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Articles intended for publication should focus on international agricultural education and/or international extension education. Articles should relate to current or emerging issues, cite appropriate literature, and draw out implications for international agricultural and extension education. Manuscripts, or portions of manuscripts, must not have been published or be under consideration for publication by another journal.

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Greetings to all *Journal of International Agricultural and Extension Education (JIAEE)* subscribers and Association for International Agricultural and Extension Education (AIAEE) members. Volume 11 comes to a close with this issue, but significant recognition continues for the *JIAEE*. Specifically, the journal has been accepted for indexing and archival purposes by the International Bibliography of the Social Sciences (IBSS). This is very good news for the *JIAEE*! We are proud to have the IBSS include our journal in its indexing service, especially since many of its current journal listings “…emphasize the need to represent not only the core social science disciplines but also a broad range of related fields” (IBSS, 2004). Additional information and a listing of journals indexed through the IBSS services may be found at [http://www.lse.ac.uk/collections/IBSS/](http://www.lse.ac.uk/collections/IBSS/); I encourage all readers to review the IBSS online.

Change, is our only certainty. Recent changes to the *JIAEE*, as per AIAEE Executive Board decision, are to no longer consider the summer issue as the *JIAEE* “Conference Issue,” and to restructure subscription prices for the *JIAEE*. We will continue producing/publishing a summer issue of the *JIAEE*, but it will contain peer-reviewed scholarship generated from you, the AIAEE members, and not be limited to research papers presented at our annual conferences. We believe this is an important move to clarify the scholarship in the journal; something that indexing services deem highly important in their review processes. Remember, we all are doing what we can to achieve inclusion in the Thomson ISI® (founded as the Institute for Scientific Information®) index.

Subscription rates have been changed to reflect ever-increasing inflation rates and postage costs associated with mailing the hardcopy booklet to subscribers. Please note that annual individual subscriptions are now USD $30/year for the Web (electronic) version, and USD $45/year for those wanting the hardcopy booklet version. Also, library subscription rates were increased to USD $75/year to more accurately reflect our actual production and postage costs associated with those types of subscriptions. However, registrants to the Annual AIAEE Conference will enjoy an annual subscription to the *JIAEE* as part of their conference fee. The new subscription rates are in effect for those who are unable to attend the annual conference.

Has it been three years since my editorship began with the *JIAEE*? Yes, it is true! Time flies when you’re having fun. So, rather than quitting what I enjoy, I applied for another term as editor of the *JIAEE*. Call me crazy, but I enjoy this job immensely and felt that many of the changes to the manuscript submission and peer-review processes I had envisioned three years ago had not been developed fully, therefore I chose to prolong my service to the *JIAEE*. I am fortunate that the AIAEE Executive Board found favor in my first term services as editor, and graciously granted me another three-year term as editor. Thank you AIAEE Executive Board! Granted, I do not envision a lifetime of service as editor, but the goals of improving *JIAEE* scholarship and securing inclusion to Thomson’s ISI® index are paramount to a successful second term as editor. So, onward and upward with Volumes 12, 13, and 14!

Thank you to all contributors (p. 93-95), reviewers (p. 97-98), and board members (p. 2-3) who made *JIAEE* Volume 11 live up to its scholarly standards. Included in this issue are nine articles and one book review, made possible through your scholarship and the untiring service of our peer reviewers. Enjoy your fall issue and continue doing what you can to promote greater understanding of agricultural and extension education worldwide.

Sincerely,

Gary J. Wingenbach, Editor

*Journal of International Agricultural and Extension Education*
The Poultry Surveillance Unit in Trinidad and Tobago

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Abstract
This paper describes a possible model for livestock-based extension (in developing countries), the Poultry Surveillance Unit (PSU), that uses local knowledge and practices. The PSU was able to operate successfully under structural adjustment conditions in Trinidad and Tobago. There are several reasons for the success of the PSU: it is a small unit, with its own home base and some degree of independence. Although labour costs are high, input costs (bulletins, videos, newsletters) are low. The PSU uses a participatory approach built on farmers’ indigenous knowledge and informal experimentation (based on local and foreign data). The usefulness of the technology that is introduced on-farm is continuously assessed by the PSU in weekly feedback meetings. The PSU emphasizes a whole-farm preventive approach rather than stressing the treatment of illnesses. As a result PSU staff act as ‘reflective practitioners’ and practise the art of transformative learning.

Keywords: Livestock-Based Extension; Poultry; Privatization; Trinidad and Tobago; Medicinal Plants

Acknowledgments: This research was supported by a fellowship from Wageningen University, The Netherlands.
Introduction

There has been widespread discussion on reducing the role of the state in extension provision and allowing for more privatization. The parties calling for a more efficient provision of services through privatization often ignore the reality that structural adjustment programs have reduced the effectiveness of many government programs by reducing budgets until they only cover labour costs (Kidd, Lamers, Ficarelli, & Hoffmann, 2000). It is our contention that further privatization of extension services in Trinidad and Tobago would be a disservice to small-scale farmers. The marginality of the livestock sector in Trinidad and Tobago limits the number of private agents willing to provide low cost services.

It is most likely that the relatively well-paid, university-trained agents of agricultural supply shops would fill any gaps in extension services with imported technology. These agents sell various types of agricultural chemicals, animal feed, medicines, machinery and equipment and monitor the performance of those products in the field (Seepersad, 2002). They maintain regular communication channels with extension services and this will be shown below in the section called ‘The PSU in Action’. The call for privatization is linked to widespread disappointment with the limited client adoption of agricultural research data and the reluctance to examine the relevance of the research that was being transferred to the farmers. For example in Trinidad and Tobago extension officers are not in touch with very low resource farmers because they are not seen as ‘serious’ but merely ‘minders’ of animals. Low resource farmers operate under what was considered to be a less productive extensive system-tethered during the day (usually on the roadside) and confined at night. These farmers identified ‘insufficient land’ as a constraint to expanding their flocks, and had problems with dogs killing their animals. Other constraints were praedial larceny, loss of crops to roaming animals, uncontrolled breeding and endoparasites (Lans, 2001).

Ruminant feedlot systems, on deep litter and on slatted floors were introduced to address the above constraints. These feedlot systems were demonstrated at the Blenheim Sheep Project in Tobago, at the Sugar Cane Feeds Centre in Trinidad and at various stations of the Ministry of Agriculture (MALMR). Blenheim has also investigated different pasture grasses. Blenheim is now state-run but was previously jointly run by both Winrock International and the Government. The Sugar Cane Feeds Centre investigates locally available by-products and crop residues for livestock rations. In the 1990s several economic evaluations of low resource sheep farmers in Barbados, Guyana and Tobago concluded that the feedlot model could not be justified for these farmers (Lans, 2001). Non-adopters were investing less time and resources and losing less money. The limitations of the Blenheim model had nothing to do with how it was disseminated by state extension, but with the false premise that grass and other forages would be easily obtained on a tropical island. Our example of the Poultry Surveillance Unit demonstrates how state extension can provide practical and useful and affordable technology to livestock farmers.

The Poultry Surveillance Unit (PSU) has the same characteristics as other developing world extension services: high labour costs and a location within a hierarchical, inefficient and under funded Ministry of Agriculture. However the PSU was able to operate successfully under structural adjustment conditions by having low input costs (few bulletins, newsletters or videos), by building on farmer knowledge and by promoting informally tested medicinal plants, which substituted for allopathic drugs (Western medicine) (Lans, 2001).
Agriculture in Trinidad and Tobago

Trinidad and Tobago is firmly locked into the globalized food system. The food import bill from January to June 1997 was $743.5 million, $720 million for the same period in 1998 and 1.8 billion for 2001 (Browne, 2002; Lans, 2001). In June 1998 employment in agriculture was 42,300 (Lans, 2001). Agriculture’s contribution to GDP declined from 6.6% in 1966-73 to 3.7% in 1988-90. The livestock industry contributes approximately 0.1% or $18.6 million to GDP. The nation is 100% self-sufficient in pigs, poultry meat and eggs. Levels of self-sufficiency in other sectors are below 25% (Lans, 2001). Trinidad and Tobago farmers generally have less than six acres of land and 25% are landless.

The removal of government subsidies resulted in an increased efficiency of poultry farming (mortality reduced from 14% to 5% and feed conversion improved from 3kg of feed to 1 kg of bird to 2.1 to 1). The majority of Trinidad’s broiler chicken farmers are contract growers who rear broilers in an all-in-all-out system for five integrators/contractors. The integrators are involved in feed manufacturing, processing and production. Under the contract system farmers are supplied with chicks, feed, medication and technical support. Technical representatives are responsible for technology transfer, monitoring supplies of feed and other inputs and providing other forms of support for the contract farmers. They visit farms twice a week or more often if required (Seepersad, 2002).

Contract farmers have broiler capacities ranging from 5,000 to 90,000. Processing plants associated with the integrators supply government institutions, supermarkets, hotels and restaurants. The integrators and a few small independent broiler operations supply live broilers to small-scale roadside pluck shops where birds are kept in floor-systems until they are slaughtered and dressed for consumers on demand. Poultry production typically fluctuates to match consumption. Trinidadians consumed 15,454,545 kilos (34 million pounds) of poultry during the period January to July 1998 (Rampersad, 1998). Most of the broilers were sold wholesale from 174 farms. There are four large and ten small to medium sized farms producing eggs. Sale of table eggs for January to July 1998 totaled 26,604,000, of which 98.1 per cent were sold wholesale. Egg sales were estimated at $12.5 million (Rampersad, 1998). Corporate control is demonstrated by the assembly-type nature of the industry; major inputs (corn, soya, equipment, medication and some hatching eggs) are imported from the USA.

Agricultural Extension in Trinidad and Tobago

Inadequate extension work with farmers, a weak research-extension linkage, poorly trained personnel, insufficient market intelligence and limited financial support for farmer training and provision of livestock information (bulletins, newsletters, radio and TV) are listed among the constraints to livestock production in Trinidad and Tobago (Rampersad, 1998). Currently animal health information is disseminated through the CARAPHIN Newsletter of the Inter-American Institute for Co-operation in Agriculture (IICA); however this publication is used by institutions and professionals rather than by farmers.

Animal health assistants (AHAs) outside of the poultry sector are not trained to provide specialized health information. Provision of their services to farmers is constrained by the same economic factors that constrain the state veterinary service; these are the financial constraints of the Ministry of Agriculture Land and Marine Resources (MALMR) under structural adjustment, inadequate rural roads, poor telephone and transport facilities in some rural areas. The PSU is part of the Division of Veterinary Services of the MALMR and was put in place in 1981 as a veterinary and technical service provider based on recommendations from a committee of
poultry farmers who had complained about vaccine efficacy. In 1981 the staff consisted of three animal health assistants (AHAs) and a veterinarian as head of the unit. From 1983 to 1993 a veterinarian with an interest in poultry headed the unit.

The PSU provides assistance to chicken producers primarily. Guinea fowls and turkeys are seen occasionally, but Muscovy ducks are regularly serviced. The staff in 2000 consisted of eight AHAs, including two women, who were assigned to different districts in Trinidad, and one veterinary officer. Currently the PSU consists of two Veterinary Officers, one Agricultural Officer and four AHAs. In 1994 the PSU made 544 visits to 55 layer farms. The number of broiler farms visited in the same year was 165 and the total visits made were 2073. In 2000 the PSU made 450 visits to layer farms, 1277 to broiler farms, 485 visits to duck farms and 24 to other farms. Figures for 2001 are 379 visits to layer farms, 1580 to broiler farms, 658 visits to duck farms and 13 visits to other farms.

Key Concepts

Ethnoveterinary medicine in this paper refers to medicinal plants or other traditional treatments used for livestock diseases and other conditions. These treatments are often based on indigenous knowledge.

Systems thinkers believe that bringing together a broad but relevant array of stakeholders to discuss an issue is an effective means of achieving change. Systems thinkers claim that the interaction and dialogue between the stakeholders who hold different perspectives, assumptions and beliefs, creates new understanding and emergent knowledge. They claim that action plans and policies developed from the stakeholder interchange are more inclusive and likely to succeed. Systems thinkers believe that shared knowledge and discussion should precede further action in problematic and contentious situations (Jiggins & Röling, 1994).

Schon (1991) refers to tacit knowledge as knowing-in-action, which will remain implicit unless effort is used to make it explicit. Reflection-in-action is usually triggered by some ‘disorientating dilemma’ (like economic constraints coupled with disease problems). The disorientation is faced when the actions habitually guided by tacit knowledge do not produce the results expected from previous experience; problem setting and reflection are needed to bring about a paradigm shift which then determines the next action (i.e. farmer experimentation) (Hatten, Knapp, & Salonga, 2000).

Transformative learning involves reflecting on and transforming the beliefs, attitudes, opinions, and emotional reactions that underlie people’s core assumptions. The role of an extension agent involved in transformative learning (as illustrated in the PSU case below) would be to:
1. Discuss alternatives to uneconomic practices in agriculture.
2. Identify and explore alternative and low-cost agricultural practices based on farmers’ ideas and informal experiments.
3. Test the efficacy of these practices through on-station and farmer experimentation and freely discuss the results.
4. Accept the results of these informal experiments as sufficiently valid although they do not meet traditional scientific standards.

Reflective learning implies continuous learning about the farming situation by advisors (like extension agents) who then assess and suggest alternatives (like local medicinal plants) to farmers to coordinate their farming systems (reflective learning). The ‘reflective practitioner’ actively participates in the molding of knowledge and society through informed, directed and committed action (Hatten et al., 2000).
PSU in Action

Information on the PSU was obtained as one outcome of a five-year study into ethnoveterinary medicine (1995-2000) (Lans, 2001). As part of this larger study, group and individual interviews to elicit ethnoveterinary practices were held with field-based officials from MALMR: 19 Agricultural Officers (AOs) and AHAs, including those in the PSU (50% of all employed in those categories) and 27 Extension officers (EOs) (33% of all employed in that category) from one East and two South Regional Offices in Trinidad.

Subsequent to these interviews a workshop on medicinal plants used in poultry production was held at the PSU office in September 1995 with the eight AHAs of the PSU and two knowledgeable poultry farmer-managers. A draft booklet on ethnoveterinary medicine used in poultry production was produced before the workshop based on the information obtained from the interviews with the PSU and the two farmers. This draft was discussed at the workshop.

In August 2000, the first author attended a regular PSU meeting to discuss the PSU as a useful model for extension. Six AHAs and two veterinarians (the incumbent head of unit who was on vacation and her temporary replacement) were present. The ordinary business of the PSU was discussed first. Literature on available commercial products from suppliers of imported commercial drugs, and papers on new, imported production techniques were discussed at the meeting.

There was then a review of cases seen by the AHAs since the last meeting. A case of sudden deaths in turkeys was attributed to water contamination. Mortality of broiler chicks on one farm over three days was discussed as either poor brooding and/or malnutrition. The suitability of using pig grower/finisher as an alternative diet for ducks was also discussed. A post mortem examination of dead birds from one farm suggested mycotoxin contamination from moldy feed. The AHA recommended two solutions for the mould contamination to the farmer: aloes (Aloe Vera) and charcoal tablets in the drinking water, and changing the feed. These discussions demonstrate how the PSU practices continuous learning about poultry farming. Next on the agenda was a discussion of a two-page outline of the work of the PSU written by the first author and a discussion of the implications of the PSU approach for extension elsewhere. The opportunity was taken to ask whether poultry farmers still used the same medicinal plants and if any new plants were used.

Findings

In the interviews conducted with the PSU in 1995, the staff stated that they learnt of folk medicinal practices from the informal experiments of farmers, neighbours and relatives. Farmers tested Aloe Vera, Momordica charantia and Citrus species for common production problems such as reduced appetite, chick mortality, heat stress and respiratory conditions. Extracts of plants were made by steeping or blending (in an electric blender) and administered to the chickens via the drinking water. The AHAs monitored the progress of these informal experiments and discussed them with the rest of the PSU at the weekly meetings. The PSU introduced strategies to enhance the possibility that pathogens that may enter the poultry farm or the bird encountered an unfavourable environment. Additionally the PSU Head of Unit and staff informed farmers of any international medicinal plant research that could be useful locally.

For example, the PSU veterinarian shared with other staff members, the Solvay Animal Health’s research on Aloe Vera; which indicated that the plant’s immunomodulatory action might be more useful if the plant product was administered in the early part of the chicken’s life (especially when given in conjunction with Marek’s disease vaccine to day old chicks) (Karaca, Sharma, & Nordgren, 1995). This also minimized the amount of plant material
necessary because of the reduced water consumption by younger birds. The PSU then suggested to farmers that *Aloe Vera* might also enhance the response to other vaccines (e.g., Infectious Bursal Disease, Avian Reovirus, Infectious Bronchitis and Newcastle Disease). When farmers started adding plant products to the drinking water no one thought about immunostimulatory activity and this effect was seen as a potential beneficial ‘side effect’ as suggested by Solvay’s research on acemannan. Some poultry producers also adopted the PSU’s recommendation of garlic to enhance productivity (garlic corms are purchased in the market or supermarket). The smaller operators who use garlic to enhance productivity (corms purchased in the market) are primarily East Indian farmers in South Trinidad.

The plant *tulsi* (*Ocimum sanctum*) was introduced to the poultry farmers by the PSU subsequent to 1995. One PSU member saw a paper by Brown and Lans (1998) and disseminated the information on *tulsi* that it contained through the PSU network. The paper described the product ‘Zeestress’ that was made by the company Indian Herbs in Bangalore, India. Zeestress contained extracts from *Ocimum sanctum* and *Withania somnifera* and was used as a drinking water additive for immunomodulation and to combat stress in poultry. The active ingredients were said to be sitonidosides and steroidal lactones. This PSU agent claimed that twenty farmers were using the plant after administering Marek’s disease and other vaccines. Indo-Trinidadian farmers already knew of the plant from its religious-cultural uses, thus facilitating the uptake of the practice.

Three criteria were used to assess which information from the farmers’ experiments should be disseminated by the PSU to other farmers: (1) the investigated medicinal plants were seen to have a positive impact on production parameters, (2) no harmful effects were seen, and (3) the farmer-experimenters were repeat users of the technology. A dose was worked out for each plant but this was offered only as a guide for farmers to work with and not as a standard. The farmer-experimenters were all intensive poultry producers using open water systems with bell or trough-type automatic drinkers that are gravity fed from overhead storage tanks. The broiler houses are typically floor systems with sides of wire mesh and bagasse or wood shavings as litter. Factors affecting the success of the PSU’s diffusion process include the similarity of all broiler systems and the simple methods used to prepare the plants for administration to the birds. In addition the plants, in some cases, were already part of the farmers’ culture and diet.

Farmers collected the plants from the wild or purchased them; on-farm cultivation of the plants was also encouraged. The impact of the technology was expressed in improved productivity and decreased mortality, both of which were easily monitored by farmers and should have a positive impact on farm profitability.

The PSU was always extension-based despite the views of some senior members of the Division of Veterinary Services, expressed at staff meetings, that the “animal health service was not about extension”. The PSU’s philosophy was always to “treat the farm”, not just the sick animals and they made routine farm visits as well as responded to calls from farmers.

Examples of ‘treating the farm’ include the following: after informal investigation of local farmer-knowledge on-station, the PSU generated data suggesting that 5% acetic acid used at a rate of 300-600 ml in 225 litres of water would reduce bacterial contamination of poultry drinking water in Trinidad. The PSU now recommends the use of vinegar to combat *Candida albicans* infection in poultry, ‘sticky eye’ (a mild conjunctivitis in ducklings associated with bacteria in drinking water and vitamin A deficiency) and to keep water lines free of slime mould. Infectious Coryza and Fowl Cholera (two
bacterial diseases) have been reduced due to better water sanitation. Infectious Bursal Disease and Pox have declined due to better management practices (Lans, 2001). The PSU recommends management practices to control Newcastle Disease Virus infection such as minimizing stress. *Aloe Vera* is recommended to reduce the negative influence of coccidiosis on poultry production (Lans, 2001).

The former head of the PSU performed the majority of post-mortem examinations on diseased birds. This gave him credibility and institutionalized an interactive relationship with poultry farmers, which facilitated trust and the provision of appropriate solutions to health problems. Due to his farm visits and involvement in the post-mortem examinations the PSU head had a very good knowledge of on-farm conditions and knew which farmer-knowledge should be most beneficial under those conditions. Healthy flocks should result in a reduced need to perform post-mortem examinations and this reduced workload could then be considered an incentive for effective implementation of appropriate research. Feedback to farmers stimulated reflection, which encouraged the PSU and farmers to continue experimentation and develop new insights. The head of the PSU did not treat the AHAs as economic competitors but taught them as much as possible so that the farmers would get the best service. The PSU built knowledge alliances and shared the responsibility for knowledge production and adaptive testing with poultry farmers who were testing and ‘validating’ medicinal plants.

**Conclusions**

Rather than advocate for less professionalization, the head of the extension unit needs to be the person in charge of diagnostic services, examining the farm problems in the laboratory or on station, providing user-oriented solutions and relevant information (Nitsch, 1991). Reflection-on-action occurs when post-mortem examinations are carried out after the use of ethnoveterinary medicines. Feedback to farmers stimulates reflection, which encourages the PSU and farmers to continue experimentation and develop new insights. The head of the PSU did not treat the AHAs as economic competitors but taught them as much as possible so that the farmers would get the best service. The PSU built knowledge alliances and shared the responsibility for knowledge production and adaptive testing with poultry farmers who were testing and ‘validating’ medicinal plants.

**Recommendations**

The Caribbean does not have a strong livestock extension service and in some of the islands global forces prevent the development of even the assembly-type poultry industry found in Trinidad. With a government budget that covers only labour and transport costs for regular farm visits the PSU provides an example of an extension service that Caribbean states can provide, in spite of globalization food and financial systems. This type of unit may be particularly effective in disseminating locally generated information and may be especially effective in the formative years of an industry in developing countries if committed staff is available.
References


Profile of Agricultural Education and Extension: Challenges from a Changing Brazilian Rural Milieu

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Abstract
Remarkable transformations in Brazilian society are requiring a new kind of professional to face the emerging demands of a diverse, innovative, technological, and integrative agriculture and rural milieu. Colleges of Agricultural Sciences, as institutions for preparing people to work in agricultural education, agricultural research, and rural extension, are challenged to redesign their practice and lead a movement to foster strong partnerships between themselves, agricultural schools, agricultural research and extension institutions. The emergence of the National Forum of Extension’s Vice-Chancellors of Brazilian Public Universities in 1987 heralded a new era to foster changes from the universities’ stand points. Such a Forum put extension in a prominent position into Brazilian public universities, as well as enforced the university’s tripartite mission - teaching, research, and extension. The new characteristics emerging in the Brazilian rural milieu and Boyer’s (1990) concept of scholarship are the background used in this study to build a conceptual model linking agricultural education, agricultural research, and rural extension.

Keywords: Extension System, Agricultural Education, Challenges, Rural Milieu, Mission

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Introduction

Agricultural education and extension in Brazil have been challenged to play a new role to address the emerging demands of a diverse, integrative, and innovative rural milieu. Brazilian agriculture has been praised as the engine propelling the country’s economic growth. As a result of the advancements in agriculture, the country’s rural environment, demographics, economics, and social relations are undergoing remarkable transformations (Caporal, 1998; Carneiro, n.d.; Gordon, 2001; Graziano da Silva, 1997; Schneider, 2000).

Agricultural education started in Brazil in 1875 and is supported by federal legislation as formal education programs until the secondary level, usually delivered in agricultural schools, responsible for preparing people to work in agriculture. Agricultural schools are typically residential schools located in rural areas with some farmland in its structure (Leite, 1999; Sobral, 1998). A total of 339 agricultural education programs at the secondary level are delivered in 256 agricultural schools in Brazil, with 54,809 students registered (National Institute of Educational Studies and Research - INEP, 2000). However, despite its importance for the country, agricultural education is not recognized as a discipline or a body of knowledge in Brazil.

Brazilian universities do not see the delivery of rural extension as their role. They deliver “university extension,” which can include rural extension programs but with the primary function of providing practical experience to the students. University extension is defined as “the educative, cultural, and scientific process that articulates teaching and research in a strong way, and makes feasible the transforming relationship between university and society” (Nogueira, 2000, p. 11).

Brazilian Colleges of Agricultural Sciences seldom feel themselves as an active partner in a network of agricultural education and rural extension, since higher education in agriculture is not considered to be part of agricultural education and rural extension. Brazil has 276 higher education programs in agriculture with a total of 63,260 students registered (INPE, 2001). It is important to highlight that the total number of students enrolled in higher education agricultural programs is only 13% greater than the total of students enrolled in agricultural education programs below the college level.

The task of creating the knowledge base in agriculture is, in most cases, performed by public agencies other than universities, even though some colleges are internationally recognized as centers of excellence in agricultural research. A federal agency—EMBRAPA—is the major institution conducting agricultural research in Brazil. EMBRAPA, which in the Portuguese language stands for Brazilian Agricultural Research Corporation, operates a network of 40 research units distributed throughout the country. EMBRAPA also coordinates the National Agricultural Research System with cooperating institutions, among them universities and colleges of Agricultural Sciences (EMBRAPA, 2001). Figure 1 provides a summary of the current state of the Brazilian agricultural education, extension, and research system.
There are productive partnerships between Brazilian Colleges of Agricultural Sciences and agricultural research institutions. Such partnerships occur very often between rural extension agencies and agricultural research institutions. However, effective partnerships between Colleges of Agricultural Sciences and agricultural schools (as well as between agricultural schools, agricultural research institutions and/or rural extension agencies) are often not as strong as they could be. Strengthening the links between these four leading conglomerates of institutions has the potential to bring tremendous benefit to the Brazilian agricultural knowledge and service. The country would be better prepared to face the environmental, economic, demographic, and social challenges demanded by a new rural milieu.

Colleges of Agricultural Sciences, as institutions responsible for preparing people to work in agricultural education, research, and extension, congregate privileged conditions to lead this process.

**Purpose**

This philosophical paper proposes a new role for Brazilian Colleges of Agricultural Sciences in leading the process to strengthen the ties among themselves, agricultural schools, agricultural research institutions, and rural extension agencies. A conceptual model (see Figure 2) linking agricultural education, agricultural research, and extension education is proposed and their functions identified. Such a model helps to recognize strategic partnerships to develop programs linking the three areas towards a sustainable and integrated rural development. The new characteristics emerging in the Brazilian rural milieu and Boyer’s (1990) concept of scholarship provide the foundation upon which the conceptual model is built.

**Theoretical/Philosophical Themes**

Agriculture has changed dramatically since the massive introduction of new technologies in the production process, commonly known as the green revolution. Agriculture is now defined (beyond the traditional production enterprise) as a broad industry engaged in the production of plants and animals for food and fiber; the provision of agricultural supplies and services; and the processing, marketing, and distribution of agricultural products (Herren & Donahue, 1991). Advancements in input, process, and knowledge technologies have impacted the rural milieu in four major areas: the production process, the economy of farming, the rural social structure, and the environment (Solbrig, 2001).

The impacts of these technologies have created a new face in the Brazilian rural milieu since the mid-1980s. Graziano da Silva and Del Grossi (1999) indicated that three groups of economic activities are dominating the new Brazilian rural scene: 1) a highly technological agriculture based on...
commodities and closely linked with agroindustries; 2) a set of nonfarm activities such as the provision of services (personal services, rural tourism, etc.), commerce, industrial activities; and 3) a set of new agricultural activities (fee fishing, hunting lodges, production of ornamental plants and animals, horticulture, fruit farming, etc.). These three groups of activities have transformed into important sources of employment and income for rural families. They found that rural residents not only limit their activities to agriculture, but also undertake nonfarm activities, as the nonfarm income of Brazilian rural residents surpassed the income generated by farm activities in 1998. Rural families in Brazil are shifting from being farm families to being pluriactive families. The emergence of part-time farmers, the plurality of economic activities, and the use of new technologies are the main characteristics of the new agriculture and rural milieu (Carneiro, n.d.; Graziano da Silva, 1997; Schneider, 2000). Such new characteristics impact all—agricultural education, agricultural research, and rural extension.

Brazilian rural extension system has been criticized for the development of an imbalanced agricultural model. Brazilian extension model was initiated with a purpose of educating people to assimilate technical progress in agriculture (Caporal, 1998; Lima, 2001). Extension was tied closely with technical assistance and supervised credit, which constituted its basic tools. In the early years, extension agents focused on transforming peasants into modern farmers in order to foster an increase in agricultural production and productivity. Lima (2001), based on empirical data of the São Paulo state extension service, acknowledged that extension agents have not changed very much. According to him, their practice remains highly based on production agriculture and is characterized by the belief on technology transfer as the major (if not the exclusive) path to the development.

Caporal (1998) indicated that Brazilian rural extension is facing currently an identity crisis in need of a new extension model. Abramovay (1997) asserted that extension faces the challenge to bridge the gap between a restricted and fragmented educational preparation of extension agents and the need that the extension agent be an agent of development, part of a wide process of social mobilization. Colleges of Agricultural Sciences and agricultural schools are not providing their graduates with the tools to face new social and economic realities.

The 1937 reform of Brazilian higher education conceived a university primarily as a conglomerate of professional schools mostly devoted to professional preparation of people with little commitment to research and service (Mendonça, 2000). Such a concept affects Brazilian higher education in some degree until today, and helps clarify why research had a secondary role in Brazilian public universities. We can understand, from this perspective, the emergence of a federal agricultural research network outside universities with the establishment of EMBRAPA in 1973. It is important to point out that some colleges and universities that were not supported by the federal government did not follow the 1937 model. Most of these colleges and universities are the ones currently playing major roles in agricultural research and extension.

However, the concept of a tripartite mission comprising teaching, research, and extension has been emphasized in Brazil since the 1987 establishment of the National Forum of Extension’s Vice-Chancellors of Brazilian Public Universities. The forum, a permanent organization, has put extension in a prominent position, as well as stressed the importance of research as part of the public university mission. University extension is seen as a path to universities meeting its societal role through integrating teaching and research (Nogueira, 2000). The forum also highlights the question of integrating
cutting-edge research and teaching. Such an issue is evidenced also in the American literature as well (Boyer, 1990; Lincoln, 1999), recognized as a form of scholarship that should be rewarded.

Subsequent to the reformulation of higher education in 1937, and in the midst of the country’s industrial expansion and democratization right after the World War II, agricultural education was legally separated from higher education in agriculture. Since 1946, agricultural education should deal only with professional preparation of people below college level to work directly in agricultural production and/or to assist people holding higher education degree in agriculture. The expectation was to accelerate workforce preparation to face the rapid technological changes in agricultural production. This vision was enforced in the Agricultural Education Development Plan of 1973 to the extent it considered the role of the agricultural technician as eminently technical, in which the content of its preparation is ultimately defined taking a job position simultaneously as starting point and goal (Franco, 1987). Recent professional education reform (Decreto No. 2208, 1997) reinforced this vision which determined that agricultural education (until the secondary level) should be delivered independently from general education.

Revision in the Brazilian literature (Abramovay, 1997; Caporal, 1998; Carneiro, 1999; Carneiro, n.d.; Franco, 1987; Graziano da Silva, 1997; Graziano da Silva & Del Grossi, 1999; Leite, 1999; Lima, 2001; Nogueira, 2000; Sobral, 1998) suggests that extension, agricultural education, and higher education in agriculture should give priority to six major areas: community development, economic plurality, leadership and life skills development, social welfare, environment and sustainability, and family agriculture.

Conclusions and Recommendations

A new cadre of agricultural education and extension professionals is needed to face the changing characteristics of Brazilian agriculture and rural milieu. The current prominence of extension in Brazilian universities, brought about by the Forum of Extension’s Vice-Chancellors, sets the stage for Colleges of Agricultural Sciences to take charge of a movement to foster generation of new agricultural knowledge through research, synthesis, practice, and teaching. Such a movement will impact the colleges, agricultural schools, and research and extension institutions preparing people to work in these areas.

Research efforts within Colleges of Agricultural Sciences should be strengthened under the concept of the scholarship of discovery in order to contribute to the stock of human knowledge and the intellectual climate of the college or university (Boyer, 1990). Such an intellectual climate may result in a paradigm shift, bringing agricultural education in Brazil to the status of a discipline. Basic and applied research in agriculture and related areas should be harmoniously divided between colleges and research institutions in order to avoid overlapping of tasks and expenditures. This requires a close partnership and integration between institutions. Colleges of Agricultural Sciences should consider research outside agricultural production as a top priority. Research in political economy is highly recommended. Political economy is the concept that includes the social, cultural, economic, political, and demographic dimensions of a society.

The criticisms about the fragmented preparation of extension professionals (Abramovay, 1997) and the highly production agriculture-based curriculum (Lima, 2001) indicated a need for a more holistic preparation of agricultural professionals both at higher education and secondary levels. A balanced blend of
agriculture, science, and political economies in the curriculum could provide the basis for bringing new insights and meaning to agricultural knowledge and service. Moreover, Colleges of Agricultural Sciences and agricultural schools are expected to prepare its graduates not only for agricultural careers, but also for careers outside agriculture. Boyer (1990) proposed the scholarship of integration, as conducting research at the boundaries where fields converge in order to make connections across disciplines. Such integration presupposes strict convergence between all partners involved.

Colleges of Agricultural Sciences should use extension as a powerful tool in the application of knowledge. Strengthening partnerships with agricultural schools and rural extension institutions is highly desirable. According to Boyer (1990), knowledge is not first discovered and then applied; rather, new intellectual understandings can arise out of the very act of application in a process he called scholarship of application. Agricultural schools should provide tools to the application of knowledge, preparing its graduates with more intellectual understanding and lessening its ties with immediate job positions.

Colleges of Agricultural Sciences should pursue the scholarship of teaching as an activity that both educates and entices future scholars through transmitting, transforming, and extending knowledge (Boyer, 1990). A study to describe how colleges, agricultural schools, agricultural research and extension institution administrators perceive the mission of the institutions and the possibilities of integration is highly recommended. Also, agricultural education, agricultural research, and rural extension should revise and redirect their focus to address the six priority areas as indicated in the literature. Figure 2 depicts graphically the proposed model.

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**Figure 2.** Proposed model for integrating Colleges of Agricultural Sciences (CAS), Rural Extension Agencies (REA), Agricultural Research Institutions (RES), and Agricultural Schools (AGS) in delivering Agricultural Education and Extension Programs.


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The sixth report of Kellogg Foundation, *Renewing the Covenant, Learning, Discovery, and Engagement in a New Age and Different World*, has provided valuable recommendations for bringing the universities closer to the people. In that, the report addresses the role of public universities and public responsibilities. Such recommendations are valuable to Brazilian universities in integrating the three (research, extension, and teaching).

**Educational Importance**

Teacher preparation programs and in-service education needs of extension agents should be identified. A needs assessment profile should be developed to identify specific programming areas that can be developed and delivered to address the six priority areas. Also, empirical data about the appropriateness of those priority areas should be collected. The major challenges resulting from the proposed model are to bring the available resources together and to identify major areas of integration. Colleges of Agricultural Sciences are required to redesign their teaching and research functions, as well as to put extension as their primary function in order to meet the demands of the new Brazilian rural milieu.

Colleges of Agricultural Sciences in Brazil should take a leadership role in the integration of agricultural knowledge and service systems. Education and communication play critical roles in the development of agricultural and extension institutions. Therefore, the need for changing the preparation of agricultural and extension personnel becomes imperative. Such an effort will help focus areas outside agricultural production, thereby contributing not only with agricultural production and productivity, but also with the integration between rural and urban milieus on an equitable basis.

In order to facilitate integration of teaching, research, and extension systems, a Task Force comprising of primary stakeholders should be appointed. The function of the Task Force is to bring various entities together to chalk out a plan to implement the integration efforts. First, the Task Force should focus on the challenges and opportunities that currently exist for integration in Brazil. This provides a better understanding of the issues and concerns that needs to be addressed if integration has to become a reality and success. Second, the Task Force should identify priority areas for development. Such priority areas may be in extension, teaching, and research or a combination of all three systems. Third, the Task Force should also develop mechanisms for periodic evaluation of its work in meeting the integration efforts.

**References**


Self-reported Levels of Competence and Training Needs in Statistical Procedures by University Academic Staff in Botswana and Swaziland

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Abstract
A descriptive survey type of research was conducted to determine level of competence and training needs in statistical procedures of university academic staff in Botswana and Swaziland. Findings showed that staff were competent in the use of basic statistical procedures, and that, they were in need of training in intermediate and advanced statistical procedures. The cumulative variance in competence level in statistical procedures was explained by six characteristics, namely: number of journal articles published, attitude toward statistics, sex, level of education, teaching experience and number of research projects supervised. Forty-one percent of the variance was explained by the number of journal articles published. The researcher recommends that an in-service training program be designed to upgrade university academic staff in statistical procedures, and that, a manual on the use of intermediate and advanced statistical procedures in research activities be developed to serve as quick reference for university academic staff in Botswana and Swaziland.

Keywords: Statistical Procedures, Training Needs, Competencies, Statistics, University Academic Staff, In-Service Needs

Introduction
University academic staff in higher agricultural education institutions should periodically examine the fundamentals related to statistical analysis procedures. This is because the students advised deserve knowledgeable assistance, and professionals should not place the decision making for data analysis only in the hands of statistical consultants and computer analysis assistants for their research activities (Miller, 1998). Besides, university academic staff must demonstrate their scholarship through paper presentation at research conferences and articles published in refereed journals (Bowen et al., 1990). Also, as Bazargan (2002) stated, statistical analysis procedures have gained recognition as an important component of many disciplines, including agricultural and extension education. Agricultural education professionals need to understand the processes of statistical investigations, and be able to plan statistical inquiry in agricultural and extension education. In this respect, statistical knowledge and skills are considered part of required competencies for professionals in agricultural and extension education. Furthermore, university academic staffs in agricultural education higher institutions need to apply research-based information to maintain and improve quality of teaching-learning processes.

Several researchers, elsewhere, have identified statistical procedures used in reporting research (Goodwin & Goodwin, 1985; Kelly et al., 1989). Bowen et al. (1990) found that statistical procedures
employed in the *Journal of Agricultural Education* were mostly at the basic level, and that the studies did not ask research questions which involved explanation, prediction or cause and effect. Studies regarding acquisition of competencies in specific contexts have been conducted. Findlay (1992) found that agricultural education teachers acquired high levels of competencies through formal, on-the-job experience, and self-directed study. Participation of staff members in in-service training programs, as well as in seminars, conferences, and workshops help to improve their professional competence, and could be among motivating factors to update their teaching and research skills.

Statistical procedures employed by university academic staff in Botswana and Swaziland have been topical for a number of years now. The conclusion from a synthesis of research studies is that, basic statistical procedures were commonly reported, with exceptions of intermediate and advanced statistical procedures. Further, agricultural and extension education students need to be trained in statistical procedures and assisted to develop abilities to think critically at higher levels of cognition, and that problem-solving skills are needed and ought to be taught to agricultural education students (Dyer & Osborne, 1996; McCormick & Whittington, 2000).

University academic staffs in Botswana and Swaziland are expected to advance knowledge through rigorous research and publication, and focus on strategic issues to bring about development. Statistical procedures are to help analyze data that contribute to the advancement of knowledge and development of theories that could guide the profession. The major reasons for research programs in the agricultural and extension profession are to find solutions to the unknown and to produce new knowledge that lead to improvements in societal welfare. Statistical procedures should also be used and justified for their appropriateness, and should address important problems being investigated, and use sound methodologies to answer research questions or problems (Miller, 1998). As Mannebach et al., (1984, p. 15) commented, “If research and development are to lead the way, we must continually review and evaluate our efforts.” The study, therefore, was conducted to determine competence and training needs in statistical procedures and to identify explanatory characteristics of competence level in statistical procedures by university academic staff in Botswana and Swaziland.

**Purpose and objectives of the study**

The purpose of the study was to determine self-reported competence and training needs in statistical procedures by university academic staff in Botswana and Swaziland. The specific objectives were to:
1. Describe the importance of statistical procedures as perceived by university academic staff in Botswana and Swaziland.
2. Describe the competence level in statistical procedures as perceived by university academic staff in Botswana and Swaziland.
3. Determine the training needs in statistical procedures by university academic staff in Botswana and Swaziland.
4. Identify characteristics of university academic staff in Botswana and Swaziland that best explain and predict perceived competence level in statistical procedures.

**Methodology**

The study employed a descriptive survey design, guided by the model developed by Borich (1980), to determine training needs in statistical procedures by university academic staff in Botswana and Swaziland. The target population was all academic staff members (university academic staff in Botswana and Swaziland) who taught in the Faculty of Agriculture at the University of Swaziland (N = 45) and
The Botswana College of Agriculture ($N=50$) during the 2002-2003 academic year. The study was a census and, therefore, sampling error was not a concern.

The survey instrument used in the study was compiled into a booklet, and divided into four parts. **Part A** consisted of a list of 22 statistical procedures identified through review of literature (Bowen, Rollins, Baggett, & Miller, 1990). Respondents were asked to rate the extent to which each of the statistical procedures was considered important in their research activities. A 6-point Likert type scale was used to measure the level of importance: 6=Very Important; 5=Important; 4=Slightly Important; 3=Slightly Unimportant; 2=Unimportant; 1=Very Unimportant. **Part B** measured the competence in statistical procedures, using a 6-point Likert type scale: 6=Very Competent; 5=Competent; 4=Slightly Competent; 3=Slightly Incompetent; 2=Incompetent; 1=Very Incompetent. **Part C** of the instrument measured the attitude of university academic staff in Botswana and Swaziland toward statistics. A 6-point Likert type scale was used to measure attitude: 6=Strongly Agree; 5=Agree; 4=Slightly Agree; 3=Slightly Disagree; 2= Disagree; 1=Strongly Disagree. **Part D** requested respondents to provide background characteristics.

The procedures followed in collecting data for the study were as follows: The Registrar’s or Manager’s office in each institution provided the list of current academic agriculture staff members in both institutions. These procedures controlled for frame error. The list of participants in the study was screened to avoid duplications, thus, controlling for selection error. The survey instrument was administered through an internal mailing system. The researcher placed the package in an envelope that contained the questionnaires, a cover letter, and a self-addressed returning envelope in the mail box of each academic staff member. A return date of two weeks after receipt of the questionnaire was requested. Respondents were requested to deposit completed questionnaires in the mail box of the researcher or his representative.

After two weeks, a series of follow-up procedures to the initial internal mailing system were conducted, according to suggestions by Dillman (1978). The first follow-up was a postcard reminder to participants. This was followed by a second follow-up consisting of a replacement questionnaire. The last follow-up was internal phone calls to participants. Responses from internal phone calls indicated that staff did not use many of the statistical procedures and possessed no knowledge of them. Thus, the low response rate could be explained by the fact that many participants did not possess knowledge of the statistical procedures. The researcher resorted to comparing early to late respondent groups. Early respondents, those who responded to the first mailing, were compared with late respondents, those who responded to the second mailing, to estimate the nature of non-response bias. Late respondents have been shown to be most like non-respondents (Miller & Smith, 1983).

Results showed no statistically significant differences between early and late respondent groups, by their background characteristics, and importance and
competence ratings, in statistical procedures. A total of 53 (56%) usable questionnaires were returned, 27 (49.09%) from university academic staff in Botswana, and 26 (53%) from the Faculty of Agriculture, at the University of Swaziland. Though findings showed no statistically significant differences between early and late respondent groups, the small size of the respondents, and study population, and the reason that non-respondents did not possess knowledge of statistical procedures would render the findings generalizable to the respondents only.

The Statistical Package for Social Sciences (v10) was used to analyze the data, employing such statistics as frequencies, means, standard deviations, correlations, and multiple regression analysis. Training needs in statistical procedures were obtained by using the needs assessment model procedures developed by Borich (1980). The weighted score was calculated and used as a basis for ranking each of the statistical procedures in which university academic staff in Botswana and Swaziland needed in-service training. The weighted scores were computed by, first, calculating the discrepancy score for each statistical procedure and subtracting the mean competence rating from the mean importance rating. Secondly, the product of each discrepancy score and mean importance rating was computed (the weighted scores). The 22 statistical procedures were then ranked using the weighted scores, the higher the weighted score, the greater being the in-service training need. Since no statistical differences were observed between respondents from Botswana and Swaziland, using a t-test, a group analysis was deemed appropriate. An a priori probability of .05 was used to determine level of statistical significance under the assumption that the “population” of university academic staff could constitute a “sample” of those who might exist at another point in time; thus, inferential statistics for samples was used.

Findings

Information contained in Table 1 relates to the perceived importance and competence level, and weighted scores of statistical procedures by university academic staff in Botswana and Swaziland. Weighted scores were used to rank the statistical procedures, thus, identifying the highest training needs in priority order.

Importance of Statistical Procedures

Objective one was to describe the importance of statistical procedures as perceived by university academic staff in Botswana and Swaziland. University academic staffs were requested to rate the extent to which each of the statistical procedure was considered important in their jobs (Table 1). University academic staffs in Botswana and Swaziland were presented with 22 statistical procedures to rate. Findings showed that university academic staff in Botswana and Swaziland considered all 22 statistical procedures to be important, with mean ratings ranging from 3.75 to 5.54. Nine of the 22 statistical procedures received mean ratings of 5.00 and above. The t-test (parametric) statistical procedure was rated the highest ($M = 5.54, SD = .69$) while nonparametric procedures were rated the lowest ($M = 3.75, SD = 1.00$).

Level of Competence in Statistical Procedures

Objective two was to describe the competence level in statistical procedures as perceived by university academic staff in Botswana and Swaziland. This was achieved by requesting university academic staff in Botswana and Swaziland to rate their competence level in statistical procedures. Findings, as indicated in Table 1, show that university academic staff in Botswana and Swaziland were competent (means greater than 5.00) in statistical procedures of t-test, descriptive statistics and one-way ANOVA; and were slightly competent (means between 4.00 and 5.00) in Pearson correlation, Chi-square, and multiple
regression. The remainder of the statistical procedures was rated below a mean of 4.00, indicating that university academic staff in Botswana and Swaziland rated themselves as less competent in those statistical procedures.

*Training Needs in Statistical Procedures of University Academic Staff in Botswana and Swaziland*

**Objective three** was to determine the training needs in statistical procedures as perceived by university academic staff in Botswana and Swaziland. This Objective was achieved by the use of the needs assessment procedure, or model, as developed by Borich (1980), shown in Table 1. The top nine highest ranked training needs (with weighted scores of 8.00 and above), in priority order, were: factor analysis; trend analysis; discriminant analysis; post-hoc multiple comparisons; part/partial regression; one-way ANCOVA; path analysis; canonical correlation; and factorial ANOVA. Also, findings revealed that, in priority order, university academic staff in Botswana and Swaziland were slightly competent (with weighted scores between 5.00 and 7.99) in planned orthogonal comparisons; other correlation analysis besides the Pearson product moment correlation; one-way MANOVA/MANCOVA; multiple regression; cluster analysis; and Factorial MANOVA/MANCOVA.

University academic staff in Botswana and Swaziland rated themselves as competent and did not need training in: Meta analysis; non-parametric statistics; Pearson product moment correlation; t-test; descriptive statistics; one-way ANOVA; and chi-square. The weighted scores of these statistical procedures were less than 5.00.
Table 1

Importance and competence ratings and in-service training needs in statistical procedures by university academic staff in Botswana and Swaziland (N = 53)

<table>
<thead>
<tr>
<th>Statistical procedure by rank</th>
<th>Importance Level</th>
<th>Competence Level</th>
<th>DS&lt;sup&gt;1&lt;/sup&gt;</th>
<th>WS&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Factor analysis</td>
<td>5.33</td>
<td>3.08</td>
<td>2.25</td>
<td>11.99</td>
<td>Advanced</td>
</tr>
<tr>
<td>2. Trend analysis</td>
<td>5.15</td>
<td>2.56</td>
<td>2.25</td>
<td>10.82</td>
<td>Advanced</td>
</tr>
<tr>
<td>3. Discriminant analysis</td>
<td>4.81</td>
<td>2.30</td>
<td>2.30</td>
<td>10.58</td>
<td>Intermediate</td>
</tr>
<tr>
<td>4. Post hoc multiple comparisons</td>
<td>4.60</td>
<td>3.04</td>
<td>1.69</td>
<td>7.99</td>
<td>Intermediate</td>
</tr>
<tr>
<td>5. Path/partial regression</td>
<td>5.22</td>
<td>3.46</td>
<td>1.76</td>
<td>9.19</td>
<td>Intermediate</td>
</tr>
<tr>
<td>6. One-way ANCOVA</td>
<td>4.47</td>
<td>2.46</td>
<td>2.01</td>
<td>8.98</td>
<td>Intermediate</td>
</tr>
<tr>
<td>7. Path analysis</td>
<td>4.36</td>
<td>2.32</td>
<td>2.04</td>
<td>8.89</td>
<td>Advanced</td>
</tr>
<tr>
<td>8. Canonical correlation</td>
<td>4.17</td>
<td>2.08</td>
<td>2.09</td>
<td>8.72</td>
<td>Advanced</td>
</tr>
<tr>
<td>9. Factorial ANOVA</td>
<td>5.24</td>
<td>3.65</td>
<td>1.59</td>
<td>8.33</td>
<td>Intermediate</td>
</tr>
<tr>
<td>10. Planned Orthogonal</td>
<td>4.73</td>
<td>3.04</td>
<td>1.69</td>
<td>7.99</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Comparisons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Other correlation analysis</td>
<td>5.37</td>
<td>3.92</td>
<td>1.45</td>
<td>7.79</td>
<td>Other</td>
</tr>
<tr>
<td>12. One-way MANOVA/MANCOVA</td>
<td>4.50</td>
<td>3.00</td>
<td>1.50</td>
<td>6.75</td>
<td>Advanced</td>
</tr>
<tr>
<td>13. Multiple regression</td>
<td>5.32</td>
<td>4.08</td>
<td>1.24</td>
<td>6.60</td>
<td>Intermediate</td>
</tr>
<tr>
<td>14. Cluster analysis</td>
<td>4.73</td>
<td>3.40</td>
<td>1.33</td>
<td>6.29</td>
<td>Advanced</td>
</tr>
<tr>
<td>15. Factorial MANOVA/MANCOVA</td>
<td>4.46</td>
<td>3.15</td>
<td>1.31</td>
<td>5.84</td>
<td>Advanced</td>
</tr>
<tr>
<td>16. Meta analysis</td>
<td>3.91</td>
<td>3.09</td>
<td>0.82</td>
<td>3.21</td>
<td>Advanced</td>
</tr>
<tr>
<td>17. Nonparametric statistics</td>
<td>3.75</td>
<td>3.12</td>
<td>0.63</td>
<td>2.36</td>
<td>Other</td>
</tr>
<tr>
<td>18. Pearson correlation</td>
<td>4.86</td>
<td>4.38</td>
<td>0.48</td>
<td>2.33</td>
<td>Basic</td>
</tr>
<tr>
<td>19. T-test</td>
<td>5.54</td>
<td>5.27</td>
<td>0.27</td>
<td>1.50</td>
<td>Basic</td>
</tr>
<tr>
<td>20. Descriptive</td>
<td>5.35</td>
<td>5.23</td>
<td>0.12</td>
<td>0.64</td>
<td>Basic</td>
</tr>
<tr>
<td>21. One-way ANOVA</td>
<td>5.23</td>
<td>5.15</td>
<td>0.08</td>
<td>0.42</td>
<td>Basic</td>
</tr>
<tr>
<td>22. Chi-square</td>
<td>4.80</td>
<td>4.88</td>
<td>-0.08</td>
<td>-0.38</td>
<td>Basic</td>
</tr>
</tbody>
</table>

Note. Scales: Importance: 6 = Very Important; 5 = Important; 4 = Slightly Important; 3 = Slightly Unimportant; 2 = Unimportant; 1 = Very Unimportant. Competence: 6 = Very Competent; 5 = Competent; 4 = Slightly Competent; 3 = Slightly Incompetent; 2 = Incompetent; 1 = Very Incompetent. <sup>1</sup>Discrepancy Score. <sup>2</sup>Weighted Score

Categories/Classification: Basic (Descriptive statistic such as frequencies, percentages, central tendency, and variability; Pearson correlation, chi-square, t-test, and one-way ANOVA); Intermediate (Factorial ANOVA, planned orthogonal comparisons, post hoc multiple comparisons, trend analysis, one-way ANCOVA, factorial ANCOVA, part/partial regression, multiple regression); Advanced (Discriminant analysis, path analysis, canonical correlation, factor analysis, cluster analysis, one-way MANOVA/MANCOVA, meta analysis, factorial MANOVA/MANCOVA); and Other correlation and nonparametric (Bowen, Rollins, Baggett, & Miller, 1990, p. 2).
Objective four was to identify characteristics of university academic staff in Botswana and Swaziland that best explained and predicted perceived competence level in statistical procedures. Stepwise regression procedures were used to determine which of the characteristics of university academic staff in the two institutions explained variance, and predicted rated competence level on statistical procedures. Examination of intercorrelations among characteristics and rated competence level in statistical procedures was conducted before performing the regression analysis, to identify and eliminate multicollinearity problems. The scale of descriptors by Davis (1971) was used as the basis for describing the magnitude of relationships. Most of the characteristics revealed negligible associations (.09 and less), while few showed low associations (.10-.29), some showing moderate associations (.30-.49) and others showing substantial associations (.50-.69). Intercorrelations among characteristics showed low degree of multicollinearity (correlations of below .80). The intercorrelations analysis was necessary for the subsequent multiple regression analysis. High magnitude of multicollinearity requires grouping of characteristics to narrow down the number of related characteristics, or even dropping the unimportant characteristics.

The regression analysis determined $R^2$ values and $R^2_{\text{change}}$ values, to explain the amount of cumulative variance that each significant characteristic accounted for and the unique amount of variance accounted for, by each significant independent variable, respectively. Table 2 presents findings of the regression analysis. Six characteristics were found to explain and predict competence level on statistical procedures by university academic staff, namely: the number of journal articles published; attitude toward statistics; sex; level of education; teaching experience; and number of research projects. The cumulative variance ($R^2$) explained by the six characteristics was 77%. The number of journal articles published explained the greatest variance (41%) in statistical procedures, while attitude toward statistics explained 12%; and gender explained 10%; teaching experience explained 7%; level of education 4%; and number of research projects 3%.

Table 2

<table>
<thead>
<tr>
<th>Characteristics of respondents</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$R^2_{\text{change}}$</th>
<th>$B$</th>
<th>$\beta$</th>
<th>$F$-value</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of journal articles published</td>
<td>.64</td>
<td>.41</td>
<td>.41</td>
<td>.01</td>
<td>.94</td>
<td>30.20</td>
<td>.00</td>
</tr>
<tr>
<td>2. Attitude toward statistics</td>
<td>.73</td>
<td>.53</td>
<td>.12</td>
<td>.34</td>
<td>.20</td>
<td>10.98</td>
<td>.00</td>
</tr>
<tr>
<td>3. Sex</td>
<td>.79</td>
<td>.63</td>
<td>.10</td>
<td>.74</td>
<td>.34</td>
<td>11.65</td>
<td>.00</td>
</tr>
<tr>
<td>4. Teaching experience</td>
<td>.86</td>
<td>.74</td>
<td>.07</td>
<td>-.01</td>
<td>-.53</td>
<td>9.75</td>
<td>.00</td>
</tr>
<tr>
<td>5. Level of education</td>
<td>.82</td>
<td>.77</td>
<td>.04</td>
<td>.89</td>
<td>.38</td>
<td>4.83</td>
<td>.03</td>
</tr>
<tr>
<td>6. Number of research projects</td>
<td>.87</td>
<td>.77</td>
<td>.03</td>
<td>-.001</td>
<td>-.19</td>
<td>4.53</td>
<td>.04</td>
</tr>
<tr>
<td>Constant</td>
<td>-.86</td>
<td>.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Adjusted $R^2 = .73$; $SE = .51$; $p \leq .05$
Conclusions and Recommendations

University academic staff in Botswana and Swaziland considered the statistical procedures important, and possessed competence, mainly, in basic or elementary statistics. The findings are consistent with the knowledge base reported by Bowen, et al. (1990) that statistical procedures employed in the Journal of Agricultural Education were mostly at the basic level, and rarely at the intermediate or advanced levels. The fact that university academic staff in Botswana and Swaziland reported competence, mainly, in basic level statistical procedures suggests, perhaps, that they most likely conducted exploratory and descriptive research as compared to research that involved explanation, prediction, and cause and effect (control).

University academic staff rated themselves in need of in-service training, mainly, in intermediate and advanced statistical procedures. The specific highest ranked training needs in priority order included factor analysis, trend analysis, discriminant analysis, post-hoc multiple comparisons, part/partial regression, one-way ANCOVA, path analysis, canonical correlation, and factorial ANOVA.

Significant relationships were found with respect to the following characteristics: number of journal articles published since university academic staff started working; attitude toward statistics; sex; teaching experience; level of education; and number of research projects. The number of journal articles published by a university academic staff explained most of the variance in the level of self-reported competence in statistical procedures. Attitude toward statistical procedures, sex, level of education, teaching experience and number of research projects explained, to a less extent, the variance in the self-reported competence level in statistical procedures of university academic staff. Thus, a university academic staff in Botswana and Swaziland that possesses positive attitude toward statistics; has many journal articles published; and who is a doctoral degree holder; a male; involved in various research projects and having many years of teaching experience; is likely to be more competent in statistical procedures than one without such characteristics.

Efforts should be made to take advantage of university academic staff in Botswana and Swaziland who possesses explanatory and predictive characteristics and positive attitude toward statistical procedures by motivating them to serve as trainers for their colleagues and university students. This has an in-built multiplier effect in the sense that, in the long run, they will serve as role models to colleagues and students, thereby building up expertise in statistical procedures in these institutions of higher learning.

It can be concluded that university academic staff in Botswana and Swaziland need in-service training in intermediate and higher levels statistical procedures. Conducting in-service training, through workshops and seminars by the universities and professional associations, such as the Association for International Agricultural and Extension Education (AIAEE), could assist such university academic staff to acquire competence in statistical procedures that are considered to be important. Further research is also needed in determining the extent to which depth in statistical procedures was learnt in the agricultural graduate programs. It is recommended that a manual on the use of advanced statistical procedures in research activities be developed, to serve as quick reference for university academic staff in Botswana and Swaziland, and to enable them to analyze their research with the desired depth and precision.

Acknowledgement

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References


Job Content and Training Needs of Agricultural Extension Agents in South-Central Botswana

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Abstract
A descriptive survey type of study was conducted in the south-central agricultural regions of Botswana in order to assess the training needs of extension agents. A semi-structured Job analysis interview schedule and a job inventory questionnaire were adapted from Pearn and Kandola (1988) and used in a two-stage study to collect data from 141 extension agents in 15 agricultural districts. The specific objectives of the study were to: (1) identify the job operations and tasks of the job of extension agents; (2) determine the skill requirements of the job; (3) assess the level of mastery of the job skills by the agents and identify their training needs. According to the results, the job of extension agents comprised eight operations and 22 tasks, and 25 skill requirements. Level of skill mastery rating by the agents showed a deficiency in 56% of the job skills therefore, indicating a training need in 14 subject areas. The study recommended regular training program review; thorough needs assessment by the Ministry of Agriculture and related training institutions involving all stakeholders to ensure relevant in-service training for extension agents.

Keywords: Job Content, Training Needs, Extension Agents, Botswana

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Introduction

It is a well-known fact that extension agents play a critical role in any extension service. According to Oakley and Garforth (1985), the success or failure of any extension programs is dependent on effective performance by extension agents. Unfortunately, majority of the agents are not sufficiently trained as the training programs are mostly technical and the outcome is usually an extension agent who has a general knowledge on a variety of subjects (Botha & Stillwell, 1997).

Extension agents with relevant training are specialists in extension methodology and human behaviour as well as being technically knowledgeable. Willingness by such agents to apply their knowledge in practice and dedication to the job is also essential to ensure effective performance in extension work (De Beers, 2000).

Two types of training, pre-service and in-service training are essential for producing capable extension workers (Chang, 1986). Pre-service training provides the initial job training. Continuous upgrading of staff through in-service training is also necessary to ensure coping with the job changes and the varied needs of the clients (Raborokgwe, 1995). However, according to Woods (1988), training programs for extension workers in most developing countries such as Botswana have not been effective. Woods mentions four constraints to extension workers’ training. First, training is done for the wrong reasons. For instance, whenever there is performance problem, training is recommended even when it is clear that it might not be the right intervention. Second, training is not continuous as once extension workers complete their studies, there is no follow up to ensure application and coping. Third, the training content is not related to the jobs of extension workers; and fourth, the development and design of the programs are usually not based on any specific needs.

Job analysis is an important step in the development of training programmes as it describes the target job, its tasks, activities, and also specifies the skill requirements (Blunt & Papoola, 1985). Job analysis also provides invaluable information to training needs assessment (Spencer, 1983).

An extension agents’ job comprises functions, processes, operations, tasks, and activities. An extension agent’s job operation refers to the main objective of the job that the agents plan and set out to achieve when they are performing their job, while a job task is a plan needed to achieve the objective. A job activity refers to behaviour that can be observed when an individual extension agent implements a job task in order to achieve a job operation (Pearn & Kandola, 1988). A typical job analysis determines the objective of a job, outlines the tasks, and activities that have to be performed in order to achieve the tasks (Wexley & Latham, 1991).

Purpose and Objectives

The purpose of the study was to analyse the job performed by extension agents to determine the job content and assess their training needs. The specific objectives were to: (1) identify the job operations and tasks as perceived by extension agents; (2) determine the skill requirements of the job as perceived by extension agents; and (3), assess the level of mastery of the job skill as perceived by extension agents.

Methodology

A semi-structured Job analysis interview schedule and a job inventory questionnaire were adapted from Pearn and Kandola (1988) and used in a two-stage study to collect the data from extension agents in Botswana.
Population and Sample

The study population comprised 141 extension agents found in 15 agricultural districts of south-central Botswana. One hundred and fifteen extension agents participated in the study. In Botswana agricultural extension is organized into six regions, 25 districts and 264 extension areas. Each extension area is serviced by an extension agent. In the first stage of the study, a purposeful sample of five agricultural districts was selected from a total of 15 agricultural districts in the south-central agricultural region. In the second stage all the 41 extension agents present in the five agricultural districts were interviewed. In the second stage, the questionnaire was sent out to 100 extension agents who were present in the remaining 10 agricultural districts in the South-Central agricultural region.

Data Collection

Data for the study was collected in two stages. In Stage one, face-to-face job analysis semi-structured interviews were conducted to collect data from extension agents. A portable tape recorder was used (with permission) as a backup for capturing interviewees’ responses. Respondents were asked to state at least five objectives of their job (job operations), outline the tasks performed to achieve each operation. In addition, extension agents were asked to indicate the skills required to perform their job well.

At the end of the interviews in Stage two, a self-administered questionnaire was developed as a validation tool using the interview data and dropped off at the district agricultural offices for distribution to the extension agents. The district agricultural officers (the supervisors of the agents) received the completed questionnaires from the agents during monthly planning meetings and the researcher collected the questionnaires from the district agricultural offices. Out of the 100 questionnaires collected, only 70 were useable.

The questionnaire had a list of job operations and tasks, and a list of job skills as described during the interviews. The agents were to confirm the job operations and tasks, and rank the job operations according to order of importance.

Analysis of Data

The interviews generated descriptive narratives that were subjected to content analysis. The interview schedules provided the categories for classifying the data. Statements in each category describing similar activities were grouped together and assigned a label or code according to a common theme. Statements were then summarized using frequencies and percentages. The data in the second stage of the study were summarized using the arithmetic mean, standard deviation and ranking.

An 8-point Likert-type scale, where a ranking of number 1 = 8, 2 = 7, 3 = 6, 4 = 5, 5 = 4, 6 = 3, 7 = 2, and 8 = 1 points was used to interpret the data. Extension agents also rated the importance and their mastery of the job skill on a 5-point Likert-type scale of 1 (lowest rating) to 5 (highest rating). A 3.00 mean cut-off point was used to separate low from high ratings. The level of rating of skill mastery by extension agents was used as a measure of training needs. Skill mastery rating below 3.00 was interpreted as an indication of a training need.

Results and Discussion

Job Operations and Tasks of Extension Agents

Table 1 outlines the job operations and tasks of extension agents as described during the interviews. Out of 184 statements describing the objectives of the job, eight job operations were derived through thematic analysis. These were: (1) teaching farmers, (2) administration of extension programs, (3) implementing government schemes, (4) group formation (5) forming and participating in 4B Club activities,
(6) Implementing drought relief programs, (7) doing office work, and (8), participating in farmers committee activities. After describing the operations, the agents were asked to list the tasks they performed to achieve each operation. This yielded 294 descriptions out of which 22 job tasks were derived by thematic analysis.

Table 1

*Extension Agents’ Description of Job Operations/Tasks (n = 41)*

<table>
<thead>
<tr>
<th>Job Operations</th>
<th>f</th>
<th>%</th>
<th>Job Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Farmers</td>
<td>75</td>
<td>41</td>
<td>Plan and prepare demonstrations. Organize training for farmers at rural training centres. Visit farmers regularly to exchange information.</td>
</tr>
<tr>
<td>Administering extension programs</td>
<td>33</td>
<td>18</td>
<td>Maintain contact with farmers in the extension area at all times. Participate in agricultural show activities. Participate in annual national events. Work with other organizations and committees involved in extension work.</td>
</tr>
<tr>
<td>Implementing government schemes</td>
<td>27</td>
<td>15</td>
<td>Inform farmers about Government schemes. Help farmers initiate projects, choose appropriate scheme and access funding. Deliver inputs and monitor progress.</td>
</tr>
<tr>
<td>Forming Groups</td>
<td>18</td>
<td>10</td>
<td>Mobilize farmers to get them to form groups. Help farmers to implement group activities and initiate projects.</td>
</tr>
<tr>
<td>Forming and participating in 4B Club activities</td>
<td>10</td>
<td>5</td>
<td>Initiate formation of 4B Clubs in the schools. Advise and initiate 4B projects. Monitor 4B activities.</td>
</tr>
<tr>
<td>Implementing drought relief programmes</td>
<td>8</td>
<td>4</td>
<td>Implement and monitor drought relief programs.</td>
</tr>
<tr>
<td>Doing Office Work</td>
<td>7</td>
<td>4</td>
<td>Conduct survey and prepare program plan for the area. Compile information and write monthly reports. Submit and discuss report and program plan with supervisor. Help farmers complete application forms for inputs. Assess farmer applications and recommend for approval.</td>
</tr>
<tr>
<td>Participating in farmers committee activities</td>
<td>6</td>
<td>3</td>
<td>Initiate formation/work with existing farmers committee to implement extension programs.</td>
</tr>
</tbody>
</table>

**8 operations** 184 100 22 tasks

*Note.* f = number of times a particular description was mentioned.
Ranking of Importance of Job Operations by Extension Agents

After outlining the job operations, extension agents ranked them according to importance. According to the ranking of job operations in Table 2, teaching farmers was the most important job operation of extension agents, followed by administration of extension programs, and Group formation. The least important job operation was implementing drought relief programs (ranked as eight).

Table 2

<table>
<thead>
<tr>
<th>Job Operation</th>
<th>Rank</th>
<th>f</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching farmers</td>
<td>1</td>
<td>67</td>
<td>536</td>
</tr>
<tr>
<td>Administration of extension programs</td>
<td>2</td>
<td>60</td>
<td>420</td>
</tr>
<tr>
<td>Group formation</td>
<td>3</td>
<td>47</td>
<td>258</td>
</tr>
<tr>
<td>Implementing government schemes</td>
<td>4</td>
<td>49</td>
<td>225</td>
</tr>
<tr>
<td>Doing Office Work</td>
<td>5</td>
<td>51</td>
<td>204</td>
</tr>
<tr>
<td>Forming and participating in 4B Club activities</td>
<td>6</td>
<td>39</td>
<td>117</td>
</tr>
<tr>
<td>Participating in farmers committee activities</td>
<td>7</td>
<td>41</td>
<td>82</td>
</tr>
<tr>
<td>Implementing drought relief programmes</td>
<td>8</td>
<td>68</td>
<td>68</td>
</tr>
</tbody>
</table>

Note. f = number of times a particular description was mentioned.

Skills Requirements of the Job of Extension Agents

Table 3 shows the skill requirements of the job of extension agents, rating of importance of skill to the job, and level of job skill mastery by the agents. According to the findings, the extension agents perceived 25 skills as important to their job (Means = 3.74 to 4.63). However, according to the mean ratings of the mastery of skills, the agents indicated that they had mastery of skill in 10 out of 25 skills (Means = 3.16 to 4.09).
### Important Job Skills and Mastery by Extension Agents

<table>
<thead>
<tr>
<th>Skill Required to Perform the Job Well</th>
<th>Skill Importance</th>
<th>Skill Mastery</th>
</tr>
</thead>
<tbody>
<tr>
<td>General knowledge of crops grown in Botswana</td>
<td>1 4.63 0.66</td>
<td>5 3.81 0.86</td>
</tr>
<tr>
<td>Interpersonal communication skills</td>
<td>2 4.60 0.69</td>
<td>23 2.14 0.89</td>
</tr>
<tr>
<td>General knowledge of extension</td>
<td>3 4.59 0.63</td>
<td>2 4.04 0.86</td>
</tr>
<tr>
<td>Working with groups</td>
<td>4 4.57 0.67</td>
<td>7 3.67 0.88</td>
</tr>
<tr>
<td>Crop protection &amp; pest control</td>
<td>5 4.56 0.77</td>
<td>9 3.59 0.83</td>
</tr>
<tr>
<td>Practical farm skills</td>
<td>6 4.54 0.83</td>
<td>16 2.79 1.00</td>
</tr>
<tr>
<td>Public speaking: Addressing meetings</td>
<td>7 4.46 0.86</td>
<td>15 2.83 1.01</td>
</tr>
<tr>
<td>Planning &amp; conducting method demonstrations</td>
<td>8 4.43 0.79</td>
<td>6 3.79 0.95</td>
</tr>
<tr>
<td>Vegetable production &amp; pest control</td>
<td>9 4.43 0.97</td>
<td>10 3.24 0.92</td>
</tr>
<tr>
<td>Organizing effective field trips &amp; farm walks</td>
<td>10 4.41 0.75</td>
<td>19 2.71 0.99</td>
</tr>
<tr>
<td>Writing minutes</td>
<td>11 4.41 0.75</td>
<td>1 4.09 1.06</td>
</tr>
<tr>
<td>Planning &amp; setting up result demonstrations</td>
<td>12 4.37 0.93</td>
<td>8 3.67 0.93</td>
</tr>
<tr>
<td>Extension methods</td>
<td>13 4.33 1.03</td>
<td>3 3.97 0.82</td>
</tr>
<tr>
<td>Teaching adults</td>
<td>14 4.33 0.85</td>
<td>4 3.89 0.96</td>
</tr>
<tr>
<td>Fruit production</td>
<td>15 4.31 1.02</td>
<td>12 2.99 0.94</td>
</tr>
<tr>
<td>Forestry production</td>
<td>16 4.29 0.87</td>
<td>24 2.10 1.08</td>
</tr>
<tr>
<td>Maintenance of farm machinery</td>
<td>17 4.27 1.09</td>
<td>14 2.87 1.01</td>
</tr>
<tr>
<td>Diploma or higher level training in agriculture</td>
<td>18 4.23 1.35</td>
<td>25 1.51 1.35</td>
</tr>
<tr>
<td>Writing skills: writing reports</td>
<td>19 4.20 1.08</td>
<td>13 2.88 0.93</td>
</tr>
<tr>
<td>Organizing effective field days</td>
<td>20 4.41 0.97</td>
<td>20 2.51 1.18</td>
</tr>
<tr>
<td>Chairing meetings</td>
<td>21 4.19 1.03</td>
<td>17 2.76 1.04</td>
</tr>
<tr>
<td>Conducting needs assessment surveys</td>
<td>22 4.10 2.39</td>
<td>21 2.37 1.09</td>
</tr>
<tr>
<td>Mobilizing people to form groups</td>
<td>23 4.09 2.41</td>
<td>22 2.21 1.07</td>
</tr>
<tr>
<td>Preparing teaching aids for farmers</td>
<td>24 3.75 1.24</td>
<td>11 3.16 1.15</td>
</tr>
<tr>
<td>Bee keeping</td>
<td>25 3.74 1.26</td>
<td>18 2.73 1.02</td>
</tr>
</tbody>
</table>

**Note.** Scale: 1 = not important…5 = very important; 1 = least mastery of skill…5 = high level of mastery skill.

### Conclusions and Recommendations

Findings of the study revealed that the job of extension agents comprised eight operations, the most important being that of teaching farmers and the least being the implementation of drought relief programs. The job also had 22 tasks that were performed to achieve the operations. The job had 25 skill requirements that the agents had to master to enable them to perform their job well. However, results revealed that extension agents were deficient in 56 percent of the skills that were important to their job. The agents therefore, needed training in 14 job skill areas.

Findings of the study further stress the need by the Ministry of Agriculture and related training institutions to conduct thorough extension training needs assessment involving all stakeholders before developing in-service training programs for extension agents. Job structures and demands on the incumbents change over time; therefore, it is expected that as the needs of farmers change, extension work also should adjust its approach and programs. This needs assessment begins with the analysis of the job to ensure relevant training for extension agents whose role is to implement the programs and
regular follow-ups of trainees to ensure coping once on-the-job.

References
The Continuing Role of Government in Pluralistic Extension Systems

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Abstract

This paper argues that only the public sector can effectively and efficiently carry out certain functions and that indeed, only national governments can assume those responsibilities that affect the state as a whole. For example, only governments—national governments or state/provincial governments in decentralized countries—can assume responsibility for ensuring that extension services deliver needed public goods. And only governments are well placed to promote increased institutional pluralism in extension service provision and oversee the quality enhancement and assurance necessary for rural development.

Keywords: Public Sector Reform, Private Sector Reform, Role of Government, Institutional Pluralism, Extension, Extension Reform, Rural Development

Introduction

Contemporary thinking on extension often downplays the role of the public sector—especially of national governments—in agricultural and rural extension activities. This paper introduces a note of caution, arguing that only the public sector can carry out certain functions and that, indeed, only national governments can assume those responsibilities that affect the state as a whole.

Most donor investments in extension stress the limitations of the public sector and encourage governments to support private provision of public goods and services. Nonetheless, international organizations recognize that a pluralistic system of complementary extension services does not exclude the state (World Bank, 1997) and that the public sector has a special role to perform in small farm development when this role is not fostered by the private sector.

Indeed, when performed successfully this special role can be as important for economic development as for social equity (Bennett, 1994; Cary, 1998; IICA, 1997; Rivera, 1997; Rivera & Cary, 1997; Swanson, 1997). Some argued early on (Rivera & Gustafson, 1991) that the impact of multi-institutional activities would create, not diminish, new roles and responsibilities for public sector agricultural extension.

Scope of Public Sector Roles in Extension

Extension is—conceptually and in practice—more than it used to be. Its function and tasks are increasingly assumed by multiple public and private organizations. Extension is now seen to consist of a range of services providing knowledge and information to rural people to enable them to modify their behavior and use of technologies to improve their livelihoods. These services are recognized to be a
function of both public and private agencies and institutions, and it has become clear that extension is not necessarily a government program, but rather the complex set of institutions whereby rural people obtain new knowledge and information. No matter what the changes in funding or management, public sector extension alone would never attend the entire demand for extension services by the world’s farmers (Maalouf, Contado, & Adhikarya, 1991).

The complexity of demands on extension has notably increased. In high-income as well as middle- and low-income countries, governments have started shifting their focus from that of increasing total production of basic foodstuffs to that of confronting related rural issues, such as the management of natural resources, rural development, the environment, and health. Both public and private extension institutions are important in responding to these critical public interest issues. Research in Bolivia, Colombia, India, Nicaragua, Uganda and Vietnam suggests that much broader, and more carefully differentiated strategies are required if extension is to reach its potential to reduce poverty among the rural poor (Farrington, Christoplos, Kidd, & Beckman, 2002).

With the widespread shift towards institutional pluralism in extension systems, the national government’s role in extension will not be the same in every country and will likely differ even between countries employing similar strategic approaches. Still, a number of factors mandate a continuing government involvement in extension systems. Some are essential functions for which national and local governments rely on extension as a key implementing mechanism; others are inherently government functions necessary for efficient and effective delivery of extension services by either public or private sector agencies. Critical government-extension interdependencies are summarized in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Interdependence</th>
<th>Function</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government needs extension for:</td>
<td>Public policy implementation</td>
<td>Implementation of public policies that enhance the public good often requires the education and mobilization of rural people to change behavior—an objective for which extension may be the best or only tool available to national governments.</td>
</tr>
<tr>
<td>Information collection</td>
<td></td>
<td>Information on agricultural conditions and rural populations can often be collected most easily and accurately by extension agents already active in the field and knowledgeable about rural areas.</td>
</tr>
<tr>
<td>Dealing with emerging concerns</td>
<td></td>
<td>Diverse new issues emerge on the extension agenda as a result of governments having to address new socioeconomic, political and technical developments, such as environment impacts of non-source pollution, animal welfare, fair business and employment practices, HIV/AIDS, and other human health issues.</td>
</tr>
</tbody>
</table>
Table 1 (continued).

<table>
<thead>
<tr>
<th>Interdependence</th>
<th>Function</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responding to emergencies</td>
<td>Only higher levels of government with the concerted help of local government can respond effectively to many emergencies; extension services are often the only widespread network of external presence in rural areas.</td>
<td></td>
</tr>
<tr>
<td>Extension services need government for:</td>
<td>Risk bearing and sharing</td>
<td>Government has the ability to bear the burden of risk more easily than can individual agents. Thus, government support may be essential in introducing new extension and rural development services, while promoting the institutional capacity of private providers to assume some, if not all, of these services.</td>
</tr>
<tr>
<td>Information provision</td>
<td>Extension is a key user of information on producers, social conditions, production systems, markets, and technologies for planning and implementing extension programs; government endorsement enhances information credibility and reliability.</td>
<td></td>
</tr>
<tr>
<td>Regulation</td>
<td>Even when funding and delivery of extension services is left to the private sector, public sector oversight and regulation is important to protect the public. A regulatory function provides rules and regulations to define conditions under which extension activities can take place and set standards for service delivery.</td>
<td></td>
</tr>
<tr>
<td>Quality control and enhancement</td>
<td>Extension services rely on key support services, especially the education and training of extension and technical support from research and other sources of innovation. Government can bring important economics of scope and scale to extension support activities that other extension providers lack.</td>
<td></td>
</tr>
<tr>
<td>System coordination</td>
<td>The government’s convening authority enables it to bring different service providers together to exchange information, develop new partnerships and collaborative mechanisms, and establish acceptable division of labor. This government coordination can improve overall pluralistic extension services.</td>
<td></td>
</tr>
<tr>
<td>Promoting reform</td>
<td>Extension reform requires a policy vision and a national strategy for implementation, whether this involves decentralization, privatization, new contractual arrangements, or user financing. Government can promote new approaches and bring about changes in institutional capacity and interrelationships.</td>
<td></td>
</tr>
</tbody>
</table>
Public Policy Implementation Function

Achieving policy goals frequently requires the education and mobilization of rural people to change behavior—an objective for which extension may be the best or only tool available to national governments. Four key public good policy objectives come to the fore—poverty reduction, food security, rural economic development, and environmental conservation. Only national governments with help from decentralized levels of government can respond fully to these public goods priorities. While government presence and intervention may be important it does not follow that these services must be delivered directly by government.

Public intervention in support of technology dissemination is justified by the public good nature of much of the technology necessary to overcome the main constraints to sustainable development. Market failures also result from the limited capacity of smallholders to pay for services and the imperfections prevailing in output, input and credit markets. Market imperfections severely limit farmers’ ability to access new technologies, equipment and inputs. Thus, state provision of goods and services is often indicated where there are (a) natural monopolies that might require either public provision or public regulation of the market, (b) incomplete or absent markets, which tends to be the case in many developing countries, (c) inequities in income distribution, although this raises the difficulty of the incentive problem, and (d) dynamic efficiencies, by which is meant that government may have access to better information about the future, that it is less risk-adverse, and generally has a longer time horizon than markets.

One of the principal responsibilities of policy-makers concerned with rural development, according to Tripp (2001), is to see that agricultural technology is adequately targeted...ensuring that technology is available for various types of farmers and that it supports equitable rural development. He concludes that re-invigorated and efficient public agricultural extension and research systems are required. These systems must ideally be able to interact with the private sector, help provide productive technology to support a robust farming sector, and contribute to the broader goals of enhancing rural livelihoods. A continued focus on promoting technological innovation by public sector extension in developing countries is essential, as about 80% of the world’s extension services are still provided by the public sector (World Bank, 2002c).

Alex, Zijp and Byerlee (2001) also maintain that government investments in extension will continue to be needed, to develop (a) sound policy frameworks that provide a conducive environment for investments to achieve desired impacts; (b) clear national strategies that precisely articulate a long-term vision and the national policies, plans, and objectives for extension investments; (c) realistic benefits and expected outcomes that justify the investment; and (d) unambiguous equity programs with appropriate services available to the poor and minorities groups and with a keen recognition that farmers and herders are both male and female (Alex, Zijp, & Byerlee, 2001).

Information Collection Function

The collection and provision of information has definite public-good attributes and can be important to national policy formulation, market development, and good governance. For extension agents—public and private—to facilitate market development, they have to know what the market demands, what the customer wants (Nielson, 2002). Governments collect and disseminate information on producers, environmental and social conditions, production systems, markets, and technologies. Such information provides a base for national statistical services, for planning and implementing public and private sector investments, and for
monitoring social, economic, and environmental changes. The presumed objectivity of government in compiling and distributing national statistics makes it the preferred, or only, source for much of such data. Since many governments’ statistical services are poorly funded and ill-equipped to collect rural statistical information, especially as relates to agricultural systems, extension services are frequently called on to assist in statistical data collection. This may be a controversial role for extension as it deviates from that of technical advisor, but in practice there is often no one else to gather statistical data and, at least, the extension agents are familiar with the agricultural sector and the area. In addition to potential roles in collection of formal statistical data on agricultural production, extension agents are a key source of informal data collection, being the government’s eyes and ears in the countryside and providing a potential channel for early information on crop and market conditions, security, and a wide range of issues.

Addressing Urgent New Priorities Function
To date, extension’s main responsibility has been the transfer of agricultural production information to farmers and farm families. In the future, diverse new issues, some agricultural and others not, are likely to emerge on the extension agenda as a result of socioeconomic, political and technical developments. Emerging concerns include environment impacts (e.g., through non-source pollution), animal welfare, fair business and employment practices, poverty reduction, and rural development. In developing countries non-agricultural concerns are pushed onto extension’s agenda, including population planning and HIV/AIDS, while animal and possible human health issues relating to “mad cow” disease recently alarmed European countries. Public extension services may be the only—or most important—tool governments have available to address these new concerns.

In the United Kingdom, five years after privatization of the Agricultural Development Advisory Service, various events (outbreak of foot and mouth disease, mad cow disease, environmental conservation issues, etc.) led the U.K. Government to recognize that its need to communicate with farmers has increased rather than diminished (Garforth, 2002). As a result the government is contracting out specific services to the private sector, establishing semi-autonomous bodies, and developing new in-house capacity (specifically the Rural Development Service). Garforth considers this development as probably inevitable given the diversity of the agricultural sector and its importance to national well-being.

Emergency Response Function
Natural disasters (such as flood, drought and fire), crop pest infestation, and widespread animal and human diseases require emergency response by government. Only higher levels of government with the concerted help of local governments can respond fully to such emergencies and extension services are often the only widespread network of external—governmental or non-governmental—presence in rural areas. Extension services are often immediately and automatically called on to respond to the emergency. This responsibility often results from what Ulrich Beck (1999) has termed “the world risk,” in which managing risk requires a systematic approach to dealing with hazards and insecurities induced and introduced by modernization itself. Contemporary society, in contrast to previous societies, is characterized by new sources of risk and by a greater ability to respond to and mitigate the impacts of emergency situations.
Risk Bearing and Sharing Role

Where market failure restricts the ability of individual private service providers to supply an optimal level and quality of services, government intervention may be essential to development of effective extension services. This frequently includes training for extension staff, development of communications products for effective extension, and assembly and packaging of information and knowledge of use to producers. In this, the public sector can frequently exploit economies of scale and scope. Although these services may need to be funded by the public sector, delivery can often be contracted out to the private sector to facilitate development of private services that may become viable and sustainable over the long term.

Information Provision

Extension services rely on accurate and detailed information—often available only from government sources—for strategic planning, priority setting, program monitoring, and impact evaluation. For extension agents – public and private – to facilitate market development, they have to know what the market demands, what the customer wants, and what production potential exists in available natural resource, infrastructure, and human capital (Nielson, 2002). Governments collect and disseminate information on producers, social conditions, production systems, markets, and technologies, information critically important for planning and implementing private sector extension services.

Regulating Role

Even when funding and delivery of extension services are left to the private sector, the public sector retains important responsibilities for certain oversight and regulatory involvement to protect the public and minimize negative impacts on public welfare. This may be especially important in programs of contracting out service delivery to the private sector, where some key public functions must be provided.

In short, a regulatory function provides a national set of rules and regulations to define the conditions under which activities can take place and to set some standards for service delivery. “Governments have the role,” as the vice-president of Uganda (Kazibwe, 1998, p. 22) states, “of developing and implementing efficient and responsible regulatory and monitoring mechanisms in the production, processing, storage and marketing of goods and provision of services at all levels in the private sector.” Regulations should generally provide for minimum restrictions on entry of service providers, but focus on preventing fraud or dissemination of technical or managerial information with potential for significant negative social or environmental impacts.

Quality Control and Enhancement

Extension services rely on key support services, especially the education and training of extension professionals and technical support from research and other sources of innovation. The private sector, as pointed out later in this paper with respect to Honduras, is not generally able to assume the costs of providing these services at an optimal level. Ensuring quality of extension services relies on objective assessment of extension activities and on the economics of scope and scale that higher levels of government can bring to extension support activities. Agricultural research, technology identification, and technical support services are often relevant to all public and private extension services providers. Only national governments with the concerted help of local governments can respond fully to this need to continually train and upgrade extension professionals.

System Coordination

Extension services oversight is an inherent aspect of the public sector’s responsibilities for policy formulation,
safeguarding of public welfare, and development and design of reforms to promote pluralistic extension institutional arrangements. The government’s convening authority enables it to bring different service providers and agencies together to exchange information, develop new partnerships and collaborative mechanisms, and establish acceptable division of labor.

The traditional focus of extension is agricultural production and continues as an important objective in public sector extension programs. However as Bennett (1996) argues, the public sector role extends beyond concerns to promote applied and basic research on new research findings, and includes responsibility to validate commercial information, transfer practices (not just technology), conduct accomplishment evaluations and promote organizational action. For these responsibilities to be met, national governments must recognize and extend their role to promote sharing of experience and coordination of the multiplicity of extension activities currently operating in their countries.

Promoting Extension Reform

Globalization, inextricably linked to privatization, confronts countries with a new and highly competitive global market. Major economic restructuring is taking place in both developed and developing countries, and has greatly changed the balance of responsibility between the public and private sectors (Fresco, 2000). In many cases, trade liberalization puts developing countries at a disadvantage in the global market. Technological innovations, such as precision farming, are revolutionizing agricultural systems. An expanding agenda and a variety of innovative approaches to extension, progressively being shaped by modern communications and information technologies, have come into being (Alex, Zijp & Byerlee, 2002; FAO/World Bank, 2000; Rivera, Qamar, & Crowder, 2002).

Thus, while there may be a global “power shift” from public to private hegemony underway (Mathews, 1997), it is only a myth that nation states have become powerless. On the contrary, the private sector is still dependent on the state’s support of an enabling environment that fosters private initiative. And national governments still set the rules and make the regulations that define the conditions under which activities can take place.

One reason to devise a coherent public sector policy on extension, according to Carney (1998), is that the extent to which other bodies will be willing to provide extension services is partially determined by government actions. She concludes that the main emphasis of government policy should be to enhance the enabling environment for non-governmental provision of extension services. Beyond its enabling function, government is likely to find it has other roles, including the regulation and coordination of a pluralistic complex of extension providers, the gathering of information on the various knowledge needs within the country and the provision of specialized information services to some segments of the population. Thus, some aspects of the role of government might actually need to increase (Rivera & Gustafson, 1991).

Reforms Worldwide

The changing socio-economic environment for agricultural extension (Christoplos, 1996; Neuchatel Initiative Group, 1999; Rivera & Gustafson, 1991) has led to a large number and variety of by-now well-known reforms worldwide. Various reforms have been instituted: (a) promotion of pluralism, emphasizing multiple and diverse partnerships between public and private sectors—including partnerships with farmer organizations and private venture companies, (b) cost recovery schemes based on contractual provisions whereby clientele are protected from inappropriate or unproductive advice, (c) decentralization
arrangements with lower levels of government wherein local authority is empowered to tax or provided with intergovernmental fiscal transfers, and (d) devolving extension responsibility to farmers and farmer organizations and, more recently, to community organizations (Nadhy, Byekwaso & Nielsen, 2002; World Bank, 2002a). This abbreviated list of strategies omits other on-going changes including those toward total privatization whereby responsibility for extension funding and delivery is shifted entirely to the private sector, as well as the plethora of new delivery and assessment techniques that are being incorporated into extension programs. Many of these innovations have promise, but most are yet to be proven sustainable and some (such as some privatization experiments) have failed for one or another reason (Davidson, Ahmad, & Tanvir, 2001; Nagel, Heiden, & Siebert, 2001; Rivera, 2001).

Change is also evidenced in the move by donor organizations to combine agricultural extension with rural extension (FAO/World Bank, 2000; World Bank, 1997) and other larger development goals. Institutional reform has resulted in a variety of institutions being engaged in the transfer and exchange of agricultural information, a variety of financial arrangements being adopted in order to provide agricultural extension services, a variety of managerial approaches to administering extension services and, as already noted, a variety of purposes being associated with extension. Donor organizations and practitioners currently anticipate extension’s future to involve a pluralistic array of institutions and practices (FAO/World Bank, 2000; Rivera, Qamar, & Crowder, 2002; World Bank, 2002b). In the final analysis what appears to be needed in many countries is a clear-cut vision and national strategy for public sector action, including the provision of extension services for purposes not targeted by other extension providers. For example in Honduras private sector companies and programs under contract by the government do not have capacity to provide for training field staff. This training role must still be assumed by the public sector (Hanson, Smyle, & Lainez, 2002).

While some countries are reconsidering their public role regarding extension, the developing world is still being pressured to limit state involvement except as an enabler of the private sector and as a funding agent for private-sector provision of extension services. The so-called “power shift” from public to private sector hegemony appears to be slowing, as reforms run into second generation problems and the realization that many services (notably those for the resource-poor) are not being picked up by the private sector. Although developing countries continue to shift responsibility for the delivery of extension services to the private sector and gradually recede from authority in this domain of knowledge dissemination, this posture in some of the more developed countries is gradually being reconsidered. On the edge of rapid knowledge change and pressured by new policy and technical demands, countries like the United Kingdom are beginning to be concerned about ensuring “an integration of advisory services and to re-create new in-house capacity for advising and informing farmers on new governmental policies and technologies” (Garforth, personal communication, December 11, 2002).

As well, institutional reform through privatizing schemes such as contracting with the private sector and the establishment of partnerships in the provision of extension services is also not always an easy process. In Nicaragua, for example, the government finds itself institutionally challenged to take on the new pluralistic extension role (Crowder, personal correspondence, February 26, 2002). Crowder notes that this role requires investment in management education directed at institutional re-orientation and innovation. Institutional re-orientation can be “pressured from below” by strengthening farmer groups to have a
decisive voice in determining extension agendas, programs, and services—through contracting, decentralization, and support to local innovation. But pluralistic extension also requires investment in basic education and training for public-sector extension and private/civil society extension service networks. Management education is needed to facilitate the common concepts, language, methods and skills needed to integrate the diversity that arises from institutional pluralism. In short, pluralism demands both new relationships and new skills.

International organizations and governments are already anticipating new challenges and new priorities, including rural development, agriculturally related health concerns, the emergence of new clientele and the impact of global urbanization. In the next decade, if not sooner, policy makers worldwide will find themselves challenged to confront again the role of national government vis-à-vis extension’s institutional pluralism and the challenge of critical development issues. Not only do extension services remain a concern of government, but also continued public sector support for extension is essential to realize urgent social and economic goals. Exciting reforms underway in many countries are attempting to make extension services more relevant and effective, but the reform process will be a long one. Government and donors will need to stay the course to ensure the evolution of new institutional approaches and foster an appropriate division of labor among public and private sectors and civil society.

References


University Curricula in Agricultural and Extension Education: An Analysis of What We Teach and What We Publish

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Abstract
This paper compares what we teach and what we publish in the field of agricultural and extension education as one step in the process of identifying cutting edge themes for inclusion in curricula. An analysis of content of existing undergraduate and graduate agricultural and extension education courses at 22 public universities in the United States was conducted in June, 2003, using course summary information available on university web sites. The identification of trends in articles published recently in the field of agricultural and extension education was also undertaken as a step toward understanding what topics and issues are on the frontier of the field. This review focused on literature from four influential journals in the field (The Journal of Agricultural Education and Extension, Journal of International Agricultural and Extension Education, Journal of Extension, and Journal of Agricultural Education) published from 1998-2002. Titles and abstracts of 684 refereed articles were examined. Themes identified in this review were then compared with higher agricultural and extension education courses listed by selected U.S. universities. The paper concludes with recommendations for curricula based on the gap between these published themes and courses listed by universities.

Keywords: University Curriculum, Agricultural Education, Extension Education, Journal Analysis

Introduction
Agricultural and extension education professionals continue to play an important role in agricultural and rural development. Proper education and training, as reflected in higher education curricula, are essential to the success of these professionals. However, due to demographic changes in society and the fast-changing fields of agriculture and rural development, there is a significant challenge in keeping agricultural and extension education curricula relevant. For example, Sulaiman V. and van den Ban (2000) examined the case of India and found there is a need to revise the agricultural extension curricula to keep pace with
changes in the agriculture sector. Haug (1999) identified several current issues related to agricultural extension including: …the role of the state, reductions in public spending, financial viability, partnership, privatization, institutional structures, decentralization, participation, gender, local knowledge, pluralism, and sustainability…(p. 263)

Rivera and Zijp (2002) present evidence that radically different institutional arrangements in extension are currently being undertaken in an increasingly large number of countries. Coupled with these changes are budget cuts to agricultural universities and public sector extension organizations as well as a general lessening of attention to agriculture and rural development on the part of governments worldwide.

**Theoretical Framework**

The theoretical framework of this study is rooted historically in a social reconstructionist perspective of curriculum development (Brameld, 1956), highlighting curricular relevance to socio-economic development. Further, the Tyler model of curriculum design as described by Madeus and Stufflebeam (1989) frames the study through recognition of the needs of society, the needs of the learners, and the structure and nature of knowledge as important elements in the process.

An ever-growing body of literature related to curriculum, learning and teaching for agricultural and extension education has been produced in recent years. In some cases, curriculum development processes focus heavily on stakeholder input (for examples see Radhakrishna and Veerabhadraiah, 2002; Zinnah, Steele, & Mattocks, 1998). In other cases, curriculum development draws heavily on input from the academy. For example, Levander (2000) surveyed 15 European universities to learn about theoretical frameworks, bodies of literature, and curricula used in teaching extension education. Survey results yielded a list of background theories utilized in extension curricula including those related to adult education, business and marketing, communication, counseling, evaluation, teaching and learning, management and leadership, and field theory. In addition, Levander identified literature of special relevance to extension education (Table 1). A similar list from U.S. universities could not be identified in the literature.
Table 1

<table>
<thead>
<tr>
<th>Literature Critical to Extension Education as Identified by 15 European Universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication networks</td>
</tr>
<tr>
<td>Community development</td>
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<tr>
<td>Curriculum development</td>
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<tr>
<td>Diffusion of innovations</td>
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<tr>
<td>Empowerment</td>
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<tr>
<td>Extension approaches</td>
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<tr>
<td>Extension methods</td>
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<td>Extension programs</td>
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<td>Extension system management</td>
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<tr>
<td>Facilitation</td>
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<tr>
<td>Human resources management/development</td>
</tr>
<tr>
<td>Institution building</td>
</tr>
<tr>
<td>Knowledge and information systems</td>
</tr>
<tr>
<td>Knowledge management</td>
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</tbody>
</table>


Röling and de Jong (1998) described the shifting paradigms in education and extension studies, specifically identifying the learner’s own awareness of learning processes as vital to experiential or discovery learning. This perspective supports the use of participatory rural appraisal, participatory technology development, and other forms of learning community activities as the basis for learning and for change.

**Purpose and Objectives**

The purpose of this study was to develop recommendations for curricular change in higher agricultural and extension education based on the gap between current course content and anticipated areas of importance as identified in recently published literature. The objectives of this study were to:

1) analyze what we currently teach in higher agricultural and extension education;

2) identify recent research and professional writing themes in the field;

3) examine the gap between current course listings and recent literature; and,

4) use these analyses to better understand curricular options.

The authors were curious whether the substantial changes that Rivera and Zijp (2002) reported in extension systems had an analog in the realm of courses in agricultural and extension education. In short, we wanted to know, at least in the U.S., if our profession “preached” what it practiced in research and publication.

**Methods and Data Sources**

This study was designed to be descriptive and exploratory. The study examined existing agricultural and extension education course descriptions at 22 public universities in the United States (Table 2). With the exception of Texas Tech University, all are land grant universities including two universities established under the second Morrill Act of 1890. The 21 land grant universities constitute one-fifth of the 105 land grant universities in the US. The 22 universities were purposely selected by the authors using the following criteria: a) they offer majors related to agricultural and extension education; b) they serve states
where agriculture is an important contributor to the economy; and c) all five U.S. geographic regions established by the Board on Agriculture Assembly, National Association of State Universities and Land Grant Colleges were represented. Some public universities were not included because they do not offer majors related to agricultural and extension education. However, no attempt was made to include every university offering a major in these areas.

Table 2

<table>
<thead>
<tr>
<th>Public U.S. Universities Offering Agricultural and Extension Education Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado State University</td>
</tr>
<tr>
<td>Iowa State University</td>
</tr>
<tr>
<td>Michigan State University</td>
</tr>
<tr>
<td>New Mexico State University</td>
</tr>
<tr>
<td>North Carolina A&amp;T University</td>
</tr>
<tr>
<td>North Carolina State University</td>
</tr>
<tr>
<td>Ohio State University</td>
</tr>
<tr>
<td>Oklahoma State University</td>
</tr>
</tbody>
</table>

Course description summaries for undergraduate (B.S.) and graduate (M.S./Ph.D.) programs that appeared on university web sites in June, 2003 for departments offering courses related to agricultural and extension education were selected for review. It was assumed that course summaries generally reflected what was taught in the course. Course themes were separately assigned a code as they emerged. These category codes were modified, collapsed, and expanded as the analysis proceeded, ultimately establishing 20 theme categories. This approach, based on a grounded theory approach, was used since no previous studies undertaken in this area were found as guides. In all, the categories for undergraduate and graduate courses were different in 18 of 20 cases.

A parallel analysis of recent literature related to agricultural and extension education and published in four refereed international journals was conducted to identify publication trends (Table 3). Titles and abstracts from a total of 684 refereed articles published between 1998 and 2002 were examined. Each article was then assigned to one of 18 researcher-developed categories that emerged during the analysis process. The work was conducted by a team of advanced graduate students and cross-checked by the study’s supervisor to improve inter-rater reliability.
Table 3

<table>
<thead>
<tr>
<th>Journal Name</th>
<th>Location of Current Editorship</th>
<th>Articles</th>
<th>Article Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal of Extension</td>
<td>U.S. Cooperative Extension Service</td>
<td>276</td>
<td>Feature Articles</td>
</tr>
<tr>
<td></td>
<td>U.S.A.</td>
<td></td>
<td>Research in Brief</td>
</tr>
<tr>
<td>Journal of Agricultural Education</td>
<td>The Pennsylvania State University</td>
<td>199</td>
<td>Feature Articles</td>
</tr>
<tr>
<td></td>
<td>U.S.A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Journal of Agricultural Education and Extension</td>
<td>Wageningen University</td>
<td>109</td>
<td>Feature Articles</td>
</tr>
<tr>
<td></td>
<td>The Netherlands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Journal of International Agricultural and Extension Education</td>
<td>Texas A&amp;M University</td>
<td>100</td>
<td>Feature Articles</td>
</tr>
<tr>
<td></td>
<td>U.S.A.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The study compared existing course themes in agricultural and extension education with the themes identified in recently published articles. There are several limitations that should be noted.

1. In the U.S., it is common to find agricultural education and extension education topics intertwined in university curriculum. The analysis of courses and the analysis of refereed journal articles treated this as one subject area referred to as agricultural and extension education.

2. All four journals are international in stature. However, it is clear that the Journal of Extension publishes articles that primarily address topics of relevance to U.S. domestic extension programs and the Journal of Agricultural Education publishes articles that primarily address topics of relevance to U.S. domestic agricultural education.

3. Not all of the refereed publications found in the four journals reported on research, but they were included because it was assumed they represented some important aspects of current trends in the field. In the Journal of Extension, both feature and research in brief articles were included in the analysis.

4. The Journal of Extension was included because it represents a large body of literature. However, it is different in its orientation than the other three journals in that it includes a significant emphasis on extension in non-agricultural settings. Also, a potentially confounding factor in the ranking of the published themes might be the larger number of articles published from 1998-2002 in the Journal of Extension (276) compared to the other journals (range: 100-199).

5. This project examined only U.S. institutions in the survey of courses at 22 public universities. However, the review of refereed journal articles drew from 4 international journals in an attempt to capture the latest global trends. The articles appearing in the 4 journals were produced by professionals from all over the world and not just from the 22 U.S. universities surveyed.

6. Analyzing curricula solely through a web-based review of course summaries has its limitations since each course may cover more than is mentioned in a summary and students take courses outside of departments of agricultural and extension education. As Levander (2000) found, despite these methodological limitations a number of useful conclusions can still be developed.
Additional U.S. universities could be added to the analysis but the authors speculated that additional universities would likely not dramatically alter the profile of course theme distribution that emerged.

### Results

**What are we teaching in higher agricultural and extension education settings?**

Tables 4 shows the most frequently listed course areas at undergraduate and graduate levels respectively. The tables display only the top ten general areas of course content in each category.

**Table 4**

**Undergraduate and Graduate Courses Offered at 22 Public U.S. Universities**

<table>
<thead>
<tr>
<th>General Area of Course Content</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>34</td>
<td>28</td>
</tr>
<tr>
<td>Leadership, personal and professional</td>
<td>29</td>
<td>23</td>
</tr>
<tr>
<td>Teaching methods, curriculum development and materials</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Technical: Biotech, animals, small engines, horticulture</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>Program planning and development</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Extension or industry field-based internship</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>Student teaching experience in schools</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Orientation/career exploration</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Computer and information technology/multimedia</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Youth development and student organizations</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Research: Design, procedures, analysis, grants, surveys</td>
<td>28</td>
<td>18</td>
</tr>
<tr>
<td>Teaching methods - Advanced</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Leadership development</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>Professional internship</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Administration and supervision</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>Instructional design, technology, media</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Program design and development in extension</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Student teaching experience in schools</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Foundations: History, philosophy, principles</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Adult, post-secondary and continuing education</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

**What are the current themes appearing in key refereed journals?**

Table 5 shows the themes identified through the review of 684 titles and abstracts of articles in four journals and their rank determined by number of occurrences.
Table 5

Top Five Ranked Themes within Individual Journals

<table>
<thead>
<tr>
<th>Research Themes</th>
<th>Rank</th>
<th>Overall</th>
<th>JAEE</th>
<th>JIAEE</th>
<th>JoE</th>
<th>JAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension management/policy</td>
<td>104</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Learning tools, approaches</td>
<td>80</td>
<td>2</td>
<td>4</td>
<td></td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Youth development</td>
<td>65</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmer behavior/education</td>
<td>56</td>
<td>3</td>
<td>3</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Higher agricultural education</td>
<td>54</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Sustainable agriculture</td>
<td>45</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender, family, AIDS</td>
<td>41</td>
<td>7</td>
<td>7</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>High school teaching</td>
<td>39</td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Distance education</td>
<td>36</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curriculum development</td>
<td>29</td>
<td>10</td>
<td>10</td>
<td></td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>


Using the results of the above analyses, this study also examined the gap between current course listings and recent research and professional publication themes to determine how well the subjects in relevant field journals align with the subjects of agricultural and extension education courses in the U.S. Table 6 shows a side-by-side comparison of course content vs. published themes for the ten most common curricular themes and the ten most common journal themes.

Table 6

A Comparison of Courses and Journal Themes

<table>
<thead>
<tr>
<th>BS Course Themes</th>
<th>MS/PhD Course Themes</th>
<th>Journal Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>Research: Design, analysis,</td>
<td>Extension management and policy</td>
</tr>
<tr>
<td>Leadership</td>
<td>grants, surveys</td>
<td></td>
</tr>
<tr>
<td>Teaching methods, curriculum</td>
<td>Teaching methods</td>
<td>Learning tools and approaches</td>
</tr>
<tr>
<td>development and materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical: Biotech, animals, small</td>
<td>Leadership development</td>
<td>Youth development</td>
</tr>
<tr>
<td>engines, horticulture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program planning and development</td>
<td>Professional internship</td>
<td>Farmer behavior and farmer education</td>
</tr>
<tr>
<td>Extension or industry field based</td>
<td>Administration and supervision</td>
<td>Higher agricultural education</td>
</tr>
<tr>
<td>internship</td>
<td>Instructional design, technology, media</td>
<td>institutions</td>
</tr>
<tr>
<td>Student teaching experience in schools</td>
<td>Program design and development in extension</td>
<td>Sustainable agriculture, organic, environment</td>
</tr>
<tr>
<td>Orientation/career exploration</td>
<td>Student teaching experience</td>
<td>Gender, family and AIDS</td>
</tr>
<tr>
<td>Computer and information technology/</td>
<td>Foundations: History, philosophy,</td>
<td></td>
</tr>
<tr>
<td>multimedia</td>
<td>principles</td>
<td></td>
</tr>
<tr>
<td>Youth development and student</td>
<td>Adult, post-secondary and continuing</td>
<td></td>
</tr>
<tr>
<td>organizations</td>
<td>education</td>
<td></td>
</tr>
</tbody>
</table>
Discussion and Conclusions

In examining the comparison of course themes and journal article themes, it is noteworthy that there is only limited alignment between the published topics appearing in four international journals and courses listed at selected U.S. universities. This finding raises several interesting questions requiring additional research: Are journal themes good indicators of cutting edge thinking in the field? Why is there an apparent weak alignment between what we publish and what we teach? Do journal themes eventually become reflected in our course offerings? What determines the pace with which research and cutting edge issues enter into course content? Is institutional inertia a factor? Are the “sanctity” of curricula and the reluctance to make curricular changes factors?

A few noteworthy examples of the apparent gap in alignment include the:

1) limited coursework on extension management and policy, and farmer behavior;
2) limited expression of global agriculture and global education themes in curricula;
3) lack of courses on the link between agriculture and other pressing social problems (HIV/AIDS as an example);
4) limited attention in course listings to issues of sustainability; and,
5) limited attention paid to alternative organizational forms in courses.

If the topics being published in refereed journals are taken as indicators of cutting edge themes and issues in the field, then we need to ask ourselves several questions:

- What are the obstacles currently impeding the incorporation of current research and professional themes into coursework?
- How can we better incorporate these cutting edge themes into curricula?
- How can we reinforce procedures for curricular renewal?

Recommendations

A challenge confronting educators, researchers, and institutions is to anticipate and adjust to trends in agriculture, agricultural education, and extension education. We should be examining the horizon for new trends that should be incorporated into courses. Programs in agricultural and extension education should look both backward (at what we have been teaching) and forward (at what we are now publishing as well as at new issues appearing on our professional horizons) to determine the content of future B.S., M.S., and Ph.D. courses.

Journals are only one source of information to consider in identifying new curricula. This analysis is not meant to suggest otherwise. Stakeholder opinions and needs, practitioners in the field, and a variety of end users of agricultural and extension education services should also be major contributors to curricular reform.

Future investigations could profitably include analyses similar to this one but conducted in conjunction with university curricula in Europe, Asia, Africa, Latin America/Caribbean, or Oceania. These analyses would help to address whether the gap is an international phenomenon and to identify regional differences that may inform the discussion.

We cannot afford to move into the future using only the rear view mirror. We have to be constantly scanning and anticipating new trends. With the introduction of highly relevant curricula, we can better prepare future human resources for agriculture and rural development as well as for leadership roles in a multi-functional agriculture context.
References


Providing Virtual International Experiences for Undergraduates

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Abstract
We live in a global society. Many researchers have suggested that undergraduate agriculture students be prepared to enter this global workforce. Study abroad and international travel have been suggested as ways for students to gain international experience, but these methods are expensive and limited to only a few students. The purpose of this study was to examine the feasibility and effectiveness of a virtual international experience for students in the college of agriculture. Eighty-three students completed an online simulation that placed them in the role of the owner of a small banana farm in rural Peru. Students who completed the assignment reflected that this was an “eye-opening” experience that gave them insight to the struggles for survival faced by people in developing countries. Students gained a new point-of-view regarding other cultures, as well as a greater appreciation for the privileges they enjoy living in a developed country. Students, who previously had not understood why the U.S. participated in development activities, are now advocates for helping developing nations overcome poverty.

Keywords: International, Agriculture, Undergraduates, Simulations, Virtual

Introduction
We cannot deny that we live in a global society. The Internet and television bring the world into our living rooms and offices on a daily basis. Products from around the globe line the shelves of department stores and supermarkets. However, few Americans understand how international cooperation and development programs impact the U.S. and developing countries. Nassar (2004) describes Friedman’s philosophy that “globalization is not a passing phenomenon, but rather the definitive world system” (p. 7).

As a result, there is a pressing need to help Americans understand the U.S.’s role in global cooperation and development, and the domestic benefits that accrue as a result of international involvement. The International Programs office of the
Cooperative State Research, Education and Extension Service describes the benefits of U.S. international involvement as including, but not limited to,

Opening up new markets for American farms and businesses, ensuring food safety, cooperating on the eradication of human and animal diseases, preserving environmental resources, and promoting world peace. Promoting growing economies, peaceful democracies, and healthy families helps to improve the quality of life both at home and abroad. (CSREES/USDA, 2004, para. 4)

There is a need for a globally educated workforce. The Globalizing Agricultural, Science, and Education Programs for America Committee (GASEPA) envisions “globally competent stakeholders, faculty and students in the U.S. food, agriculture, and natural resource sectors who live, compete, and work well in an ever dynamic and interdependent world community” (CSREES/USDA, 2004, para. 6). Bobby D. Moser, Chairman of GASEPA, states that higher education must play a role in developing globally educated citizens:

As we position U.S. agriculture for the 21st century, we are cognizant that higher education, research, and outreach programs at our land-grant and similar universities will need to address global issues more than in the past. We urgently need to find ways to increase the level of engagement of our resident teaching faculty, research scientists, and extension agents in addressing global dimensions of food and fiber industries, and the natural resource base on which they rely. Only in this way will we adequately serve the needs of the citizens of our respective states. (para. 7)

Recent research reveals that higher education, especially colleges of agriculture, are doing a poor job of educating students for their role in a global society. Wingenbach, et al. (2003) discovered that agricultural education undergraduate students knew very little about agricultural policies, products, peoples, and cultures. This study supported earlier research (RoperASW, 2002) that found most 18-24 year-olds did not have an understanding of global events and the impact of those events on their lives. Other studies (Sammons & Martin, 1997; Duffy, Toness, & Christiansen, 1998) also revealed the lack of progress in increasing post-secondary students’ knowledge of global agriculture, despite specific efforts to do so. The lack of international knowledge is not limited to undergraduates. Lindner and Dooley (2002) found that doctoral students’ knowledge of international agriculture was low upon entering the graduate program and only “average” upon graduation.

Wingenbach, et al. (2003) suggested that “out-of-country” learning experiences be used to increase agricultural student’s knowledge about agricultural policies, products, peoples, and cultures. Such experiences might include international foreign youth exchanges, travel abroad or study abroad, and international internships with global organizations. These methods are expensive and available to a limited number of students. How can agricultural educators bring international experiences to a greater number of students? Virtual international experiences may offer an alternative to expensive study abroad classes and serve as a way to integrate international experiences into the broader agricultural curriculum.

Boyle noted the effectiveness of using simulations in the classroom, “One of the most powerful uses of multimedia is to immerse the user in a learning environment” (1997, p. 35). Boyd and Murphrey (2002) discovered that simulation activities delivered via the World Wide Web were an effective tool for teaching leadership skills. Can such an activity simulate an international experience as well?
Purpose and Objectives
The purpose of this study was to determine if an asynchronously delivered simulation could provide agricultural education students with a viable experience in international agricultural development. The specific objective was to document student’s perceptions of the online activity, *Experience Five Minutes in a Third-World*, using a reflective writing assignment.

Methods
The methodology used in this study borrows from the methods used in an earlier study (Dooley & Lindner, 2002). The population consisted of 1300 undergraduate students in the Department of Agricultural Education at a major land-grant institution. The sample consisted of 250 undergraduates in a course entitled *Leadership and Issues in Agricultural Education*. The upper-level course is an introductory course designed to expose agricultural education students to the knowledge bases and contexts in which agricultural educators work. International agricultural development is among the contexts taught.

As a part of the unit on international agricultural development, students were asked to view a simulation called, *Experience Five Minutes in a Third-World*. The simulation was developed by Wendy Folsom and David Barker, international development workers with Food for the Hungry International (FHI). The simulation resides on FHI’s Web site (http://www.fhi.net/fhiperu/).

In the simulation, students assumed the role of a banana farmer in Peru with a family of four. This family is very poor, surviving mostly on the bananas produced on the farm. This simulation asked students to make decisions that Peruvian farmers must make everyday. The activity involved a decision-making tree where at every turn there were different outcomes. At each stage of the simulation, students made a decision between two alternatives with the goal of improving the lives of the farmer’s family. Examples of decisions the students were asked to make included whether to stay on the farm or sell it and move to the city to find work; whether or not to have more children; and whether to send their children to school or send them to beg in the streets for additional income.

Students were asked to complete the simulation several times, changing their responses each time to achieve different outcomes. Upon completion of the simulation, learners were asked to write a one-page reflection paper to describe their reaction to this experience. Eighty-three students completed this voluntary assignment and each paper was numerically coded to ensure confidentiality. This study was approved by the Institutional Review Board.

This study is grounded in the qualitative research paradigm. The general characteristics of this qualitative study reflect those identified by Fraenkel and Wallen (1999) as professionally acceptable and appropriate methods for studying a phenomenon when: The natural setting is the direct source of data (qualitative) versus a “snapshot” in time (quantitative); data are collected holistically from a participant’s perspective (qualitative) versus relying on a participant’s quantitative response (quantitative); the process (qualitative) as well as the variables of interest (quantitative) are considered; data are analyzed inductively (qualitative) versus deductively (quantitative); and data attempts to capture concern for a participant’s behavior, attitude, reason, or motive (qualitative).

Activities to increase credibility for this study included triangulation of sources and investigators, and peer debriefing. The narrative descriptions of the data constructs and themes provided sufficient detail so interpretations and transferability decisions can be made by the reader. An audit trail including initial data analysis and compilation of units was kept with each coded writing sample to ensure...
dependability and confirmability (Lincoln & Guba, 1985).

The natural setting and prolonged engagement for this study was two sections of a 15-week undergraduate course. Two of the researchers were instructors for the course, while the other served as a peer debriefer, methodologist, and data interpreter. Content analysis techniques were used by the researchers to analyze students’ reflections and reactions to the simulation. “Content analysis is a technique that enables researchers to study human behavior in an indirect way, through an analysis of their communications” (Fraenkel & Wallen, 1999, p. 405).

The constant comparative method was used for data analysis (Lincoln & Guba, 1985). This method includes four stages: 1) comparing incidents applicable to each category, 2) integrating categories and their properties, 3) delimiting the construction, and 4) writing the construction. Each reflective paper was read and highlighted individually to determine initial category formulation in the first stage of the content analysis. Inter-rater reliability among the authors was achieved through a process of individual category identification and reconciliation of differences by consensus during a peer debriefing in stage two. Representative quotes were used to provide narrative descriptions of the constructs in the findings.

Findings

Content analysis of the students’ reflection papers yielded five constructs: 1) A western viewpoint in decision-making, 2) Life is very difficult in developing countries with few choices for improving peoples’ lives, 3) The realization that life is very different from what most students know (“eye-opening experience”), 4) Students feel grateful to live in the U.S. and are more appreciative of the privileges and prosperity that they enjoy, and 5) Students were motivated to want to help those in developing nations.

Many of the students exhibited a western viewpoint when making decisions during the initial stages of the simulation. In the simulation, the farmer has a wife and three children. The small banana farm barely produces enough to sustain life. Most nights, the family goes to bed hungry. When faced with the decision of whether to have more children, 29 students opted to not have more children because “I can barely feed the children that I have” (student code #17). Another student stated that, “My way of thinking is, the more children I have, the more mouths to feed and more bodies to clothe” (38). After completing the activity several times, students realized that having more children, while initially difficult, secured a better life for the family later on. More children meant more labor available on the farm, enabling the farmer to grow and harvest more bananas. Children in developing countries are also expected to take care of the parents in their old age. One student made this point very succinctly, “I soon realized I was totally looking at his family as if they were living in the U.S. I did not take into consideration that their beliefs and family structure are completely different” (2). Another “western” assumption was that if you work hard enough at something, you will succeed. Students discovered that hard work cannot overcome many barriers that people in developing countries face, such as low prices and lack of markets for crops, or lack of jobs in areas other than subsistence farming. Despite the farmer’s hard work in the simulation, it was difficult to get ahead. One student’s comments are indicative of this thought process, “I have been taught that hard work will be rewarded and it seems that in these situations, these people continue to work hard and still receive no rewards” (30).

Another construct that emerged from the data was that life in developing countries is very difficult and that most decisions mean life or death to the families making those decisions. Students were themselves
discouraged because, in their view, there were few choices that led to a “happy” outcome for the farmer and his family. One student stated, “This activity was very discouraging to me because every decision you had to make was really not going to help out matters” (102). This student learned, “Their decisions could mean life or death for them and their family” (3).

Another student reflected that the activity “…caused me to sit back and think about the harsh realities of everyday life in some parts of our world. Everyday, people fight and work long hours for simple food and shelter” (109).

Most students had no concept of the realities of life in developing countries. Many stated that even television doesn’t portray life in developing countries as well as the simulation. The simulation immersed the students in the lives of a family living in a developing country. Twenty-seven students described the simulation as an “eye-opening” experience. “This trip was extremely eye-opening. Most Americans know about developing countries and the need there for aid. After doing this assignment, I however feel like I have experienced it myself” (6). This student realized, “…that while I’m a ‘poor college student,’ a lot of people in these developing countries are living their entire lives barely able to afford to eat with no hope of any improvement any time in their lives” (10).

Student 26 noted that others need this experience, “Now, I have an awareness of these countries and I see what kind of decisions they face, but how many other people have the awareness that I have?”

Twenty-seven students noted that the simulation reminded them of the benefits and privileges that they enjoy in the United States. These statements are representative of what most of the students said about the simulation, “It helped me appreciate what I have in my life” (15), or “We (Americans) take everything for granted” (18). This student went on to comment that, “I wish there was something that I could do that was not out of my reach to help the countries that are starving” (18). Students commented that both individuals and the U.S. should be involved in international agricultural development. “We should help these people improve their living conditions and farming practices. We need to share our technology and advancements with them” (28).

Two students found the simulation hard to grasp because it was so far from anything they had ever experienced. “I found it very hard to relate to the given situations. The decisions they were asking me to make were very out of my experience base” (30). Another noted that, “When I think of poor, I don’t even think of being that poor” (35).

Conclusions, Recommendations, and Implications

Asynchronous simulations were found to be an effective means to provide students with an international experience without leaving the comforts of their homes or classrooms. Students gained insight to the challenges faced by families in developing countries and an appreciation for the bounty that they enjoy in the United States. Students also gained some understanding of another culture and how that culture affects the person’s decisions. This student sums the impact of participation in this activity, “In closing, this article helps me see the world outside of my little bubble that I live in. I see the hardships and the tragedies people face, living in a developing country. It makes me appreciate the things I have and makes me more charitable to those who are without” (41).

The need for international education is well documented. This study has demonstrated that it is feasible to provide agricultural students with a realistic international experience using an asynchronous simulation. Most international experiences, such as study-abroad, focus on small groups. While simulations cannot be compared to study abroad courses, they can provide students in large classrooms with a
reasonably realistic experience. Although we support authentic international experiences, many students cannot afford the time or expense to travel abroad; therefore, simulations can provide a more efficient alternative.

If the goal is to internationalize the agricultural curriculum, then simulation activities may prove to be part of the answer. It is recommended that additional simulations be developed to help students cultivate an understanding of globalization.

We also observed instructional benefits with the use of simulations in general. Decision-making, problem-solving, critical thinking, reflection, meta-cognition, and writing skills are important in many content areas. Further research is needed to comprehend the benefits of simulation for higher-order thinking.

References


Reasons Girls Choose Agriculture or Other Science and Technology Programs in Swaziland

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Abstract

A descriptive-correlational study explored reasons for girls to choose agriculture or other science and technology programs at high school and tertiary levels. Findings revealed respondents’ reasons were: economic, personal, educational, family, and social. Negligible to low associations were found between background characteristics of respondents and their reasons to enroll in scientific programs. However, three background characteristics showed influence in the domain reasons for choice: place of birth, location of high school attended, and, type of school attended. A t-test analysis procedure of high school and tertiary girls’ reasons showed no significant differences. Additional information provided revealed girls aspired for careers in health fields and, applied sciences, including agriculture. Among the recommendations made were that, career guidance teachers should play a major role in showing girls how to choose subjects combination in high school which suits their aptitudes and, family members should encourage girls to take up scientific programs.

Keywords: Course, Program, Career-Choice, High School, Tertiary, Girls, Mathematics, Science, Technology

Introduction

Participation of girls in mathematics, science and, technology subjects (home economics and agriculture) at primary school level (grades 1 to 7) and, mathematics at secondary school level (grades 8 to 12) in Swaziland is similar with that of boys, mainly because both are compelled to take these subjects. However, participation of girls in agriculture and science in both secondary and tertiary levels (college or university) was low. Schools through streaming practices stereotyped participation of girls and boys in secondary school technology subjects. Female Education in Mathematics, Science and Technology in Africa (FEMSA) in a study published in 1999 found that, home economics was for girls and, woodwork, metalwork and technical drawing for boys only. Agriculture was open for both girls and boys, but girls were underrepresented all the time. The imbalanced trend continues to tertiary level. Only recently, that in Swaziland, few girls have attempted to join boys in non-traditionally-female science and technology fields, but not boys joining girls in traditionally-female fields. Tertiary level
statistics also show that, many girls who completed high school in a science stream opted not to go for a science program at tertiary level.

International, regional and national governmental declarations and actions were being put in place on improving the situation of women and girls (Southern African Development Community (SADC) 1997; 2001). Interventions were also mounted at the regional, national and community levels, by non-governmental organizations to promote girls participation in education, an area identified as key to promoting the situation of women in the developmental areas, in the long term. Squire (2003) reviewed strategies for enhancing women’s full participation in sustainable agricultural development and environmental conservation in sub-Saharan Africa, and, concluded among others that, a holistic and integrated approach is needed, including gender equality in access to educational opportunities and training programs for females.

Recently in Swaziland, UNESCO has placed emphasis on girls’ education under Education for All (EFA) campaign. UNICEF focused its efforts on removing gender bias in the primary school curriculum. The Forum for African Women Educationalists (FAWE) focused on the education of girls and women. The FEMSA project targeted mathematics, science and technology education of primary and secondary school girls. The African Child Literacy in Science and Technology (AFCLIST) project linked education context, including gender, with classroom science (Savage, Naïdoo, & Fabiano, 2001).

Literature on description of factors generally influencing occupational choice and entry is abundant, and are on career planning, recognizing self-priorities, skills, and opportunities in careers (The Nottingham Trust University (NTU), 2002). However, empirical evidence on explaining and predicting reasons for girls to or not to enroll in science courses or programs is scanty, especially within the African context. The background to the foregoing can be attributed to the lack of concerted efforts in the past that targeted greater participation of girls in science and technology, which could have facilitated development of theories in the problem area.

In Africa, except in the northern region, descriptive studies between 1996 and 2001 were conducted by FEMSA national centers with both primary and secondary school boys and girls, on the problems girls face, the causes and solutions to the problems and, their coping strategies in studying science, for the purpose of mounting interventions in schools and communities. The similar problems that emerged were: the negative attitudes of girls toward science and, toward their intellectual capacity to do science; the perceived unimportance of science in their lives after school; special constraints and difficulties faced by girls; and, the greater involvement of girls in household chores. When boys and girls were probed more on the causes for these problems, causes given could be linked with “personal convictions” (Behutiye & Wagner, 1995); “economic support and opportunities” (NTU, 2002); “family background” (Afrassa, 1998; Howie & Pietersen, 2001); “educational and school system” (Cohn & Rossmiller, 1987; Lenga & Mwanycky, 2001; Riddel, 1997; Taylor & Vingevoid, 1999); “school and classroom-related factors” (Howie, 2002); “socialization” (Daniel, 1995; FEMSA, 1999; Mitchell, 1995); and “peer group attitudes” (FEMSA, 1999; Howie & Wedepohl, 1997).

Thus, a need arose to explore specific reasons and explanations for girls’ participation in agriculture, science and technology courses or programs, in order to gain insights on possible approaches that worked for girls that may be used to maximize their participation in the national scientific and technological capacity building. The specific research question for the study is, what are the reasons and
possible explanations and predictions for girls to choose agriculture or other science and technology courses in high school or programs at tertiary level?

**Purpose and Objectives**
The study sought to determine the reasons for girls to choose agriculture or other science and technology programs in high school and tertiary levels. The specific objectives of the study were to:

1. Describe reasons for girls to choose agriculture or other science and technology programs;
2. Describe the relationship between background characteristics of respondents and their reasons for choosing agriculture or other science and technology programs;
3. Explore explanatory and predictive reasons for girls to choose agriculture or other science and technology programs; and,
4. Determine whether significant differences existed in reasons for girls to choose agriculture or other science and technology programs.

**Methodology**
The study was descriptive-correlational. The target population for the study was graduating female students enrolled in high school \(N = 272\) and tertiary institutions \(N = 198\), during 2002 calendar year. The high school girls were in the final year (Grade 12) in core science courses in purposively selected high schools. The science core courses were offered either as three stand-alone subjects of Physics, Chemistry and Biology; or, two science subjects of Physical Science (Physics and Chemistry) with Biology, together with other complementing subjects. The tertiary girls were also in the final year (fourth year in the university or second year in the technology college) in the purposively-selected institutions: a faculty/college that offered degree programs in agriculture in the University of Swaziland; a faculty/college that offered a double science major in the University of Swaziland; and, a technology college that offered associate degree in engineering, the Swaziland College of Technology. Sampling error was not a threat to external validity, since a census of all female students was conducted. Checking for duplication of, and finalizing, the names of students in the class lists, provided by the class teachers or registrar’s office of each school or institution controlled selection error.

The questionnaire consisted of three sections: Section A comprised of a list of 28 reasons developed through a review of literature and suggestions in the validated instruments on reasons for girls to choose agriculture or other science and technology programs organized under seven grouped reasons or domains. Respondents were asked to rate each of the reasons using a six-point Likert-type scale, to measure agreement to each of the reasons for girls to choose agriculture or other science and technology programs. The scale ranged from 1 to 6, with 1=strongly disagree, 2=disagree, 3=slightly disagree, 4=slightly agree, 5=agree, and 6=strongly agree. Section B requested high school respondents to provide additional information regarding their tertiary program aspirations and, both groups of respondents to make suggestions on how high school girls may be encouraged to enter sciences. Section C requested respondents to provide their background characteristics.

The face and content validity of the instrument were established using three individuals who have held a position in an organization promoting girls’ education. A pilot study was conducted with an intact class in a high school that offered science courses and, another intact class in an agricultural college. Cronbach’s alpha reliability coefficients were computed, and ranged from .64 to .78, for the domains, with an overall of .80 for high school girls’ instrument, and .80 for tertiary girls’ instrument.
Two data collection procedures were followed in the study. For the respondents from the University of Swaziland and the Swaziland College of Technology, questionnaires were personally delivered and collected two weeks later. For the respondents from high schools, class teachers were requested to administer the questionnaires during study time, and were collected two weeks later. Non-response errors were controlled, by following up non-respondents until all returned the filled questionnaire. A 100% response rate was achieved. Data collected were analyzed using descriptive statistics, correlations and, multiple regression procedures. The populations in the study, namely, high school and tertiary girls were treated as samples in time, and therefore, inferential statistics were applied.

Findings

Objective one was to describe reasons for girls to choose agriculture or other science and technology programs. The overall reasons for girls to choose agriculture or other science and technology programs, as shown in Table 1, were found to be the following, in mean rank order: i) economic ($M = 4.73; SD = 1.33$); (ii) personal ($M = 4.49; SD = .89$); (iii) educational ($M = 4.37; SD = .68$); (iv) family ($M = 4.31; SD = 1.87$); and, (v) social ($M = 4.15; SD = .85$). On the whole, respondents only slightly agreed with school reasons ($M = 3.99; SD = .97$) and peer pressure reasons ($M = 3.69; SD = 1.18$). The same trend of mean responses is observable for both groups. Of worth noting is that, the high school group varied highly ($SD = 2.22$) in the family reasons, that is, respondents tended to disagree with regard the items in this domain.

Table 1

| Grouped Reasons for Girls to Choose Agriculture or Other Science and Technology Programs |
|-----------------------------------------------|---|---|---|
| Grouped reasons                              | Tertiary ($N = 198$) | High Schools ($N = 272$) | Total ($N = 470$) |
| Economic                                     | $M = 4.65$ | $SD = 1.29$ | $M = 4.79$ | $SD = 1.35$ | $M = 4.73$ | $SD = 1.33$ |
| Personal                                     | $M = 4.47$ | $SD = .94$ | $M = 4.51$ | $SD = 1.38$ | $M = 4.49$ | $SD = .89$ |
| Educational                                   | $M = 4.33$ | $SD = .71$ | $M = 4.41$ | $SD = .66$ | $M = 4.37$ | $SD = .68$ |
| Family                                       | $M = 4.15$ | $SD = 1.21$ | $M = 4.43$ | $SD = 2.22$ | $M = 4.31$ | $SD = 1.87$ |
| Social                                       | $M = 4.09$ | $SD = .84$ | $M = 4.19$ | $SD = .85$ | $M = 4.15$ | $SD = .85$ |
| School                                       | $M = 3.84$ | $SD = 1.08$ | $M = 4.09$ | $SD = .88$ | $M = 3.99$ | $SD = .97$ |
| Peer pressure                                | $M = 3.77$ | $SD = 1.16$ | $M = 3.63$ | $SD = 1.20$ | $M = 3.69$ | $SD = 1.18$ |
| Overall                                      | $M = 4.14$ | $SD = .61$ | $M = 4.26$ | $SD = .61$ | $M = 4.21$ | $SD = .62$ |

Note. Rating scale: 1 = strongly disagree; 2 = slightly disagree; 3 = disagree; 4 = slightly agree; 5 = agree; 6 = strongly agree.

Objective two was to describe the relationship between background characteristics of respondents and their reasons for choosing agriculture or other science and technology programs. The characteristics of the study sample were established at first. Fifty-eight percent of the respondents were at high school, while the rest at tertiary level. Among high school girls, 47% were in a single sex schools while 53% were in a co-educational schools, 95% were residing in urban areas, and 53% were in a government school, with 47% in mission schools. About 81% of the respondents were born in urban areas, 87% studied in urban primary and, 93% studied in urban high schools. Adjectives and ranges developed by Davis (1971) were used to
describe the magnitude of relationships. The analysis used Spearman rank order and point bi-serial correlation coefficients, to describe the strength of associations.

The inter-correlations existed and ranged from negligible (.01 to .09) to low (.10 to .29). Therefore, each background characteristic was tested as explanatory variable to reasons for choice. Further analysis of inter-correlations among background characteristics indicated low degree of multi-co linearity (correlations of -.01 to .61). The inter-correlations analysis was necessary for the subsequent multiple regression analysis. High magnitude of multi-co linearity (correlations of .80 and above) requires grouping of background characteristics to narrow down the number of related background characteristics.

Objective three was to explore explanatory reasons for girls to choose agriculture or other science and technology programs. A forward stepwise variable entry and removal procedure was used, which examines the variable in the block at each step for entry or removal. In all domains/reasons, including the overall domain/reason, except with educational domain/reason, three variables repeatedly explained choice. Place of birth, contributed 6.9% of the variance in the dependent variable. The background characteristic location of high school attended, explained 1.4% of the variance, while, school type by sex explained .9%.

Objective four was to determine whether significant differences existed in reasons for girls to choose agriculture or other science and technology programs. An a priori level of .05 was used. In the seven grouped reasons, a significant difference was observed only with respect to school reasons, receiving higher mean rating ($M = 4.09; SD = .88$) with high school girls as compared to tertiary girls ($M = 3.84; SD = 1.08$). However, effect size analysis revealed a small effect size ($d = .15$), with no practical value, according to Cohen’s (1988) descriptors. All other domains were not rated significantly different.

Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>$R^2$</th>
<th>$R^2_{\text{Change}}$ (Unstandardized)</th>
<th>SE $B$</th>
<th>t-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place of birth$^1$</td>
<td>.069</td>
<td>-.297</td>
<td>.080</td>
<td>-3.59</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Location of high school attended$^2$</td>
<td>.083</td>
<td>-.348</td>
<td>.124</td>
<td>-2.79</td>
<td>.005</td>
</tr>
<tr>
<td>School type by sex$^3$</td>
<td>.092</td>
<td>.158</td>
<td>.073</td>
<td>.17</td>
<td>.030</td>
</tr>
<tr>
<td>Constant: 4.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $^1$Place of birth: 0 = rural ($n = 91$); 1 = urban ($n = 379$). $^2$0 = rural ($n = 32$); 1 = urban ($n = 438$). $^3$0 = co-ed ($n = 144$); 1 = single sex ($n = 128$).

High School Girls’ Tertiary Programs Aspirations

High school girls were asked to indicate which tertiary program they wished to pursue upon completing high school. Almost half ($n = 100$) of the 215 responding students aspired to enter health sciences: Medicine ($n = 73$), Nursing ($n = 9$), Pharmacy ($n = 9$), Environmental Science ($n = 7$) and, Dentistry ($n = 2$). Seventy-seven of the respondents aspired for applied sciences, with 38% ($n = 29$) wishing to take up a program in Agriculture, 18% ($n = 14$) in Home Economics, 13% ($n = 10$) in Computer Science, and, 9% ($n = 7$) in Information Technology. Seventeen (22%)
of the seventy-seven aspired for other applied sciences, fifteen of whom, in engineering fields and two, in mathematics. The remaining respondents (n = 38) aspired to enter non-science programs.

Suggestions on How High School Girls May Be Encouraged to Enter Science Courses or Programs

Combined high school and tertiary girls who gave suggestions totaled 407. The most important to mention are the following. One hundred and twenty students (29%) suggested that career guidance teachers should play a major role in showing girls how to choose subjects combination which will suit their aptitudes, while 98 (24%) stated that family members should encourage girls to take up scientific programs. Seventy-one students (17%) suggested that English Language should be discarded as an overall passing subject, as the present system closes opportunities in the sciences for students who receive excellent grades in mathematics and sciences, according to the respondents. Fifty-one respondents (12.5%) suggested that the government scholarship board should make a provision in the quota to sponsor students on an equal basis in the science and technology programs. The other 67 students (17%) had suggestions regarding: science being made compulsory in secondary curriculum (7%); science teachers providing extra help to students (5%); parents and teachers discouraging thoughts that science programs are difficult (2%); gender equality being emphasized (1%); education ministry closely monitoring science programs (1%); and, students who are already taking up science courses or programs serving as role models to younger students (1%).

Conclusions and Implications

Respondents identified five reasons for enrolling in science programs: economic, personal, educational, family and social. Girls believed that, they would pursue science courses if financial assistance and jobs were available. Personal views of science as a positive field for a career were believed to have influenced girls to take up sciences. Science and technology streams in high school were open to girls, but instructional materials content, approaches, teachers’ attitudes, gender equity quality in schools, were viewed influencing girls’ choice of science as a course. Therefore, challenges are posed to the National Curriculum Centre of Swaziland to ensure gender unbiased content and approaches in pupil and teacher materials through their normal evaluation of materials, and also through research. Teacher training institutions in science and technology should examine their courses and programmes and identify needed gender sensitive content and approaches. The administrators and guidance counselors in schools are encouraged to ensure gender unbiased practices in the schools, especially in streaming and guiding students in career paths. Opportunities for research in guidance and counseling are also indicative, especially in the area of gender and career choice. Exposure to science fields through family members and significant others in science careers boost girls’ choice of science for a course. The society and parents’ attitudes toward girls being able to attempt science were believed facilitating or limiting girls’ choice of science as a program of study. Therefore, the family is the basic unit where socialization to science and technology may be promoted.

When background characteristics were tested as explanatory variables to reasons for choice of program, three background characteristics showed some importance: place of birth; location of high school attended; and, type of school attended. Girls’ immediate environment,
such as their place of birth exerts some influence on their aspirations. The beta coefficients showed that a rural classification resulted in a -.29 decrease in the dependent variable score. Similarly, girls from a rural school, choose science and technology less ($\beta = -.0348$) than their urban counterparts. The foregoing can be explained by the greatly varying environment and availability of facilities in the schools in promoting or limiting the interests in the courses offered, especially science, that need special laboratories and equipment. Lastly, girls from co-educational schools choose science and technology less. A higher beta coefficient (.015) accompanied the single sex classification. The last finding confirmed that of FEMSA Swaziland (1999), which showed that, girls in a single-sex school exhibit fewer inhibitions in learning as compared with girls who are in a co-educational school.

The education level where girls were at, did not pose as a variable associated with their reasons for choosing agriculture or other science and technology programs. The findings indicate that the reasons in high school about what programs they would like to pursue persist up until tertiary level.

Girls’ tertiary program aspirations reflect the nurturing nature of females. These programs are medicine, nursing, pharmacy, environmental science, dentistry, agriculture and home economics, with the exception of computer science and information technology and, engineering. However, computer science and information technology might be associated with growing importance of these fields (Amarteifo, 2001). Engineering and mathematics were found in other studies (Awacango, 2001) as potential programs for girls, when aptitudes are developed in the early educational levels. It is worth noting that, some girls aspired for non-science programs, even though they were already in a science stream. Why girls identified capable in science in high school would like to deviate at tertiary level, is an important question that may need exploration.

Career guidance teachers are urged to play a major role in showing girls how to choose subjects combination that suits their aptitudes and, how to conquer their fears of the non-traditionally-female programs. The Educational Testing, Guidance and Psychological Services (ETGPS) department of the Ministry of Education do a lot of activities in the schools already in the form of aptitude testing and career guidance based on aptitude test result. However, school-based career guidance and counseling teachers need to be given more skills in guiding girls how to develop their aptitudes, to realize a career matching their aptitudes, and how to eliminate competing influences, from the time they enter secondary school. Family members were believed to have some considerable influence in encouraging girls to take up scientific programs, and therefore, need to be encouraged to play a significant role.

The educational system policy of obtaining a passing grade in English Language as a pre-requisite to graduate in high school, is being questioned for its validity by the respondents, since the relevant subjects alone, like mathematics and sciences, were found by other studies as indicators of success in the science tertiary programs (Erinosho, 2001). Most tertiary programs require a credit pass in English as entrance requirement. The Faculty of Agriculture requires a pass or better in English for entry, but provides pre-requisite academic communication skills courses for first years, to better prepare them in agribusiness communication. In terms of scholarship provision in Swaziland, the Ministry of Education is already considering science and technology as priority fields for scholarship grants purposes at tertiary levels. However, it is in high school where girls may be further encouraged to take the science and technology path, by possibly providing affirmative bursary to girls who show aptitudes to succeed.
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Factors Fueling the HIV/AIDS Pandemic in Africa’s Rural Communities: Implications for Agricultural Extension and Communication

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Abstract

The human immunodeficiency virus (HIV) causing the acquired immunodeficiency syndrome (AIDS) is invading rural farming communities in Africa and posing a great threat to agricultural production and food security in a continent already ravaged by war and famine. AIDS is no longer just a health problem but a concern for agricultural extension workers as well. Therefore, understanding potential factors that may be fueling the spread of the disease, such as, polygamy, illiteracy, and circumcision could help in the development of an extension education curriculum on HIV/AIDS. This article calls on agricultural extension workers, particularly in Africa, to get involved in HIV/AIDS education because the future of agriculture and food security depends heavily on eradicating the pandemic.

Keywords: HIV/AIDS, Extension Education, Food Security, Small Farmers, Women in Development, Agricultural and Rural Development, and Health Communication

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Introduction

HIV/AIDS is something not many people talk about but agricultural extension workers must because the disease is affecting the farming population. HIV/AIDS is ravaging African rural communities like wild fire and affecting food production and security (World Food Summit Report, 2003). Agricultural extension workers in Africa can no longer ignore the HIV/AIDS pandemic. The authors argue that understanding factors that may be fueling the disease offers fodder for an extension curriculum on HIV/AIDS. The study is based on a survey of male and female farmers in the Upper East Region of Ghana.

Theoretical Framework

Africa is a continent in perpetual crisis. It started with colonial rule in the 1800s, which gave way to short-lived democracies in the late 1960s. Many African leaders who were democratically elected at independence quickly turned their governments into single-party dictatorships, characterized by mismanagement of national resources, civil unrest, and nepotism. Harsh climatic conditions, such as drought and flood, have also taken a heavy toll on the continent’s agricultural productivity. Now, the HIV/AIDS epidemic seems poised to sweep the continent clean of any healthy human population. AIDS is perhaps Africa’s major nightmare (Agunga, 1997).

Nurtured by misconceptions that HIV/AIDS was a western problem or a disease common to promiscuous city dwellers, African leaders failed to take proactive measures to curb it. Numbers of the dead and dying in Africa are staggering. A 1998 Joint United Nations Program on AIDS (UNAIDS) noted that more than 30 million people were infected in the world and nearly 70% of them are in Sub-Saharan Africa. In southern and eastern Africa, the number of people infected is nearing an epidemic—about 25% of Kenyans, and over 30% in Swaziland, Botswana, South Africa, and Malawi (Mutangadura et al., 1999).

Women and children are most affected, accounting for almost 8 million of the 14 million AIDS deaths (or roughly 60%). About 80% of the dying is between the ages of 20 and 50, that is, people in their prime and constituting the main agricultural labor force (Piot, 2003). At the 15th International AIDS Conference in Bangkok, Thailand this year, participants observed the global implications of this disease, which has no cure, to be overwhelming. The World Health Organization reported that the world has failed miserably in getting lifesaving drugs to millions afflicted with HIV, estimated at 38 million. Of this total, 28 million are in sub-Saharan Africa and 7.2 million in Asia (Mader, 2004).

Haslwimmer (1996) discussed the impact of HIV/AIDS on small-scale agricultural productivity. She noted that crop production seriously declined in many areas due to reduction in land use and/or poor crop yields because money saved for farm inputs was diverted to medications or funerals. She added that sickness and death in households meant not many family members remained to work in the fields. Piot (2003) traces the link between agriculture and HIV/AIDS in southern Africa:

It’s no coincidence that the six southern African nations that now face the prospect of mass famine—Lesotho, Malawi, Mozambique, Swaziland, Zambia, and Zimbabwe—also have substantial and still-growing HIV epidemics, with between one-sixth and one-third of their populations infected. In southern Africa, famine and AIDS are directly related.

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The magnitude of the catastrophe in agricultural communities in southern Africa is also captured by Olivea Muchena, Deputy Minister of Lands and Agriculture for Zimbabwe, reported by Mutangadura et al. (1999):

The major impact of HIV/AIDS on smallholder agriculture includes serious depletion of human resources, diversion...
of capital from agriculture, loss of farm and non-farm income and other psychosocial impacts that affect agricultural productivity. Women and men, young and old, people expected to plough the land, tend the crops, harvest and store the produce, are dying.

Further justification for treating HIV/AIDS as an agricultural extension concern comes from United Nations Secretary-General Kofi Annan, in his address to the World Food Summit Delegates in 2002 (see World Food Summit Report, 2003). He noted that 800 million of the world’s one billion undernourished are in rural areas and depend on agriculture. He warned that agricultural productivity and standards of living in the countryside cannot be improved if problems outside the agricultural sector, such as illiteracy, population growth and ill health, especially the spread of AIDS, were not addressed.

Roling & Engel (1991) described extension as an “Agricultural Information and Knowledge System” (AKIS), implying that providing people with information, on issues that affect their lives, must be the primacy of extension. The Ghana Ministry of Food and Agriculture (MOFA) supports this holistic view of agricultural extension, arguing that “emerging issues, such as the HIV/AIDS pandemic, empowerment of farmers, environmental degradation, and poverty reduction need to be tackled within the Extension delivery system”(MOFA, 2003, p. 1). The MOFA further notes that no “demand-driven” extension system in Africa can avoid addressing the HIV/AIDS problem.

From the foregoing, the authors contend that HIV/AIDS education must be a critical component of agricultural extension programming in Africa. This study has identified factors in Africa’s rural areas that may be fueling the AIDS pandemic—information that could serve as the basis for an HIV/AIDS extension curriculum.

**Purpose and Objectives**

The primary purpose of this study was to identify factors in the rural environment that may be causing the spread of the HIV/AIDS. The specific objectives of the study were to determine:

1. Demographic characteristics, such as age, family size, and income as these relate to poverty, malnutrition, predisposition to diseases, and labor for agriculture.
2. Levels of illiteracy as it relates to traditional and mythical beliefs.
3. Levels of consumption of bushmeat, as wildlife may be carriers of the HIV virus.
4. Extent to which polygamy is practiced as it implies sexual relationship with multiple partners and hence a potential fueling factor for HIV/AIDS.
5. Seasonal human migration and prostitution as possible sources of transmission of the disease.
6. If circumcision, particularly female genital mutilation (FGM), is practiced in the region as studies show that FGM enhances the spread of the disease.

**Methodology**

This was an exploratory study using an interview schedule. Although every effort was made to obtain a representative sample through stratification, systematic random sampling was not possible because there were no farmer directories to draw from.

Table 1 shows how the sampling was done. In all, 280 farmers (140 male and 140 female) were interviewed. It took 14 extension workers, including females, using motorcycles, to collect the data. Since data was collected by direct contact, the threat of non-response was fully controlled, yielding a response rate of 100%. Interviewers were briefed on how to administer the questionnaire. The questionnaire was written in English. However, interviewees were trained to adlib, that is, translate the questions instantaneously into the local language and then record farmers’ responses.
back in English (O’Barr, et al., 1973). Given that the interviewers were highly competent in both English and the local language, any reliability error introduced was minor. Reliability and validity concerns were addressed through a team of experts and pilot-testing the instrument. Data analysis was completed using the Statistical Package for the Social Sciences. Descriptive statistics were used to summarize the data. Cronbach’s alpha was not calculated because no Likert-type questions were used. The simple measure of central tendency was sufficient to give enough information to adequately describe the characteristics of farmers.

Table 1

Procedure of Selecting Farmers for the Study

<table>
<thead>
<tr>
<th>District</th>
<th>Pop.</th>
<th>Sub-districts</th>
<th>#:Sub-district</th>
<th>Males</th>
<th>Females</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bawku East</td>
<td>307,162</td>
<td>Bawku</td>
<td>4</td>
<td>15</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bugri</td>
<td>15</td>
<td>8</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Garu</td>
<td>15</td>
<td>8</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pusiga</td>
<td>15</td>
<td>8</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Bawku West</td>
<td>81,927</td>
<td>Kusanaba</td>
<td>3</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zebilla</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sapeliga</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Bolgatanga</td>
<td>225,864</td>
<td>Talensi</td>
<td>3</td>
<td>20</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nabdam</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frafra/Gurunei</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Bongo</td>
<td>76,773</td>
<td>Gurune</td>
<td>2</td>
<td>30</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Builsa</td>
<td>74,576</td>
<td>Buli</td>
<td>2</td>
<td>40</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Navrongo</td>
<td>150,949</td>
<td>Kassem</td>
<td>4</td>
<td>30</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nankem</td>
<td>30</td>
<td>15</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>914,251</td>
<td>18</td>
<td>280</td>
<td>140</td>
<td>140</td>
<td>40</td>
</tr>
</tbody>
</table>

Findings

The study set out to examine sociocultural, educational and economic factors that may be fueling the HIV/AIDS pandemic in northern Ghana. The study examined the socioeconomic status of subsistence farm families in the Upper East Region of Ghana. We asked questions on age, marital status and property ownership (as a measure of income), to name just a few. Some of the questions were repeated from a 1976 study of 419 farmers in the Navrongo district of the region. Although the 2002 sample population differed from that of 1976, we feel that the two sets of data provide the reader a sense of changes in the region over the 26-year period. Table 2 shows comparative data on the age of farmers. From the two studies, it is clear that the population of the region is much younger. Only 21.1% of those surveyed in 2002 were over 50 years compared to 42.3% in 1976. The number of farmers aged 20–30 years in 1976 was 7.6% compared to 18.6% in 2002. In 26 years, the population has more than reversed itself. The sexually active population, aged 20–50 years, has also increased. It was 56.1% in 1976 compared to 77.5% in 2002 thereby significantly increasing the risk of contracting HIV/AIDS.
Farming remains the primary occupation of the people. In 1976, the number of respondents who mentioned farming as their primary occupation was 387 out of 419 (92.7%). In 2002, it was 238 out of 280, or roughly 90% of respondents. It suggests that after 26 years, farmers remain relatively fixed on their small pieces of land. There are no industrial jobs to draw labor out of agriculture. Industry accounts for only one percent of the labor force in the region (World Bank, 2003).

Socioeconomic status, or a person’s level of poverty, is considered a major factor in his or her ability to ward off disease. Hunger, poverty, and HIV/AIDS are strongly linked. Jeter (2002) in a Washington Post article noted that AIDS and hunger are bedfellows, in that, the incidence of AIDS is highest among the farming population, the poorest of African society. In southern Africa, where famine afflicts 20 million people, the AIDS epidemic is deepening the misery. Hunger accelerates the onset of debilitating diseases and even death among household breadwinners. Economic conditions play a major role in the spread of HIV and AIDS among the poor (Piot, 2003).

**Illiteracy and Traditionalism**

Table 3 shows the level of education of respondents in 1976 and 2002. Over a 26-year period the percentage of farmers with no education has dropped from 88.8% to 64.6%, an improvement of 24.2%. The number of respondents with primary, middle or other education also has increased. However, the level of increase in literacy in the region is small compared to the rest of the country.

According to the World Bank (2003) the region’s 25% literacy rate is the lowest in the country. The national average is 70%. Illiteracy, defined as the inability to read or write in the local language or English, is a major handicap to development. Amartya Sen (2002), the 1998 Nobel Prize winner in economics, noted that basic education can transform societies and cites Japan, China, Taiwan, and South Korea as cases in point. Joseph Chanie (2002), director of the UNAIDS, notes that literacy opens people’s eyes to the reality that AIDS kills and they must change their behaviors or die. Without literacy, people think that they are either at no risk at all or at small risk of contracting AIDS. Without literacy, people also tend to hold mystical beliefs about how the disease spreads. For example, some respondents’ believed it was an Act of God or caused by Angry Spirits.

### Table 2

**Age Distribution of Farming Population in 1976 and 2002**

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>1976</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 20</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>20-30</td>
<td>32</td>
<td>52</td>
</tr>
<tr>
<td>31-35</td>
<td>38</td>
<td>32</td>
</tr>
<tr>
<td>36-40</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>41-50</td>
<td>105</td>
<td>93</td>
</tr>
<tr>
<td>Over 50</td>
<td>177</td>
<td>59</td>
</tr>
<tr>
<td>Total</td>
<td>419</td>
<td>280</td>
</tr>
</tbody>
</table>

Consumption of Bushmeat

We asked respondents to indicate their primary sources of meat for consumption. Table 4 shows the vast majority (more than 80%) get their meat from farm animals, such as sheep, goats, and poultry. About 62% depend on meat from the market. However, a substantially large
number, 16% of respondents consume bushmeat, whether hunted or purchased from the market.

Table 4

<table>
<thead>
<tr>
<th>Meat Sources</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homegrown (Farm/Domestic)</td>
<td>229</td>
<td>81.8</td>
</tr>
<tr>
<td>Market</td>
<td>173</td>
<td>61.8</td>
</tr>
<tr>
<td>Bushmeat hunted by self/family</td>
<td>30</td>
<td>10.7</td>
</tr>
<tr>
<td>Bushmeat from market</td>
<td>17</td>
<td>6.1</td>
</tr>
<tr>
<td>Fishing by self/family</td>
<td>19</td>
<td>6.8</td>
</tr>
<tr>
<td>Fish from market</td>
<td>206</td>
<td>73.6</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>3.6</td>
</tr>
</tbody>
</table>

A study in Cameroon by Peeters et al. (2002) says that monkeys and chimpanzees carry the mild form of HIV/AIDS and when improperly cooked and consumed could be a source of transmission into humans. They note that bites from pet primates and possible contact with the animals’ feces and urine may also transmit the virus. However, they are not certain if it infects humans. Nevertheless, their study suggests that people who hunt and/or eat bushmeat should exercise caution until scientific findings become more conclusive given the enormous capacity of HIV strains to mutate and thrive in other species.

Polygamy

Of the 280 interviewed in 2002, 228 (81.5%) were married, 16 (5.7%) single and 34 (11.2%) divorced or widowed. Given that 80% or more were married this may suggest a community with a stable sexual relationship which could ward off the epidemic. Of the male respondents (N = 140), 127 (90.7%) were married. Of those married, 86 (67.7%) indicated having one wife; 41 (32.3%), 2 wives; 10 (3.6%), 3-4 wives; and, 2 (0.7%), 5 or more wives (Table 5). The data are similar to what were found in 1976. The two sets of data show that the marriage pattern in the region, over a 26-year period, remains roughly the same, polygamous and stable.

Table 5

<table>
<thead>
<tr>
<th>Marital Status of Respondents</th>
<th>1976</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navrongo District</td>
<td>(N = 419)</td>
<td>(N = 140)</td>
</tr>
<tr>
<td># of Wives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single/Divorced</td>
<td>65</td>
<td>13</td>
</tr>
<tr>
<td>1 wife</td>
<td>233</td>
<td>86</td>
</tr>
<tr>
<td>2 wives</td>
<td>96</td>
<td>29</td>
</tr>
<tr>
<td>3 wives</td>
<td>21</td>
<td>8</td>
</tr>
<tr>
<td>4 wives</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5 or more</td>
<td>2</td>
<td>1.4</td>
</tr>
</tbody>
</table>

However, when polygamy is combined with high birth rate, unemployment, illiteracy, a teeming population of youth, and limited medical facilities, a breeding ground for the spread of HIV/AIDS and other communicable diseases emerges. Divorce and re-marriage also spread HIV/AIDS (Toubia, 1995). In essence, a polygamous environment could fuel the spread of HIV and needs to be seriously addressed. Associated with polygamy is breast-feeding, a significant way of transmitting HIV from mother to child (Helmes, 2002).

Seasonal Migration and Prostitution

The Upper East Region not only has the lowest literacy rate, it is also the poorest economically. As a result, many, mostly young men, leave their wives behind and migrate to southern Ghana during the off farm season to work on cocoa plantations. Away from home and family, they may engage in sexual activities with multiple partners and/or prostitutes and become susceptible to sexually transmitted diseases and viruses, which may be transferred to their wives upon their return home.

Respondents were asked if men often leave their wives to work in the cities during the off-season. One hundred and sixty
(57.1%) said “yes,” 42 (15.0%) said “some times” and 69 (24.6%) said “no.” Farmers were also asked whether they felt prostitution prevailed in their communities. Eighty respondents (28.6%) said “yes,” 41(14.6%) said “sometimes,” while 136 (48.6%) said there was no prostitution in their communities. With about 60% of respondents acknowledging the presence of migration and another 40% reporting the presence of prostitution in their communities, the potential for the spread of HIV/AIDS exists. Kulis et al. (2004) noted that the mobile work force in Africa is a major source by which AIDS is spread to women, particularly, housewives.

**Male Circumcision and Female Genital Mutilation (FGM)**

Our study examined whether circumcision, both male and female, was practiced in the region. As shown in Table 6, about 83% of respondents acknowledged the prevalence of male circumcision compared to only 7.2% who said female circumcision was practiced in their communities. The main reasons for circumcision varied from tribal rite of passage through religious beliefs, to the need to ensure virginity before marriage. Of those who mentioned that female circumcision was practiced, 7.2% offered tribal rites as the main reason, followed by religion (3.6%), chastity (1.8%), and ensuring virginity (1.1%). The reasons for male circumcision were the same except that the number of respondents to this question was much larger. About 26.4% mentioned religion, followed by rite of passage (22.9%), chastity (11.1%) and ensuring virginity (4.3%).

### Table 6

<table>
<thead>
<tr>
<th>Type of Circumcision</th>
<th>$f$</th>
<th>Reason(s) for Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>20 (7.2%)</td>
<td>Tribal rites of passage, 20 (7.2%). Religion, 10 (3.6%)</td>
</tr>
<tr>
<td>Male</td>
<td>233 (83.2%)</td>
<td>Tribal rites of passage, 64 (22.9%). Religion, 74 (26.4%)</td>
</tr>
</tbody>
</table>

Although the practice of FGM in Ghana is relatively small it is highly pervasive in other parts of Africa. For example, in Burkina Faso, Egypt, Djibouti, Ethiopia and the Gambia, 70% or more of the population practice it. It is estimated that over 135 million girls and women in the world, and about 100 million in Africa alone, are genitally mutilated (Toubia, 1995). Whatever the reason, it is clear that circumcision, especially FGM, can fuel the spread of HIV/AIDS (Bongaarts et al., 1989).

### Conclusion and Recommendations

This study set out to identify factors that may be fueling the spread of HIV/AIDS in the Upper East Region of Ghana. These factors are: polygamy, illiteracy, poverty, migration, prostitution, consumption of bushmeat, and female circumcision. Although no generalization of the findings is intended, it is clear that these fueling factors predominate in many countries in Africa. Therefore, the study has implications for Ghana and other African nations. We believe that extension education could be
modeled on these factors. Therefore, we make the following recommendations.

1. We found the region has a very large concentration of youth. Therefore, HIV/AIDS education must actively focus on this impressionable age group particularly the prepubescent and pubescent demographic—stressing on responsibility to self and family, gender issues, reproductive health and knowledge and abstinence.

2. Given the high rate of illiteracy in the region, HIV/AIDS education must focus not only on preventive measures, such as condoms or abstinence, but also on the health effects and vulnerability of populations practicing polygamy and seasonal migration.

3. Agricultural extension workers could use on-farm topics as a springboard to introduce HIV/AIDS education to farmers.

4. Many extension workers in developing countries are not adequately trained in HIV/AIDS education. Intensive training programs that are culturally inclusive and appropriate are essential before embarking on an HIV/AIDS extension education effort. This training has already begun in the Upper East region.

References


Tools of the Profession
Book Review

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“If we did all the things we are capable of doing, we would literally astound ourselves”
Thomas Edison

Edison’s quote is found on the opening pages of David Bornstein’s 2004 book titled How to Change the World, Social Entrepreneurs and the Power of New Ideas. David Bornstein specializes in writing about social innovations. The book is the result of five years of travel and interviewing by Bornstein in Bangladesh, Brazil, Hungary, India, Poland, South Africa and the United States. How to Change the World focuses on the vision and decision made by Bill Drayton to establish an organization to support social entrepreneurs around the world.

Bornstein defines social entrepreneurs as people with new ideas to address major problems. His book tells stories of individuals around the world who have been working to change behavior patterns and perceptions. The book looks at organizational characteristics, personal qualities, and strategies to make change happen portraying real people doing real things well. The entrepreneurial person sees a problem, envisions a new solution, and takes the initiative to act on that vision. He or she gathers resources and builds an organization to market the vision.

For the person interested in getting a quick overview of the book, scanning the opening chapters on Restless People and From Little Acorns Do Great Trees Grow and the concluding chapter titled Emergence of the Citizen Sector will provide a good overview of the book. Drayton was an assistant administrator with the U.S. Environmental Protection Agency in 1978 and conceived of building an organization to support talented change makers. Today Drayton’s organization, Ashoka, operates in 46 countries and has assisted 1400 social entrepreneurs, and the book tells some of their stories.

The book truly has a global focus and the stories told about people and the lessons learned appear well documented. Interviews with the social entrepreneur and those who have benefited are presented. For example, you will read about Veronica Khosa, a 54 year old nurse working in Pretoria’s AIDS testing center, who formed an organization focusing on dignity and care of AIDS patients and strengthening capacities of families and communities. Although the term “extension” is not applied to the work being done by these social entrepreneurs, I would challenge any of you reading the book to think about the best practices of extension professionals or best programs you’ve encountered and consider—could I be telling a similar story about them? Bornstein has the ability to describe the problem, outline the actions which were taken and share the accomplishments and hopes for the future.

I appreciate the optimistic tone Bornstein chose in telling the story, but at times found myself wondering what was
tried and didn’t work? Could the reader also benefit from hearing “the other side of the story”? He addressed this briefly in the epilogue as he talked about being in the process of writing the book and living in New York in September of 2001. The book clearly presents the premise that the antithesis of the terrorist’s impulse is the social entrepreneur. “Social entrepreneurs demonstrate the power of building things instead of destroying them. And they are addressing the underlying causes of today’s global instability: lack of education, lack of women’s rights, the destruction of the environment, poverty” (p. 281).

In rereading How to Change the World and thinking about applications for extension, I found myself turning back to the chapters on Practices of Innovative Organizations and Six Qualities of Successful Social Entrepreneurs. If change is to occur, an extension organization and its structure must be open to innovation and the people who work as a part of it must believe themselves to be innovative and able to turn a vision into reality. Entrepreneurship and innovation are terms extension professionals will be hearing more about in the future and this book provides one of the best introductions I have found to a complex topic. A national U.S. Extension conference on innovation sponsored by CSREES in October of 2004 featured Bornstein as the keynote presenter.

Bornstein describes the four qualities innovative organizations need to put in place to foster entrepreneurship: Institutional listening which is enhanced by having in place systems and guidelines for how we listen to our clientele. Chance discussions or “knowing what people think” are not sufficient. Paying attention to the exceptional means being particularly observant of unexpected successes and expeditious ways for them to become routine while listening and watching. Designing real solutions for real people reminds us to be realistic about human behavior and how to get clients to accept the “new product” or change being offered. Finally, focusing on human qualities stresses the importance of the people we recruit, hire, and manage. We must find people who demonstrate empathy, flexible thinking and a “strong inner core.”

Bornstein’s research points to six qualities of successful social entrepreneurs. You’ll need to read the book to find out the specifics, but a key factor appears to be the quality of motivation and determination to achieve a long-term goal that had meaning to them personally. Some of the most successful social entrepreneurs are working quietly, in small groups and in relative obscurity. At some point each decided: “I had to do this.” Their quiet, steady and unremitting pressure is the force causing change.

Extension is a part of what Bornstein calls the citizen sector and he describes the change it is going through as comparable to those that occurred in the business sector over the past three centuries. He notes, “the citizen sector...is beginning to resemble a market economy of social ideas characterized by a rich diversity of grassroots institutions and energetic entrepreneurs crafting solutions that no one could have anticipated, let alone planned for” (p. 269). The citizen sector may want to turn to law rather than business for guidance in developing performance metrics. Consider the jury system. It is a structured process using decision rules and analytic tools such as the conceptual test of “reasonable doubt.” Everyday citizens serving on criminal juries weigh the evidence and make life and death decisions that don’t employ quantitative data; instead it is the application of courageous judgment (p. 273).

This book would be a good tool for Extension leaders and university professors teaching courses on extension or educational change to consider using. A colleague at Ohio State, has done just that, organizing the course content around the book and four key questions: (I) What makes us who we are – understanding ourselves and others; (II)
What makes systems work – understanding systems thinking; (III) What makes a particular situation work – understanding strategic design; (IV) What innovation is needed – understanding social innovation. Can extension, as it becomes more entrepreneurial, design new decision making processes and better feedback mechanisms so that quality endeavors are not under funded? How to Change the World provides insights and guideposts and will cause you to ask questions and look differently at what you do and how you do it.


### List of Reviewers for Volume 11, 2004

<table>
<thead>
<tr>
<th>Reviewer</th>
<th>Affiliation</th>
<th>Country</th>
</tr>
</thead>
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<tr>
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<tr>
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<td>Montana State University</td>
<td>USA</td>
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<tr>
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