP, 2012). According to Rivera (1996), decentralization of extension services empowers farmers to make independent decisions that best suit their needs, promotes sustainability, and increases the likelihood of commitment and collective responsibility amongst farmers regarding the decisions they make.

Unlike the government, which may offer a wide range of extension services, what the private sector provides tends to be *commodity-specific* depending on its needs and aims (Muyanga & Jayne, 2006, 2008). For example, corporations and cooperatives dealing in commercial crops, such as tea, coffee, and pyrethrum, may provide customized advisory services to their outgrowers to increase production and improve quality (Muyanga & Jayne, 2008). In more recent times, Kenya’s government has embraced a more demand-driven and participatory approach to the delivery of extension services (NASEP, 2012). For example, “[a] focal areas approach and farmer field schools (FFS)” (NASEP, 2012,

p. 6) have become more of the norm. Although the Kenyan government still provides financial support for its extension system, the “long term goal is to have private sector-led and fully commercialized extension services” (NASEP, 2012, p. 28) in the future.

Conclusions

In these countries, during the 1980s and 1990s, the respective governments and parastatals together with the private sector, especially NGOs, were involved in the provision of extension services through community participation, which led to further *decentralization of their extension services* (Bashaasha et al., 2011; Friis-Hansen & Kisauzi, 2002; Gautam, 1999; Hanyani-Mlambo, 2002; NASEP, 2012; Rivera, Qamar, & Crowder, 2001; Semana, 2008; Venkatesan & Kampen, 1998). When more than one type of extension provider serves a given area, a *pluralistic extension system* is operating (Rivera et al., 2001; Swanson, 2011; Venkatesan & Kampen, 1998). Rivera (1996) asserted that, in such a system, the private sector provides extension to commercial farmers as well as the smallholder farmers (outgrowers) contracted to grow crops for the companies; and, at the same time, the public sector provides extension to the subsistence farmers. For example, in Uganda, corporations, such as Sugar Corporation of Uganda Limited and Kakira Sugar Works, sign contracts with farmers to whom they provide inputs and extension services and, in turn, those farmers are obliged to honor the contracts by selling their sugarcane to the corporations (Smith, 1970). Kenya and Zimbabwe also have a number of agricultural corporations that contract with outgrowers to whom they provide inputs and extension services to ensure high quality and efficient agricultural outputs (Coulter, Goodland, Tallontire, & Stringfellow, 1999).

It is evident these former British colonies more or less have adopted demand-driven, pluralistic approaches to provide extension services (Bashaasha et al., 2011; Friis-Hansen & Kisauzi, 2002; Gautam, 1999; Hanyani-Mlambo, 2002; NASEP, 2012; Rivera et al., 2001; Semana, 2008; Venkatesan & Kampen, 1998). This kind of approach, however, makes it difficult to harmonize the activities of the various agencies involved and it may sometimes foment conflicts, especially if advice rendered to clientele by extension personnel differs from the official government position (NASEP, 2012; Qamar, 2005). This calls for governments to supervise and monitor the activities of organizations providing extension services (Qamar, 2005). Further, other than only providing agricultural extension services, most of the organizations, private and public, have incorporated multiple activities or deliverables ranging from HIV/AIDS awareness and prevention to programs supporting economic empowerment in a variety of ways (Davis, 2008; Muyanga & Jayne, 2008; NASEP, 2012; Rivera et al., 2001).

Challenges and Recommendations for Zimbabwe, Uganda, and Kenya in the Future

It should be noted that, historically, extension in the three countries studied was frequently associated with cruelty, exploitation, and oppression toward, as well as the enforcement of law and order amongst, their Black populations, i.e., those purported to be its *beneficiaries* (Moyo et al., 1987; Schwartz & Eicher, 1991; Whiteside, 1998). These acts of social injustice may have created negative perceptions so long-lasting that descendants of the people affected still harbor feelings of bitterness and distrust. Further, the *militarization of extension*, a path taken

recently by the Government of Uganda (Anyango, 2014; Lumu & Kiwuuwa, 2014; Nassaka, 2014; Rwakakamba & Lukwago, 2014; The State House of Uganda, 2014; Uganda Media Centre, 2014a), may foment civil discord because some Ugandans endured human rights abuses under past regimes, such as Idi Amin's presidency in the 1970s (Kaufman, 2003; Kyemba, 1977). However, encouraging a more participatory model for extension (Navarro, 2008) may help counter some of the negative views created during the colonial era as well as the aftermath of approaches implemented post-independence that were unsuccessful.

Reconsidering what Cohen et al. (2007) and McDowell (2002) professed, historical research enables us to understand how the past shaped the present while also learning about events likely to influence the future. Davis (2008) posited that through awareness of a country's past extension experiences more effective systems can be implemented to achieve desirable results going forward. To that aim, the governments of Zimbabwe, Uganda, and Kenya should not underestimate what impact the use of extension agents to enforce unpopular government policies may have had on the successes or failures of extension services and programs in the past. Moreover, a pluralistic approach to extension may be the most appropriate model to pursue (Davis, 2008), but in accord with guidelines set by the responsible government agencies and complementary to the nations' development agendas. In addition, national governments should guide and monitor activities of the various extension organizations to ensure harmony and avoid gratuitous use or waste of scarce resources (Lumu & Kiwuuwa, 2014; Oladele, 2011). The approaches adopted should not only involve agricultural production but rather aim to empower beneficiaries to embrace and apply sustainable practices to better ensure a

prosperous future. This would include working with stakeholders to find solutions to address crosscutting issues, such as HIV/AIDS, malaria, malnutrition, climate change, gender equity, and the promotion of good leadership (Davis, 2008; Oladele, 2011; Qamar, 2005).

Although the need exists for countries to move toward more demand-driven approaches to extension, especially with farmer participation and empowerment, guidelines should be clearly stipulated and followed by the authorities, and mixing approaches or models with politics should be avoided. By not following this stipulation, corruption, politicking, and perceived lack of accountability has already presented a substantial challenge to the future of NAADS in Uganda (Benin et al., 2011; Bukenya, 2010; Lumu & Kiwuuwa, 2014; Mafaranga, 2010; Musheshe, 2013; Nassaka, 2014). Further, even though decentralization and privatization of extension services stands to increase the accountability, efficiency, and effectiveness of providers (Bashaasha et al., 2011; Nambiro et al., 2006; Rivera, 1996), not many of the smallholder and subsistence farmers in these countries can afford to pay for extension/advisory services. The governments of Zimbabwe, Uganda, and Kenya, therefore, should continue to provide public extension to their low income, resource-poor farmers in addition to opening the provision of extension to the private sector and other sources of services. Moreover, governments of the three countries should honor the *Maputo Protocol* to which all three are signatories, and commit at least 10% of their national budgets, as agreed to in the protocol, toward the agriculture sector (Food and Agriculture Organization, 2004) to increase production and improve food security. Corporations are urged to continue providing extension services for outgrowers and to also consider

other aspects of their well-being, such as ensuring food security, providing HIV/AIDS prevention and treatment, improving general healthcare, and supporting education for them and their families.

Additional studies should be conducted to understand the longstanding impact of using chiefs and other law enforcers as extension agents on individuals' present-day perceptions about extension. This may warrant a historical narrative study (Cohen et al., 2007; McDowell, 2002) or could involve a phenomenological inquiry, i.e., personal interviews (Lincoln & Guba, 1985; Moustakas, 1994), to determine the *essence* of their lived experiences about extension during that era, including remembrances of elders' views and stories. The findings may provide extension service providers and policymakers a way forward on how best to offer extension services to this population in the future. In addition, studies should be conducted to examine the impacts and effectiveness of using military personnel to deliver extension services. McDowell (2002) posited that being aware of the past helps to avoid repeating earlier mistakes and guides us in making proper decisions for the future with some degree of certainty. Reliable data to that end could be helpful to policymakers and practitioners of extension in Zimbabwe, Uganda, Kenya, and elsewhere in the world.

References

- Alonge, J. A. (2003). Integrating farmers, their local level institutions, and social capital into extension delivery systems in Sub-Saharan Africa: Issues, challenges, and implications. *Proceedings of the 19th annual conference of the Association of International Agricultural and Extension Education, USA*, 19–31.
- Anderson, J. R. (2007). *Agricultural advisory services: Background paper*

- for the world development report 2008. The World Bank Group, Washington, DC: Agriculture and Rural Development Department. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/9041/WD R2008_0003.pdf?sequence=1
- Anyango, J. (2014, August). *300 UPDF officers awarded Makerere certificates in agriculture training: Officers hailed for discipline and urged to pass on the knowledge and skills to improve people's livelihoods. Kampala, Uganda: Makerere University, College of Agricultural and Environmental Sciences*. Retrieved from <http://caes.mak.ac.ug/news-events/latest-news/1522-300-updf-officers-awarded-makerere-certificates-in-agriculture-training-officers-hailed-for-discipline-and-urged-to-pass-on-the-knowledge-and-skills-to-improve-peoples-livelihoods.html>
- Bashaasha, B., Mangheni, N. M., & Nkonya, E. (2011). *Decentralization and rural service delivery in Uganda* (IFPRI Discussion paper 01063). Washington, DC: International Food Policy Research Institute. Retrieved from <http://www.ifpri.org/sites/default/files/publications/ifpridp01063.pdf>
- Benin, S., Nkonya, E., Okecho, G., Randriamamony, J., Kato, E., Lubadde, G., . . . & Byekwaso, F. (2011). *Impact of Uganda's national agricultural advisory services program*. Research Monograph. Washington, DC: International Food Policy Research Institute. Retrieved from <http://www.ifpri.org/sites/default/files/publications/rr175.pdf>
- Birmingham, D. M. (1999). Revisiting agricultural extension: Experiences in less industrialized countries. (Invited panel presentation). *Journal of International Agricultural and Extension Education*, 6(2), 19-26 (Conference issue). Retrieved from <https://www.aiaee.org/attachments/article/335/Vol-6.2.pdf>
- Borg, W. R. (1963). *Educational research: An introduction*. New York, NY: David McKay Company, Inc.
- Bukenya, C. (2010). *Meeting farmer demand? An assessment of extension reform in Uganda* (Doctoral thesis, Wageningen University). Retrieved from <http://edepot.wur.nl/15663>
- Cobbett, M. (1985). Agricultural extension in Zimbabwe: The basis for rural development. *Reality*, 7(1), 16-20. Retrieved from http://www.disa.ukzn.ac.za/index.php?option=com_displaydc&recordID=rejan85.8
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). New York, NY: Routledge. Retrieved from <http://knowledgeportal.pakteachers.org/sites/knowledgeportal.pakteachers.org/files/resources/RESEARCH%20METHOD%20COHEN%20ok.pdf>
- Coulter, J., Goodland, A., Tallontire, A., & Stringfellow, R. (1999). *Marrying farmer co-operation and contract farming for agricultural service provision in Sub-Saharan Africa*. Kent, United Kingdom: Natural Resources Institute, University of Greenwich. Retrieved from <http://www.hubrural.org/IMG/pdf/contractingoutzambia.pdf>
- Davis, K. E. (2008). Extension in Sub-Saharan Africa: Overview and assessment of past and current

- models, and future prospects.
Journal of International Agricultural and Extension Education, 15(3), 15-28.
doi:10.5191/jiaee.2008.15302
- Davis, K., & Place, N. (2003). Current concepts and approaches in agricultural extension in Kenya. *Proceedings of the 19th annual conference of the Association of International Agricultural and Extension Education, USA*, 745-756.
- Food and Agriculture Organization. (2004). *Implementation of the comprehensive Africa agriculture development programme (CAADP) of NEPAD—progress review*. Rome, Italy: Author. Retrieved from <http://www.fao.org/docrep/meeting/007/j1604e.htm>
- Friis-Hansen, E., Kisauzi, D. (2002). Evolution of extension–farmer relationship in Uganda. *Proceedings of Workshop on Extension and Rural Development: A Convergence of Views on International Approaches*. Washington, DC: The World Bank Group, Agriculture and Rural Development.
- Gaddis, J. L. (2001). In defense of particular generalization: Rewriting cold war history, rethinking international relations theory. In C. Elman, & M. F. Elma (Eds.), *Bridges and Boundaries: Historians, Political scientists, and the study of International Relations* (pp. 301-326). Cambridge, MA: MIT Press
- Gautam, M. (1999). *Agricultural extension: The Kenya experience*. Washington, DC: World Bank Operations Evaluation Department. Retrieved from [http://Inweb90.worldbank.org/oed/oe_ddoclib.nsf/DocUNIDViewForJavaSearch/B728D8](http://Inweb90.worldbank.org/oed/oe_ddoclib.nsf/DocUNIDViewForJavaSearch/B728D887FC2B754D852568BD005A8C19/$file/198precis.pdf)
- Hagmann, J., Chuma, E., Connolly, M., & Murwira, K. (1997). *Propelling change from the bottom-up: Institutional reform in Zimbabwe* (Gatekeeper Series No. 71). London, UK: International Institute for Environment and Development. Retrieved from <http://pubs.iied.org/pdfs/6134IIED.pdf>
- Hanyani-Mlambo, B. T. (2000). Re-framing Zimbabwe's public agricultural extension services: Institutional analysis and stakeholders views. *Agrekon*, 39(4), 665-672.
- Hanyani-Mlambo, B. T. (2002). *Strengthening the pluralistic agricultural extension system: A Zimbabwean case study*. Rome, Italy: Food and Agriculture Organization, Integrated Support to Sustainable Development and Food Security Program. Retrieved from <ftp://ftp.fao.org/docrep/fao/005/AC913E/AC913E00.pdf>
- Herren, R. V., & Edwards, M. C. (2002). Whence we came: The land-grant tradition - origin, evolution, and implications for the 21st century. *Journal of Agricultural Education*, 43(4), 88-98.
doi:10.5032/jae.2002.04088
- Jones, G. E., & Garforth, C. (1997). The history, development, and future of agricultural extension. In B. E. Swanson, R. P. Bentz, & A. J. Sofranko (Eds.), *Improving agricultural extension: A reference manual* (chap. 1). Rome, Italy: Food and Agriculture Organization. Retrieved from

- <http://www.fao.org/docrep/w5830e/w5830e03.htm#TopOfPage>
- Kaufman, M. T. (2003, August 17). Idi Amin, murderous and erratic ruler of Uganda in the 70's, dies in exile. *The New York Times*. Retrieved from <http://www.nytimes.com/2003/08/17/world/idi-amin-murderous-and-erratic-ruler-of-uganda-in-the-70-s-dies-in-exile.html?pagewanted=all>
- Kibwika, P., Wals, A. E. J., & Nassuna-Musoke, M. G. (2009). Competence challenges of demand-led agricultural research and extension in Uganda. *The Journal of Agricultural Education and Extension, 15*(1), 5-19. doi:10.1080/13892240802617510
- Kidd, D. A. (2001). *Extension, poverty and vulnerability in Uganda country study for the Neuchâtel initiative* (Working paper 151). London, UK: Overseas Development Institute. Retrieved from <http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/2995.pdf>
- Kramer, E. (1997). The early years: Extension services in peasant agriculture in colonial Zimbabwe, 1925-1929. *Zambezia, 24*(2), 159-179.
- Kyemba, H. (1977). *State of blood: The inside story of Idi Amin*. New York, NY: Putnam Pub Group.
- Levstik, L. S. (1997). "Any history is someone's history:" Listening to multiple voices from the past. *Social Education, 61*(1), 48-51.
- Lincoln, Y. S., & Guba, E. (1985) *Naturalistic inquiry*. Newbury Park, CA: Sage Publications.
- Lumu, D., & Kiwuuwa, P. (2014, June 18). NAADS: UPDF says it's ready to take over from civil servants. *The New Vision*. Retrieved from <http://www.newvision.co.ug/news/656685-naads-updf-says-it-s-ready-to-take-over-from-civil-servants.html>
- Mafaranga, H. (2010, July 7). Museveni suspends NAADS again. *The New Vision*. Retrieved from <http://www.newvision.co.ug/D/8/13/725098>
- Manby, B. (2002). *Fast track land reform in Zimbabwe*. Human Rights Watch. Report Vol. 14 (1A). New York, NY: Author. Retrieved from <http://www.hrw.org/reports/2002/zimbabwe/ZimLand0302.pdf>
- Marshall, P. J. (2001). *Cambridge illustrated history: British Empire*. Cambridge, United Kingdom: The Press Syndicate of the University of Cambridge.
- McDowell, W. H. (2002). *Historical research: A guide*. Harlow, Essex, England: Pearson Education Limited.
- Moustakas, C. E. (1994). *Phenomenological research methods*. Thousand Oaks, CA: SAGE Publications.
- Moyo, S., Mutuma, M. P., & Magonya. (1987). *An evaluation of agricultural extension services support to women farmers in Zimbabwe with special reference to Makonde District* (Consultancy paper 12). Harare, Zimbabwe: Zimbabwe Institute of Development Studies. Retrieved from <http://ir.uz.ac.zw/jspui/handle/10646/733>
- Musheshe, M. (2013, February 22). Who is killing NAADS, agriculture? *The Independent*. Retrieved from <http://www.independent.co.ug/column/comment/7496-who-is-killing-naads-agriculture>
- Muyanga, M., & Jayne, T. S. (2006). *Agricultural extension in Kenya: Practice and policy lessons*

- (Tegemeo Working paper 26/2006). Nairobi, Kenya: Egerton University. Retrieved from <http://ageconsearch.umn.edu/bitstream/55168/2/wp26.pdf>
- Muyanga, M., & Jayne, T. S. (2008). Private agricultural extension services in Kenya: Practice and policy lessons. *The Journal of Agricultural Education and Extension*, 14(2), 111-124. doi:10.1080/13892240802019063
- Nambiro, E., Chianu, J., & Murage, A. (2010, September). The association of agricultural information services and technical efficiency among maize producers in Kakamega, western Kenya. *Contributed paper presented at the 3rd Agricultural Economists Association of South Africa (AEASA) conference, September, 19-23. Cape Town, South Africa.*
- Nambiro, E., Omiti, J., & Mugunieri, L. (2006, August). Decentralization and access to agricultural extension services in Kenya. *Contributed poster presented at the International Association of Agricultural Economists Conference, August 12-18. Gold Coast, Australia.*
- Närman, A. (1991). *Education, training and agricultural development in Zimbabwe*. Paris, France: International Institute for Educational Planning (UNESCO). Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&sqi=2&ved=0CC4QFjAB&url=http%3A%2F%2Funesdoc.unesco.org%2Fimages%2F0009%2F000921%2F092104eo.pdf&ei=pgqVUoH6Ccr1oAT934CgAQ&usq=AFQjCNHiyQbqRmiVSIk4qTI7bpGivV_Ng&bv m=bv.57155469,d.cGU
- Nassaka, F. (2014, June 15). Is disbanding NAADS Museveni's next blunder? *The Independent*. Retrieved from <http://independent.co.ug/news/news-analysis/9057-is-disbanding-naads-musevenis-next-blunder>
- National Agricultural Sector Extension Policy [NASEP]. (2012). *National agricultural sector extension policy. Government of Kenya, Agricultural Sector Coordination Unit (ASCU)*. Nairobi, Kenya: Author. Retrieved from http://www.kilimo.go.ke/kilimo_docs/pdf/NASEP_SESSIONAL_Policy.pdf
- Navarro, M. (2008). On the path to sustainable agricultural development: Enhancing extension agents' contribution. *The International Journal of Environmental, Cultural, Economic & Social Sustainability*, 4(3), 71-77.
- Ndlela, D., & Robinson, P. (2007). *Distortions to agricultural incentives in Zimbabwe* (Agricultural Distortions Working paper 39). Harare, Zimbabwe. Retrieved from http://siteresources.worldbank.org/INTTRADERESEAR/Resouces/544824-1146153362267/Zimbabwe_0708rev.pdf
- Ojambo, H. (2012). Decentralization in Africa: A critical review of Uganda's experience. *Potchefstroom Electronic Law Journal*, 15(2), 70-88. Retrieved from <http://www.saflii.org/za/journals/PELR/2012/17.pdf>
- Oladele, I. O. (2011). Features of agricultural extension models and policy in selected sub-Saharan African countries. *Journal of Agriculture and Environment for International Development*, 105(1),

- 35-44. Retrieved from <http://www.iao.florence.it/ojs/index.php/JAEID/article/view/10>
- Peters, J. S. (2002). Rousing the people on the land: The roots of the educational organizing tradition in extension work. *Journal of Extension*, 40(3). Retrieved from <http://www.joe.org/joe/2002june/a1.php>
- Qamar, K. M. (2005). *Modernizing national agricultural extension systems: A practical guide for policy-makers of developing countries*. Rome, Italy: Food and Agriculture Organization, Research, Extension and Training Division, Sustainable Development Department. Retrieved from <ftp://ftp.fao.org/docrep/fao/008/a0219e/a0219e00.pdf>
- Qamar, K. M. (2013). *Zimbabwe. Global forum for rural advisory services*. Lindau, Switzerland: World Wide Extension Study. Retrieved from <http://www.g-fras.org/en/world-wide-extension-study/africa/eastern-africa/zimbabwe.html>
- Rasmussen, W. D. (1989). *Taking the university to the people: Seventy-five years of Cooperative Extension*. Ames, IA: Iowa State University Press.
- Rivera, W. M. (1996). Agricultural extension in transition worldwide: Structural, financial and managerial strategies for improving agricultural extension. *Public Administration and Development*, 16(2), 151-161. doi:10.1002/(SICI)1099-162X(199605)16:2<151::AID-PAD868>3.0.CO;2-S
- Rivera, W. M., Qamar, K. M., & Crowder, V. L. (2001). *Agricultural and rural extension worldwide: Options for institutional reform in the developing countries*. Rome, Italy: Food and Agriculture Organization, Research, Extension and Training Division. Retrieved from <ftp://ftp.fao.org/docrep/fao/004/y2709e/y2709e.pdf>
- Rivera, W. M., & Sulaiman, R. V. (2009). Extension: Objective of reform, engine for innovation. *Outlook on Agriculture*, 38(3), 267-273. doi:<http://dx.doi.org/10.5367/000000009789396810>
- Roodt, M. J. (2012). Zimbabwe's land reform: Myths and realities. *African Journal of Range & Forage Science*, 29(2), 97-99. doi:10.2989/10220119.2012.717104
- Rwakakamba, M., & Lukwago, D. (2014). *The changing face of NAADS and what the entry of Uganda People's Defense Forces will mean for Uganda's agriculture* (Public Policy Issue Paper No:004/2014). Kampala, Uganda: Agency for Transformation. Retrieved from <http://www.agencyft.org/wp-content/uploads/2014/09/The-Changing-face-of-NAADS.pdf>
- Schwartz, L. A., & Eicher, C. K. (1991). *Extension in Africa: An institutional analysis*. East Lansing, MI: Michigan State University. Retrieved from <http://ageconsearch.umn.edu/bitstream/11075/1/pb91sc01.pdf>
- Scoones, I., Marongwe, N., Mavedzenge, B., Murimbarimba, F., Mahenehene, J., & Sukume, C. (2011). Zimbabwe's land reform: Challenging the myths. *Journal of Peasant Studies*, 38(5), 967-993. doi:10.1080/03066150.2011.622042
- Scott, R. V. (1970). *The reluctant farmer: The rise of agricultural extension to 1914*. Chicago, IL: University of Illinois Press.

- Semana, A. R. (2008). *Agricultural extension services at crossroads: Present dilemma and possible solutions for future in Uganda*. Retrieved from Makerere University, Department of Agriculture Extension/Education, Kampala, Uganda. Website: <http://codesria.org/IMG/pdf/Semana.pdf>
- Shah, A. (1999). *Balance, accountability, and responsiveness: Lessons about decentralization*. Washington, DC: The World Bank. Retrieved from <http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-2021>
- Smith, A. J. (1970). The production of sugar cane by outgrowers in East Mengo-Uganda. *East African Geographical Review*, 8(April), 47-54. Retrieved from http://www.macalester.edu/academic/s/geography/agr/journals/1970_8_6.pdf
- Swan, K. O., & Hofer, M. (1998). The historical scene investigation (HIS) project: Facilitating historical thinking with web-based, digital primary source documents. *Journal of the Association for History and Computing*, 11(1). Retrieved from <http://hdl.handle.net/2027/spo.33104.10.0011.101>
- Swanson, B. E. (2011). *Developing innovative extension systems, part I* (video). Modernizing Extension and Advisory Services (MEAS). Champaign, IL: University of Illinois and the United States Agency for International Development. Retrieved from <http://www.meas-extension.org/>
- Swanson, B. E., & Claar, B. J. (1984). The history and development of agricultural extension. In B. E. Swanson (Ed.) *Agricultural extension: A reference manual* (2nd ed.). Rome, Italy: Food and Agriculture Organization.
- Swanson, B. E., & Rajalahti, R. (2010). *Strengthening agricultural extension and advisory systems: Procedures for assessing, transforming, and evaluating extension systems* (Agriculture and Rural Development discussion Paper 45). Washington, DC: Agriculture and Rural Development, The World Bank. Retrieved from http://siteresources.worldbank.org/INTARD/Resources/Stren_combined_web.pdf
- The State House of Uganda. (2014, June). President Museveni commends UPDF officers for successful veterans agro program, disbands NAADS structure of coordinators. Kampala, Uganda: Author. Retrieved from <http://www.statehouse.go.ug/media/news/2014/06/10/president-museveni-commends-updf-officers-successful-veterans-agro-program-dis>
- Thies, C. G. (2002). A pragmatic guide to qualitative historical analysis in the study of international relations. *International Studies Perspectives*, 3(4), 351-372. doi:10.1111/1528-3577.t01-1-00099
- Tibezinda, J. P. (1996). *Measures of extension impact: A comparative study of three agricultural extension programs in Hoima District, Uganda* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI 9639359)
- True, C. A. (1929). *A history of agricultural education in the United States 1785-1925* (Miscellaneous Publication No. 36). Washington, DC: United States Department of Agriculture.

- Retrieved from
<http://www.biodiversitylibrary.org/item/80172#page/6/mode/1up>
- Tumushabe, G., Mushemeza, D. E., Tamale, M. L., Lukwago, D., & Ssemakela, E. (2010). *Monitoring and assessing the performance of local government councils in Uganda: Background, methodology and score card* (ACODE Policy Research Series No. 31, 2010). Kampala, Uganda: ACODE. Retrieved from
http://www.acode-u.org/documents/PRS_31.pdf
- Uganda Media Centre. (2014a, June). *President congratulates army officers for good work done*. Kampala, Uganda: Author. Retrieved from
<http://www.mediacentre.go.ug/press-release/president-congratulates-army-officers-good-work-done>
- Uganda Media Centre. (2014b, September). *Army came in to save NAADS funds from further misappropriation – President*. Kampala, Uganda: Author. Retrieved from
<http://www.mediacentre.go.ug/press-release/%E2%80%9Carmy-came-save-naads-funds-further-misappropriation%E2%80%9D-%E2%80%93-president>
- Van den Ban, A. W., & Hawkins, H. S. (1996). *Agricultural extension* (2nd ed.). Cambridge, MA: Blackwell Science.
- Venkatesan, V., & Kampen, J. (1998). *Evolution of agricultural services in Sub-Saharan Africa* (World Bank Discussion Paper No. 390). Washington, DC: The World Bank. Retrieved from
<http://elibrary.worldbank.org/doi/book/10.1596/0-8213-4259-2>
- Whiteside, M. (1998). *Encouraging sustainable smallholder agriculture in Zimbabwe. Agriculture Services Reform in Southern Africa* (R6452CA). London, UK: Environment & Development Consultancy Ltd. Retrieved from
<http://www.eldis.org/vfile/upload/1/document/0708/DOC6493.pdf>
- Wichramasinghe, L. (1981). *Toward a new extension strategy from promotion of innovations to participatory communication*. In Food and Agriculture Organization (Author). *1981 training for agriculture and rural development* (pp. 15-24). Rome, Italy: Publication Division, Food and Agriculture Organization.
- Zikhali, P. (2008, October). *Fast track land reform and agricultural productivity in Zimbabwe* (Environment for Development discussion paper series 08-30). Gothenburg, Sweden: Environment for Development Initiative. Retrieved from
<http://www.rff.org/RFF/Documents/EfD-DP-08-30.pdf>

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Examining Louisiana State University College of Agriculture Students' Perceived Motivators and Barriers to Participation in International Experiences

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Abstract

In an effort to internationalize higher education and produce globally competent professionals, many universities have increased the time and financial assets put toward promoting an international experience (IE). Research supports using an IE to supplement international education efforts and help students develop the global perspective and experience needed to succeed in the workplace. The purpose of this study was to determine College of Agriculture (CoA) students' perceptions of IE participation, and identify factors that CoA students perceived as barriers and motivators to participation in an IE. CoA students were interested in an IE. Overall life experience was identified as the most agreed motivator, and financial cost was identified as the most agreed barrier. No differences were found in perceived motivators or barriers of CoA students based on academic status. University faculty should encourage students who have participated in an IE to provide presentations and workshops to other CoA students. Further, presentations should focus on overall life experiences students gained from their IE participation, and should be informal in nature to allow for peer-to-peer discussion. This study should be replicated at other peer and regional universities for comparison, and a longitudinal study could be conducted to identify trends over time. Differences in gender and major regarding barriers and motivators should also be examined.

Keywords: Motivations, Barriers, International Experiences, Undergraduate Education, College of Agriculture

Introduction

Globalization has influenced every aspect of modern agriculture and as a result, the United States (U.S.) agriculture sector is more globally interdependent now than ever before (Lewis & Gibson, 2008). The passage of the North American Free Trade Agreement (NAFTA) in 1994 reduced trade barriers, created new markets, and brought international agriculture to the doorsteps of U.S. producers and agribusinesses (Redmann, Schupp, & Richardson, 1998; Wingenbach, Boyd, & Lindner, 2003). Since then, the impact of globalization continued to grow as new market development programs were implemented to create, expand, and maintain foreign markets for U.S. agricultural products (FAS, 2010).

Today, U.S agriculture is driven by an interconnected global economy, increased competitiveness in the market, and globalized commodities and services. As such, agriculture and extension professionals must be able to compete in a culturally integrated workplace and adequately meet the needs of diverse clientele (Navarro, 2005). According to the 2004 report by the National Association of Universities and Land-Grant Colleges (NASULGC) Task Force on International Education, “for students to contribute and succeed today, they must not only have a broad knowledge of the world, its people, politics, and cultures, but more importantly, have developed the skills to comprehend, analyze, and evaluate that knowledge” (p. 8). Graduating students must have an understanding of global issues and the ability to address local issues within a global context (Ludwig, 2007; Norris & Gillespie, 2009; Redmann et al., 1998).

Higher education institutions have been given much of the responsibility for developing the next-generation workforce (Punteney, 2012). U.S land-grant universities have been called to reassess their role in the changing global environment, and increase efforts to internationalize curricula (Ludwig, 2007; Norris & Gillespie, 2009). Throughout the literature, researchers agree that internationalization is a necessary goal for universities (Briers, Shinn, & Nguyen, 2010; Childress, 2009; Norris & Gillespie, 2010; Punteney, 2012; Redman et al., 1998; Wingenbach et al., 2003). NASULGC (2004) put forth the rationale that internationalization helps students “develop the global critical thinking essential to contributing as citizens of the world and competing in the international marketplace” (p. 8). According to Briers et al. (2010), a global curriculum can result in a better-prepared student by increasing their awareness of world cultures, developing global critical thinking skills, and developing intercultural communication skills.

In an effort to internationalize higher education and produce globally competent professionals, many universities have increased the time and financial assets allocated for promoting international experiences (IEs) (Childress, 2009; Navarro, 2005; Parsons, 2010; Van Hoof & Verbeeten, 2005). Prior research supports using IEs to supplement international education efforts and help students develop the global perspective and experience needed to succeed in the workplace (Norris & Gillespie, 2009; Ricketts & Morgan, 2009). In a study by Childress (2009), participation in an international experience (IE) affected the career

choices of nearly two-thirds of the student respondents, and half of the respondents developed careers with global aspects. Parsons (2010) found students who participated in an IE demonstrated greater foreign language skills, increased knowledge of specific regions and countries, greater cross-cultural skills, and a greater overall global perspective. Additionally, these students demonstrated attitudes, perceptions, and behaviors that were more internationally aware, open-minded, and cooperative (Parsons, 2010).

While increased institutional support has increased student participation in such experiences (Salisbury, Brian, & Pascarella, 2013), the number of U.S students who participate in an IE during their undergraduate career remains less than 10%. Only 1.3% of those students are in agriculturally related majors (Institute of International Education, 2013). To promote IEs among agriculture students, research is needed to examine the motivators and barriers that influence students' decisions to participate.

The majority of students in prior studies held positive perceptions toward participating in an IE (Briers et al., 2010; Bunch, Lamm, Israel, & Edwards, 2013; Van Hoof & Verbeeten, 2005) and were motivated to participate if they perceived IEs were important and worth pursuing (Bunch et al., 2013; Spiering & Erickson, 2006). Stroud (2010) reported students who perceived IEs were important to improving their understanding of other countries and cultures were twice as likely to participate than students who did not share the same belief. Another motivational factor frequently reported was the possibility of future career

benefits as an IE outcome (Kim & Goldstein, 2005; Schnusenberg, de Jong, & Goel, 2012; Stroud, 2010). Briers et al. (2010) found 70% of students were motivated to participate in an IE because they perceived participation would strengthen their resume and increase their ability to compete in the workplace. Students were motivated to participate in IEs when they had a general interest in other countries and cultures (Briers et al., 2010; Stroud, 2010) and saw IEs as a good opportunity to travel and experience other cultures (Van Hoof & Verbeeten, 2005). Additionally, students were motivated to participate when they liked the country in which the IE was located (Van Hoof & Verbeeten, 2005).

If students have positive perceptions and favorable attitudes toward IEs, they may still decline opportunities to participate if they perceive barriers to involvement. Spiering and Erickson (2006) assessed students' attitudes regarding IEs and found no significant difference in overall attitude toward IEs between students who had previously participated in an IE and students who had not. Students who chose not to participate in an IE were those who perceived the process as too complex and thought there were too many barriers involved (Spiering & Erickson, 2006). Of the barriers identified in the literature, financial cost was frequently reported (Bunch et al., 2013; Salisbury, Umbach, Paulsen, & Pascarella, 2009). Briers et al. (2010) reported that students identified (a) paying for the program, (b) allocating affordable and proper housing, and (c) other financial constraints associated with IEs as the major barriers they considered when deciding whether or not they would participate in an IE. However, financial cost cannot solely

explain students' decision not to participate in an IE during their undergraduate career. Spiering and Erickson (2006) found the majority of students thought IEs were still worth pursuing, despite the financial costs involved. A combination of other barriers may explain students' decisions to not participate. Other identified barriers include lack of information about IE opportunities (Peterson, 2003), lack of foreign language skills (Goldstein & Kim, 2006), non-supportive opinions and expectations of family members (Presley, Damron-Martinez, & Zhang, 2010; Schnusenberget al., 2012), and concern regarding how well IEs fit into their academic plan (Spiering & Erickson, 2006).

Theoretical Framework

Ajzen's (1991) Theory of Planned Behavior (TPB) served as the theoretical framework for this study. According to Ajzen (1991), human behavior is influenced by the behavioral, normative, and control beliefs of an individual. Behavioral beliefs include students' positive or negative attitudes they form when evaluating their participation in IEs. Normative beliefs include students' perceptions of the subjective norm, which represents the peer pressure they perceive to be associated with participating in an IE. Control beliefs represent students' perceptions of the success or difficulty involved in participating in IEs. These three beliefs include past experiences and foreseen obstacles, and together they can predict students' intention to participate in an IE. Further, the manipulation of any of these three beliefs can modify an individual's intention to perform a specific behavior and, therefore, increase or decrease the

likelihood they will perform the targeted behavior (Ajzen 1991). Prior research has supported that a relationship exists between intent and actual behavior (Schnusenberget al., 2012). Therefore, understanding student beliefs can assist university faculty and administrators to effectively design and market IE opportunities and increase student participation in IEs.

Purpose and Objectives

The purpose of this study was two-fold: (a) to determine CoA students' perceptions of IE participation, and (b) to identify factors that CoA students perceived as barriers and motivators to participation in an IE. The following research questions guided this study:

1. What are the selected personal and educational characteristics of CoA undergraduate students?
2. What are the perceptions of CoA undergraduate students regarding interest, importance, time of year, duration, and cost concerning participation in an IE?
3. What factors do CoA undergraduate students perceive as motivators of participation in an IE?
4. What factors do CoA undergraduate students perceive as barriers to participation in an IE?
5. Are there differences in CoA undergraduate students' perceptions of motivators of participation in an IE based on their academic status?
6. Are there differences in CoA undergraduate students' perceptions of barriers to

participation in an IE based on their academic status?

Methods

The study's population consisted of all Louisiana State University CoA students ($N = 1,359$) during the 2013-2014 academic year. The frame used for the study was the CoA fall semester course schedule. A random sample of five courses from each academic status level (e.g., 1000, 2000, 3000) was selected using a stratified cluster sample (Creswell, 2012). Thus, the sample used in this study was 806 students.

Data were collected, face-to-face, via a hard copy questionnaire from students who were in attendance in the randomly selected course during the day of data collection ($n = 444$). The researchers modified the original questionnaires (Bunch et al., 2013; Lamm & Harder, 2010; Reiger, n.d.) to meet the objectives of this study. Frame error was discovered during the data analysis procedures. A total of 41 students did not meet the criteria of being an undergraduate, CoA student. These 41 respondents and their responses were removed from the study. Additionally, 44 students were removed because of failure to report academic status. Completed instruments were collected from 359 of the 806 CoA students for a response rate of 45%. To control for non-response, personal and educational characteristics were compared to all students in the CoA. One significant difference was found. The freshmen included in this study were not representative of the population. It is assumed this is a result of sampling error (Creswell, 2012). No differences were found regarding all other personal and educational characteristics.

Instrumentation

The instrument consisted of 66 total items (Bunch et al., 2013; Lamm & Harder, 2010; Reiger, n.d.). The questionnaire was divided into six sections (a) interest in participating in an IE, (b) preferred locations to participate in an IE, (c) preferred activities to participate in while involved with an IE, (d) perceived motivators to participation in an IE, (e) perceived barriers to participation in an IE, and (f) personal and educational characteristics. To establish face and content validity, a panel of experts with expertise in international development reviewed the questionnaire. The panel deemed the questionnaire to be acceptable and did not recommend changes.

For the purpose of this study, only data from four sections were used for analyses. The first section used was designed to measure CoA students' interest level in participating in an IE. Item examples from this section included: (a) are you personally interested in participating in an IE, (b) how important is an IE to your education, and (c) how much time do you prefer to spend on an IE? The second section used asked CoA students to indicate their level of importance with 10 motivation items. A four-point anchored scale (1 = *Not important*, 2 = *Not very important*, 3 = *Somewhat important*, and 4 = *Very important*) was used to determine students' level of importance regarding these items. Item examples include (a) learn another language, (b) increased employability, (c) overall life experience, and (d) important stage in my personal development.

The third section used asked CoA students to indicate their level of agreement with 15 barrier items. A four-

point anchored scale (1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Agree*, and 4 = *Strongly agree*) was used to determine students' level of agreement regarding the barrier items. Item examples include (a) I cannot afford to participate in a study abroad opportunity, (b) I am intimidated by the thought of engaging in a study abroad opportunity, (c) my parents do not approve of study abroad opportunities, and (d) I am too busy with school. Lastly, the personal and educational characteristics section was used to describe the CoA students. This section included 10 items such as (a) gender, (b) ethnicity, (c) hometown residence, and (d) academic status.

Because this study sought to determine CoA undergraduate students' perceptions of motivations and barriers to participation in an IE, *post hoc* reliability estimates were calculated on these two constructs. Cronbach's alpha coefficient revealed exemplary (Robinson, Shaver, & Wrightsman, 1991) estimates of .84 for both motivations and barriers.

Data Analysis

Data were coded for analysis using the SPSS22[®] software package. Data analyses for research questions one through four consisted of calculating descriptive statistics (e.g., means, percentages, frequencies, and standard deviations). Research questions five and six were analyzed by employing a one-way ANOVA. A statistical significance level of .05 was established *a priori* for all statistical tests employed. Partial eta squared (η_p^2) was utilized to determine the practical effect of statistically significant findings associated with the ANOVA procedures.

Findings

Research question one asked about the personal and educational characteristics of CoA undergraduate students at Louisiana State University. Regarding gender, 252 (70.2%) students were female and 107 (29.8%) were male. The majority ($n = 286$; 79.7%) of the CoA students were White (non-Hispanic). Of the remaining students, 32 (8.9%) were African-American, 15 (4.2%) were Hispanic, 10 (2.8%) were Multi-racial, 8 (2.7%) were Asian, and 4 (1.1%) were American Indian/Native American.

In all, 17 (4.7%) of the students were freshmen, 118 (32.9%) were sophomores, 99 (27.6%) were juniors, and 123 (34.3%) indicated senior as their academic status. Regarding academic majors, the most frequent responses were Animal, Dairy, and Poultry Science ($n = 97$; 27.0%), Nutrition and Food Sciences ($n = 78$; 21.7%), Natural Resource Ecology and Management ($n = 77$; 21.4%), Textiles, Apparel, and Merchandizing ($n = 58$; 16.2%), and Agricultural Business ($n = 28$; 7.8%). About half ($n = 178$; 49.6%) indicated they grew up inside the city limits, and 177 (49.3%) grew up outside the city limits. The majority of respondents ($n = 315$; 87.7%) indicated that they were not fluent in a language other than English and had not previously engaged in an IE ($n = 317$; 88.3%).

Research question two sought to determine the perceptions of undergraduate CoA students regarding interest in participation, importance, ideal time of year, duration, and cost of participation concerning IEs. The majority ($n = 264$; 73.5%) of CoA undergraduate students indicated personal interest in participating in an IE during their undergraduate education.

Additionally, most ($n = 246$; 68.5%) of the students perceived IEs to be either somewhat or very important.

The most frequent sources of information utilized to inquire about IEs were friends/word of mouth ($n = 206$; 57.4%), the Academic Programs Abroad website ($n = 122$; 34.0%), and flyer, magazine, or newspaper ($n = 114$; 31.7%). The least frequent sources of information utilized to inquire about IEs were Internet site/Other ($n = 35$; 9.7%) and the student's academic advisor ($n = 49$; 13.6%). The junior year ($n = 220$; 61.3%) was indicated as the most suitable academic status in which to participate in an IE. Summer ($n = 183$; 51.0%) was indicated as the preferred time of year for an IE and 4-6 weeks ($n = 142$; 40.0%) was most often indicated as the preferred amount of time spent.

More than one-half ($n = 199$; 55.4%) of the students were willing to pay between \$1,000 and \$2,999 to participate in an IE. Most ($n = 196$; 54.6%) of the students required scholarships to cover between 26% and 75% of the costs associated with IE participation.

Research question three was concerned with determining factors that CoA undergraduate students perceived as motivators to IE participation (see Table 1). The overall mean of the motivator construct was 3.25 ($SD = .50$). The highest rated motivator item mean was *Overall Life Experience* ($M = 3.69$; $SD = .52$), which was in the real limits of *Very Important*. The remaining motivator item means were within the real limits of *Somewhat Important*.

Table 1

Perceived Motivations to IE Participation by CoA Undergraduate Students (n = 359)

Motivations	M	SD	Interpretation
Overall life experience	3.69	.52	Very Important
Looks good on a résumé	3.46	.72	Somewhat Important
Opportunity to live in another country or culture	3.37	.73	Somewhat Important
Important stage in my personal development	3.32	.79	Somewhat Important
Increased employability	3.31	.75	Somewhat Important
Learn more about my academic specialization	3.17	.78	Somewhat Important
Learn another language	3.12	.87	Somewhat Important
Get a graduate degree	3.11	.88	Somewhat Important
Opportunity to work in another country after completing current degree	3.06	.86	Somewhat Important
Importance placed by academic advisor or department	2.86	.86	Somewhat Important
Motivation Construct	3.25	.50	Somewhat Important

Note. Real Limits: 1.00 to 1.49 = *Not Important at All*, 1.50 to 2.49 = *Not Very Important*, 2.50 to 3.49 = *Somewhat Important*, 3.50 to 4.00 = *Very Important*.

Research question four sought to identify items the CoA undergraduate students perceived as barriers to IE

participation (see Table 2). The overall mean of the barriers construct was 2.03 ($SD = .45$). The highest rated barrier

item was *I cannot afford to participate in study abroad opportunities* ($M = 2.71$; $SD = .86$), followed by *I am too busy with school* ($M = 2.65$; $SD = .83$). The mean scores for these items were in the

real limits of *Agree*. The mean scores of the remaining items were within the real limits of *Disagree*.

Table 2

Perceived Barriers to IE Participation by CoA Undergraduate Students (n = 359)

Barriers	<i>M</i>	<i>SD</i>	Interpretation
I cannot afford to participate in study abroad opportunities	2.71	.86	Agree
I am too busy with school	2.65	.82	Agree
I am too busy with work	2.48	.90	Disagree
Academic departments do not encourage me to participate in study abroad opportunities	2.25	.84	Disagree
I am not aware of study abroad opportunities	2.15	.87	Disagree
I am concerned that a study abroad opportunity will impact my personal relationships	2.02	.90	Disagree
I am intimidated by the thought of engaging in a study abroad opportunity	2.00	.81	Disagree
I do not see the need to study abroad	1.93	.85	Disagree
The culture of the university does not support me in study abroad opportunities	1.93	.72	Disagree
A study abroad opportunity will not have an impact on my future career	1.87	.80	Disagree
I am not self-motivated to participate in study abroad opportunities	1.82	.81	Disagree
Studying abroad will not help me academically	1.80	.75	Disagree
My parents do not approve of study abroad opportunities	1.72	.73	Disagree
I am not interested in learning about other cultures	1.59	.77	Disagree
I am satisfied with the world I live in and do not see a need to travel	1.54	.72	Disagree
Barrier Construct	2.03	.45	Disagree

Note. Real Limits: 1.00 to 1.49 = *Strongly Disagree*, 1.50 to 2.49 = *Disagree*, 2.50 to 3.49 = *Agree*, 3.50 to 4.00 = *Strongly Agree*.

Research question five asked if there were differences in motivators perceived by CoA undergraduate students by academic status (see Table 3). Sophomore students held the highest

perceived motivator score ($M = 3.30$; $SD = .50$). Senior students held the lowest overall motivator score ($M = 3.17$; $SD = .48$).

Table 3

Mean Motivators Perceived by CoA Undergraduate Students by Academic Status

Academic Status	<i>M</i>	<i>SD</i>	<i>n</i>
Freshman	3.29	.50	17
Sophomore	3.30	.50	116
Junior	3.28	.51	96
Senior	3.17	.48	122
Total	3.25	.50	351

A one-way ANOVA was employed to determine if a statistically significant difference existed in perceived motivators to IE participation based on academic status (see Table 4).

Levene's test was used to ensure the assumption of equality of error variances was not violated. Levene's statistic was not significant ($p = .61$). The ANOVA yielded a $F(3, 347) = 1.44, p = 0.231$.

Table 4

Analysis of Variance Summary Table of Perceived Motivators to IE Participation by Academic Status of CoA Undergraduate Students

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Between Groups	1.07	3	.356	1.44	.231
Within Groups	85.78	347	.25		
Total	86.85	350			

Research question six sought to determine if statistically significant differences existed in perceived barriers to IE participation based on academic status of CoA undergraduate students (see Table 5). Freshman students ($M = 2.11, SD = .40$) held the highest overall

perceptions of barriers to IE participation. Senior students ($M = 1.97; SD = .42$) held the lowest overall perceptions of barriers to IE participation.

Table 5

Mean Barriers Perceived by CoA Undergraduate Students by Academic Status

Academic Status	<i>M</i>	<i>SD</i>	<i>n</i>
Freshmen	2.11	.40	17
Sophomore	2.10	.48	118
Junior	2.01	.46	99
Senior	1.97	.42	123
Total	2.03	.45	357

Prior to employing a one-way ANOVA, Levene's statistic was not statistically significant ($p = .65$), therefore, equality of error variances was

assumed. The ANOVA yielded a $F(3, 353) = 2.00, p = 0.12$.

Table 6

Analysis of Variance Summary Table of Perceived Barriers to IE Participation by Academic Status of CoA Undergraduate Students

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Between Groups	1.20	3	.399	2.00	.12
Within Groups	70.81	353	.20		
Total	72.00	356			

Conclusions, Recommendations, and Implications

The typical CoA student at Louisiana State University was a white female majoring in Animal, Dairy, and Poultry Sciences who received federal financial aid and other scholarships to assist in paying for tuition. These personal and educational characteristics are similar to students who participated in an IE during the 2011/2012 academic year nationwide (Institute of International Education, 2013). The clear majority of CoA students were interested in participating in an IE. However, one-fourth of the students reported they had

no personal interest in participating in an IE. The CoA students seeking information on IE opportunities were likely to do so through friends, word-of-mouth, or from the study abroad academic websites.

Overall life experience has been previously reported as a strong motivator for students to participate in IEs (Briers et al., 2010) and was the only motivation item CoA students perceived as very important. Students perceived all other motivation items as at least somewhat important. Regarding perceived barriers, students indicated they could not afford to participate in an IE and that they were

too busy with school to participate. This finding was not surprising, as financial cost is a common barrier reported in the literature (Briers et al., 2010; Salisbury et al., 2009; Van Hoof & Verbeeten, 2005). Lastly, no differences were found in the perceived motivators or barriers of CoA students based on their academic status.

Recommendations for Practice

An individual's perception of a behavior as a norm within his or her social group can influence the likelihood of that individual performing a specific behavior (Ajzen, 1991). In fact, Spiering and Erickson (2006) reported when considering their decision to participate in an IE, students perceived a positive benefit when discussing their experiences with other students who had participated in similar programs. Because CoA students indicated friends and word of mouth were their preferred means of inquiring information on IE participation, university faculty should encourage students who have participated in an IE previously to provide presentations and workshops to other CoA students. These presentations should focus on the overall life experiences students gained from their IE participation and should be informal in nature to allow for peer-to-peer discussion. Additionally, a global agriculture ambassador program could be initiated in Colleges of Agriculture. Advisors of this program would recruit students who were interested in international agriculture and utilize these students for international education recruitment. In addition to peer support, advisors and faculty members can contribute to students' positive perceptions concerning IE participation as a subjective norm and, therefore,

increase the likelihood they will participate (Ajzen, 1991; Schnusenberg et al., 2012). Also, CoA faculty and advisors should help reduce students' perceptions of barriers by assisting students in allocating funds, as well as working with students to incorporate IE courses into their academic track (Spiering & Erickson, 2006). Informational seminars and training could be provided to CoA faculty to help them better assist students in their IE pursuits.

Recommendations for Future Research

This study should be replicated at other peer and regional universities for comparison and a longitudinal study could be conducted to identify trends over time. To better explain why one-fourth of the students were not interested in participating in an IE, future analysis is warranted to identify how their perceived barriers differed from those students who indicated personal interest in participating. Differences in gender and major regarding barriers and motivators should also be examined. Considering the influence faculty and advisors have in internationalizing the curricula and promoting IE participation, future research should seek to investigate the IE perceptions and awareness of CoA faculty. Additionally, a study of this nature could provide researchers with information regarding the current role of faculty members in promoting IEs among students. This information could help universities determine if a training program is needed for their faculty members and, if so, how to best design those training programs.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. doi:10.1016/0749-5978(91)90020-T
- Briers, G. E., Shinn, G. C., & Nguyen, A. N. (2010). Through students' eyes: Perceptions and aspirations of college of agriculture and life science students regarding international education experiences. *Journal of International Agricultural and Extension Education*, (17)2, 5-20. doi: 10.5191/jiaee.2010.17201
- Bunch, J. C., Lamm, A. J., Israel, G. D., & Edwards, C. M. (2013). Assessing the motivators and barriers influencing undergraduate student choices to participate in international experiences. *Journal of Agricultural Education*, 54(2), 217-231. doi: 10.5032/jae.2013.02217
- Childress, L. K. (2009). Internationalization plans for higher education institutions. *Journal of Studies in International Education*, 13(3), 289-309. doi: 10.1177/1028315308329804
- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Upper Saddle River, NJ: Pearson/Merrill Hall.
- Institute of International Education. (2010). *Open doors report*. Retrieved from <http://www.iie.org/en/Research-and-Publications/Open-Doors>
- Institute of International Education (2013). *Open doors report*. Retrieved from <http://www.iie.org/en/Research-and-Publications/Open-Doors/Data>
- Kim, R. I., & Goldstein, S. B. (2005). Intercultural attitudes predict favorable study abroad expectations of U.S. college students. *Journal of Studies in International Education*, 9(3), 265-278. doi: 10.1177/1028315305277684
- Lamm, A. J., & Harder, A. (2010). Don't drink the water: Recognizing the fears associated with international Extension work. *Journal of International Agricultural and Extension Education*, 17(3), 31-41. doi: 10.5191/jiaee.2010.17303
- Lewis, E. C., & Gibson, J. (2008). The attitudes of extension faculty in Virginia toward globalizing extension programs. *Journal of International Agricultural and Extension Education*, 15(3), 59-68.
- Ludwig, B. G. (2007). Today is yesterday's future: Globalizing in the 21st century. *Journal of International Agricultural and Extension Education*, 14(3), 5-15. doi: 10.5191/jiaee.2007.14301
- National Association of State Universities and Land-Grant Colleges (NASULGC) Task Force on International Education (2004). *A call to leadership: The presidential role in internationalizing the university*. Retrieved from <http://www.aplu.org/NetCommunity/Document.Doc?id=340>

- Navarro, M. (2004). *Associations between faculty self-perceived international knowledge and their perspectives on strategies to internationalize the agricultural curriculum*. Paper presented at the Association for International Agricultural and Extension Education Annual Conference, San Antonio, TX. Abstract received from <https://www.aiaee.org/attachment/s/article/963/060.pdf>
- Norris, E. M. & Gillespie, J. (2009). How study abroad shapes global career: Evidence from the United States. *Journal of Studies in International Education, 13*(3), 382-397. doi: 10.1177/1028315308319740
- Parsons, L. R. (2010). The effects of an internationalized university experience on domestic students in the United States and Australia. *Journal of Studies in International Education, 14*(4), 313-334. doi: 10.1177/1028315309331390
- Peterson, D. L. (2003). The decision to study abroad: Contributing factors and implications for communication strategies. *Dissertation Abstracts International, 64*, 1450.
- Puntaney, K. N. (2012). International careers: The gap between student interest and knowledge. *Journal of Studies in International Education, 16*(4), 390-407. doi: 10.1177/1028315311430354
- Rieger, M. (n.d.) *University of Florida College of Agricultural and Life Sciences study abroad interest survey*. Unpublished manuscript, University of Florida.
- Robinson, J. P., Shaver, P. R., & Wrightsman, L. S. (1991). *Measures of personality and social psychological attitudes*. San Diego, CA: Academic Press.
- Salisbury, M. H., Umbach, P. D., Paulsen, M. B., & Pascarella, E. T. (2009). Going global: Understanding the choice process of the intent to study abroad. *Research in Higher Education, 50*(2), 119-143. doi: 10.1007/s11162-008-9111-x
- Salisbury, M. H., Brian, A. P., & Pascarella, P. T. (2013). The effect of study abroad on intercultural competence among undergraduate college students. *Journal of Student Affairs Research and Practice, 50*(1), 1-20. doi: 10.1515/jsarp-2013-0001
- Schnusenberg, O., de Jong, P., & Goel, L. (2012). Predicting study abroad intentions based on the theory of planned behavior. *Decision Sciences Journal of Innovative Education, 10*(3), 337-361. doi: 10.1111/j.1540-4609.2012.00350.x
- Spiering, K. & Erickson, S. (2006). Study abroad as an innovation: Applying the diffusion model to international education. *International Education Journal, 7*(3), 314-322.
- Stroud, A. H. (2010). Who plans (not) to study abroad? An examination of U.S. student intent. *Journal of Studies in International Education, 14*(5), 491-507. doi: 10.1177/1028315309357942
- Van Hoof, H. B., & Verbeeten, M. J. (2005). Wine is for drinking, water is for washing: Student opinions about international exchange programs. *Journal of*

- Studies in International Education*, 9(1), 42-61. doi: 10.1177/1028315304271480
- Wingenbach, G. J., Boyd, B. L., & Lindner, J. R. (2003). Students' knowledge and attitudes about international agricultural issues. *Journal of International Agricultural and Extension Education*, 10(3), 25-35. doi: 10.5191/jiaee.2003.10304

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