The Journal of International Agricultural and Extension Education is the official refereed publication of the Association for International Agricultural and Extension Education. The purpose is to enhance the research and knowledge base of agricultural and extension education from an international perspective.

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 should not have been published or be under consideration for publication by another journal.

Three types of articles are solicited for the Journal: Feature Articles; Commentary Articles; Tools of the Profession Articles.

**Feature Articles**

Feature articles focus on philosophy, current or emerging issues, and the methodology and practical application of specific research and appropriate technologies, which have implications for developed and developing countries. Feature articles go through the Journal’s blind review process utilizing peer reviewers to evaluate content and readability. Reviewers are usually selected from the membership of the AIAEE. In the blind review process all reference to author(s) is removed before the manuscript is sent to reviewers.

**Commentary Articles**

Commentary articles state an opinion, offer a challenge, or present a thought-provoking idea on an issue of concern to international agricultural and extension education, including a published article in the Journal. Commentary articles are reviewed by two members of the editorial board for appropriateness and relevance to the Journal, and for readability.

**Tools of the Profession Articles**

Tools of the Profession articles report on specific techniques, materials, books and technologies that can be useful to agricultural and extension educators in a global context and/or in a country/region. Tools of the Profession articles are reviewed by two members of the editorial board for appropriateness and relevance to the Journal, and for readability.

The Journal is distributed in one of three formats: printed copy ($25), computer disk ($15), or email ($10). Subscriptions should be made payable to AIAEE and mailed to Dr. Steve Jones, Director - MAST, Room 240 Vo Tech Building, 1954 Buford Ave., University of Minnesota, St. Paul, MN 55108. Please visit the AIAEE Website at: [http://ag.arizona.edu/aed/aiaee](http://ag.arizona.edu/aed/aiaee)
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From the Editor
These are exciting times for the Association for International Agricultural and Extension Education (AIAEE) and the Journal of International Agricultural and Extension Education. This is the first issue of Volume 8 of the Journal. While it is still a “new” Journal compared to other scholarly publications in agricultural and extension education, it has been a very successful start. The Journal’s success has followed the growth and expansion of its parent organization, AIAEE. The organization will hold another successful conference this spring at Louisiana State University in Baton Rouge, LA and just one year from now the organization will hold its second meeting outside the United States, when it travels to South Africa in the spring of 2002.

Yet, as both the Journal and AIAEE has grown over the past few years, there is still a great potential for additional expansion. This past year has seen a drop in the number of papers submitted for publication to the Journal. This comes even as the Editorial Board decided to eliminate the submission fee. Unfortunately, this did not result in an increase in submissions. Even with the increasing pressure to conduct scholarly research and publish in peer-reviewed journals, the submissions to the Journal of International Agricultural and Extension Education lags behind expectations.

It is with this background, that I pose a challenge to all AIAEE members. I would encourage each AIAEE member in 2001 to do two things. First, I would like all AIAEE members to submit at least one scholarly article, either a feature-research paper, a commentary article, or an innovative idea or book review for the Tools for the Profession section. Secondly, I would like each member to give a copy of the Journal (back issues are available) to a friend, colleague, graduate student, etc. and encourage them to join AIAEE and submit an article for publication to the Journal. As an Editor, I would like to receive from 50 to 75 articles in 2001 for possible publication in the Journal.

In addition to more submissions, the Journal is in desperate need of people willing to review papers submitted for publication. As Editor, I try to spread the articles among my list of reviewers so no one person is asked to read too many papers per year. However, I must continually ask a handful of people to review articles because the list of reviewers is shrinking. Therefore, I ask that if you have a spare hour or two and would like to keep current about the latest research and scholarly writing in international agricultural and extension education, please volunteer to serve as a reviewer for the Journal.

If you accept these challenges, the information you need is included in this issue of the Journal. Information on submitting manuscripts for publication is included on the inside front and back covers of this issue. I’ve also enclosed a copy of the subscription form and peer reviewer form in the back of the issue. Please consider submitting a manuscript and volunteering to serve as a peer reviewer. The Journal of International Agricultural and Extension Education and the AIAEE can only continue to grow and prosper if scholars are willing to participate in these important activities.
Predictors of the Adoption of Educational Technologies by Faculty in the University of Guadalajara Center for Biology, Agronomic and Animal Sciences

Ana Carr
Professor, University of Guadalajara

Greg Miller
Associate Professor, Iowa State University

Abstract

The primary purpose of this study was to determine whether personal and institutional characteristics of professors at the University Center for Biology, Agronomic and Animal Sciences (CUCBA) in the University of Guadalajara, Mexico could be used to predict their adoption of computers and the Internet for traditional classroom instruction and their potential adoption of distance education for learning and for teaching. Four variables explained 18% of the variance in professors' adoption of computers and the Internet for classroom instruction. Potential adopters of distance education for learning were more likely to choose distance education for learning via the Internet, report that their highest level of education was a bachelor's degree, report their subject matter discipline as veterinary science, have been teaching longer and were less likely to be self-taught computer users than those who were not potential adopters. Predictors of the adoption of distance education for teaching were consistent with those identified for the adoption of distance education for learning.

Introduction

The University of Guadalajara is the only public university in the state of Jalisco, Mexico. It has about 50,000 students enrolled in higher education, and 96,300 students attending high school (Universidad de Guadalajara, 1998b). The university’s system of operation is referred to as Red Universitaria or University Net. The net is a system that connects several university centers throughout the state of Jalisco. The university’s mission embraces teaching, research, and extension as a means to promote economic development and scientific advancement similar to the mission of a typical land-grant university in the United States. Most land-grant universities in the United States have a college of agriculture. Likewise, the University of Guadalajara has a University Center for Biology, Agronomic and Animal Sciences (CUCBA).

Only a small proportion of the 10,259 academicians employed by the University of Guadalajara hold graduate degrees. This is a concern of the university as it tries to reinforce the academic culture of the institution (Universidad de Guadalajara, 1998c). What options are available to enhance the educational level of faculty in the University of Guadalajara? Carr (1999) indicates that Mexican national universities with graduate programs, universities in other countries, and distance learning are options.

Providing equal access to education and access to information sources are two additional challenges faced by the University of Guadalajara (Universidad de Guadalajara, 1998b). Computers, the Internet, and distance education may be useful tools in addressing challenges faced by the university. Educators in Mexico have found that the advantages of modern technologies help them to cope with both old and new challenges at the higher education level (Alvarez-Manilla, 1996). As with any new technology, even those with obvious advantages, securing adoption by a majority of the population is not an easy task. Adoption takes time, the amount of which is influenced by individual decision-making processes, the individual’s level of innovativeness, and the rate of adoption in the system (Rogers, 1995). Are faculty in the CUCBA ready to adopt these technologies? Faculty readiness is an important consideration because resistance by faculty can be a major barrier to technology implementation (Dillon and Walsh, 1992). Researchers (Faseyitan & Hirschbuhl, 1992; Masiclat, 1992; Wu, 1996; Yarbrough, 1986) have examined factors that influence educators’ adoption of instructional
technologies. The question that still remains, however, is what factors might influence CUCBA professors’ adoption of educational technologies for traditional classroom instruction, for distance learning, and for distance teaching?

**Purpose and Objectives**

The primary purpose of this study was to determine whether personal and institutional characteristics of professors at the University Center for Biology, Agronomic and Animal Sciences (CUCBA) in the University of Guadalajara, Mexico, could be used to predict their adoption of computers and the Internet for traditional classroom instruction and their potential adoption of distance education for learning and for teaching. The objectives of the study were as follows:

1. Describe selected demographic characteristics of CUCBA professors.
2. Describe CUCBA professors’ interest in computers and their interest in distance education for learning and for teaching.
3. Describe how CUCBA professors were using computers for traditional classroom instruction.
4. Identify predictors of CUCBA professors’ adoption of computers and the Internet for traditional classroom instruction.
5. Identify predictors of CUCBA professors’ potential adoption of distance education for learning and for teaching.

**Procedures**

The target population (N=234) included all full-time and selected part-time professors who taught at least one course in any of the majors offered by CUCBA. A list of all technical and academic personnel (N=341) was provided by the CUCBA administration. The list of technical and academic personnel was reviewed by department heads and secretaries to eliminate names of persons not involved in teaching. All members of the target population were surveyed.

The questionnaire was developed by the researchers. It contained 100 questions and was organized into six sections. A variety of question types were used including Likert-type items, closed-ended questions, partially closed-ended questions, and open-ended questions. Included in the questionnaire was a computer and Internet self-efficacy instrument. This instrument was developed after reviewing similar instruments developed by Murphy, Coover, and Owen (1988), Delcourt and Kinzie (1993), and Faseyitan and Hirschbuhl (1992). The computer and Internet self-efficacy instrument contained 17 Likert-type items with response options ranging from 1 (not confident) to 5 (most confident).

Content and face validity for the questionnaire were established by a panel of experts from CUCBA and Iowa State University. To enhance design and clarity, the questionnaire was field-tested with a group of 10 Spanish-speaking graduate students at Iowa State University. These graduate students had previously been employed as professors of agriculture at universities in Mexico and other Latin-American universities. Five of the graduate students completed the questionnaire a second time four weeks later. The coefficient of stability for this test-retest procedure was .81. The computer and Internet self-efficacy instrument was not included in the test-retest procedure. Instead, Cronbach’s alpha was calculated on data received from the actual survey and resulted in a coefficient of .95.

Data were collected in the spring of 1998. The questionnaire along with a cover letter and an ink pen were distributed to all persons in the target population. The ink pen was intended to be an incentive for participation in the survey. Cultivando el Futuro, CUCBA, Universidad de Guadalajara (Cultivating the future, CUCBA, University of Guadalajara), was printed on the pen. Most professors received their materials when they went to the treasurer’s office to collect their paycheck. Materials were delivered to the offices of the remaining professors. Approximately two weeks after initially distributing the questionnaires, nonrespondents were sent a written reminder and a replacement questionnaire. A total of 159 useable questionnaires was returned for a response rate of 68%. Nonresponse error was addressed by comparing early and late respondents (Miller & Smith, 1983). Early respondents (n=124) were those who returned their questionnaire within
two weeks. The remaining 35 respondents were considered late. Comparisons were made on professors’ adoption of computers and the Internet for traditional classroom instruction, professors’ potential adoption of distance education for learning and for teaching, and professors’ computer and Internet self-efficacy. No significant differences were found and the results were deemed generalizable to the population.

Analysis of Data

All data were analyzed with the SPSS for Windows, version 7.0, personal computer program. Davis’ (1971) descriptors were used to interpret the magnitude of all measures of association. Because of the exploratory nature of the study, the alpha level was set a priori at .10. In preparation for the stepwise regression analysis and discriminant analysis procedures that were used, variables at the nominal level were coded into a set of dummy variables (Norusis, 1990). Measures of association between the predictor variables and the dependent variables and among the predictor variables included Pearson correlations, point biserial correlations, biserial correlations, and phi coefficients.

Findings

Objective 1. Describe selected demographic characteristics of CUCBA professors.

Most (89%, n = 135) of the professors held full-time positions in the CUCBA. A majority (57.6%, n = 91) of professors held master’s degrees as their highest level of educational attainment, 27.2% (n = 43) held the bachelor’s degree and 15.2% (n = 24) held the Ph.D. degree. The professors were, on the average, 38.7 years of age with a standard deviation of 7.3 and had completed 9.9 years of service to the CUCBA with a standard deviation of 7.4. The most frequently cited area of expertise reported by the professors was biological sciences (43%, n = 68) followed by agronomical sciences (30%, n = 48), veterinary sciences (17%, n = 26), social sciences (6%, n = 9), and mathematic and exact sciences (4%, n = 7). Almost three fourths (74.2%, n = 118) of the professors were male.

Objective 2. Describe CUCBA professors’ interest in computers and their interest in distance education for learning and for teaching.

Most (90%, n = 141) of the professors at CUCBA were very interested in learning more about computers and 99% (n = 151) were interested in improving their skills in using some software. More than three fourths of the professors (82%, n = 120) were planning to restructure their courses to use computers more extensively.

A majority (60%, n = 92) of the CUCBA professors considered distance education as an option for their own education. These professors noted such advantages as time management, practicality, availability when local attendance is not an option, ability to maintain family and career responsibilities, and a reduction in the need to travel. Slightly more than one fourth of the professors (26.2%, n = 40) did not consider distance education as an option for their own education. They noted concerns about the lack of interaction, a preference for on-campus study, and concerns about quality. Approximately half (49%, n = 75) of the professors at CUCBA were interested in teaching courses at a distance.

Objective 3. Describe how CUCBA professors were using computers for traditional classroom instruction.

A majority (67%, n = 102) of CUCBA professors frequently or very frequently used computers to prepare for classes, 54% (n = 82) required students to use computers in completing homework, 31% (n = 47) taught with computers, and 5% (n = 7) used electronic mail to deliver class materials and to communicate with students.

Objective 4. Identify predictors of CUCBA professors’ adoption of computers and the Internet for classroom instruction.

Professors’ adoption of computers and the Internet for traditional classroom instruction was measured with a 5-point Likert-type scale consisting of five statements. Response options ranged from 1 (never) to 5 (very frequently). Professors provided a mean score of 2.5 with a standard deviation of .8 on the scale.
Twenty-nine independent variables were considered for inclusion in a stepwise multiple linear regression analysis. Eleven of these were significantly correlated with adoption of computers and the Internet for traditional classroom instruction and were used in the analysis. Associations ranged in magnitude from low to moderate. It was determined that four variables explained a statistically significant unique proportion of the variation. These were (1) computer and Internet self-efficacy, (2) sharing experiences and knowledge about computers with other people, (3) professors’ use of an Internet account, and (4) whether professors were planning to restructure courses to increase their use of computers in the classroom. The four variables explained 18% of the variance in professors’ adoption of computers and the Internet for classroom instruction (Table 1).

Table 1
Stepwise multiple regression of adoption of computers and the Internet for traditional classroom instruction on the significant independent variables.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>R^2</th>
<th>R^2 Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer software and Internet self-efficacy</td>
<td>.11</td>
<td>.11</td>
</tr>
<tr>
<td>Sharing experiences and knowledge about computers</td>
<td>.15</td>
<td>.04</td>
</tr>
<tr>
<td>Plan to restructure courses for more computer use</td>
<td>.17</td>
<td>.02</td>
</tr>
<tr>
<td>Use of an Internet account</td>
<td>.18</td>
<td>.01</td>
</tr>
</tbody>
</table>

Objective 5. Identify predictors of CUCBA professors’ potential adoption of distance education for learning and for teaching.

Professors’ potential adoption of distance education for learning was measured by the professors’ response to the question “Do you consider distance education as an option for your own education?” A majority (60%, n = 92) of professors responded affirmatively whereas 26% (n = 40) responded negatively. Data from professors (14%, n = 21) who indicated that they were uncertain about the meaning of distance education were not included in the analysis.

Thirty-six independent variables were examined for possible relationships with professors’ potential adoption of distance education for learning. Of these thirty-six variables, sixteen were significantly related to the dependent variable with magnitudes ranging from low to moderate.

Stepwise Discriminant analysis was used to determine if a linear combination of the sixteen significantly correlated variables could be used to predict adoption of distance education for learning. Out of 159 cases, only 109 were used in the discriminant analysis, due to missing data on the discriminating variables. Of these, 35 belonged to the non-potential adopters group and 74 to the potential adopters group. For the classification of all professors, a mean substitution was used for missing data. The mean discriminant score (centroid) for potential adopters (.46) was significantly different from the mean discriminant score for non-potential adopters (-.98) (Wilks’ Lambda = .68, Chi-square (5df) = 39.78, p<.10) The analysis resulted in an eigenvalue of .46 and a canonical correlation of .56. The most distinguishing characteristics of potential adopters of distance education for learning, when compared with non-potential adopters, can be determined by examining the standardized discriminant function coefficients (Table 2).

Potential adopters were more likely to choose distance education for learning via the Internet, report that their highest level of education was a bachelor’s degree, report their subject matter discipline as veterinary science, have been teaching longer, and were less likely to be self-taught computer users than those who were not potential adopters of distance education for learning.

The discriminant function resulted in an overall correct classification rate of 77%. Potential adopters of distance education for learning were correctly classified 79% of the time whereas non-potential adopters were correctly classified 70% of the time. Random assignment of professors to adoption groups would result in correct classification 50% of the time. Classification of professors using the five
Table 2

Summary of data from the discriminant analysis procedure, predicting potential adoption of distance education for learning

<table>
<thead>
<tr>
<th>Variables</th>
<th>b</th>
<th>s</th>
<th>Group</th>
<th>Centroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would use distance education for learning via Internet</td>
<td>.50</td>
<td>.37</td>
<td>Potential adopters</td>
<td>.46</td>
</tr>
<tr>
<td>Highest degree was bachelor’s</td>
<td>.46</td>
<td>.49</td>
<td>Non-potential adopters</td>
<td>-.98</td>
</tr>
<tr>
<td>Subject matter discipline: veterinary science</td>
<td>.45</td>
<td>.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-taught computer user</td>
<td>-.42</td>
<td>-.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years teaching</td>
<td>.35</td>
<td>.44</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>$R_c$</th>
<th>Wilks’ Lambda</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>.46</td>
<td>.56</td>
<td>.68</td>
<td>&lt;.10</td>
</tr>
</tbody>
</table>

$b = $standardized canonical discriminant function coefficient. $s = $within-groups structure coefficient. $R_c = $canonical correlation coefficient.

discriminating variables resulted in 53% fewer errors than would be expected from random classification ($\tau = .53$). Professors’ potential adoption of teaching at a distance was measured by their response to the question, “Do you think you are interested in teaching courses at a distance?” Almost half (49%, $n = 74$) of the professors answered yes and 24% ($n = 36$) answered no. Data from professors (28%, $n = 42$) who indicated that they were uncertain about the meaning of distance education were not included in the analysis.

Thirty-seven variables were examined for possible relationship with the dependent variable. Of these thirty-seven variables, ten had significant associations with the dependent variable ranging in magnitude from low to moderate.

Stepwise discriminant analysis was used to determine the linear combination of these ten significantly correlated variables that most accurately predicted the professors’ potential adoption of teaching at a distance. Due to missing data on the discriminating variables, only 92 of the 159 cases were used in the discriminant analysis. Of these, 30 belonged to the non-potential adopters group, and 62 belonged to the potential adopters group. For the classification of all professors, a mean substitution was used for missing data.

The procedure resulted in the selection of seven discriminating variables from the ten included in the analysis. The mean discriminant score (centroid) for the potential adopters (.57) was significantly different from the mean discriminant score for non-potential adopters (-1.19) ($\text{Wilks’ Lambda} = .59$, $\chi^2 (7 \ df) = 45.6, p < .10$). The eigenvalue was .69 and the canonical correlation was .64. The most distinguishing characteristics of potential adopters, when compared with non-potential adopters, can be determined by examining the standardized discriminant function coefficients (Table 3).

When compared with non-potential adopters, potential adopters of teaching at a distance were more likely to share experiences and knowledge about computers with other people, to consider restructuring their courses to incorporate more use of computers, to consider distance education as an option for their own learning, and to choose distance education for learning via the Internet and satellite. Potential adopters were less likely to be self-taught computer users and have expertise in sociology.
Table 3

Summary of data from the discriminant analysis procedure, predicting potential adoption of teaching at a distance.

<table>
<thead>
<tr>
<th>Variables</th>
<th>b</th>
<th>s</th>
<th>Group</th>
<th>Centroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Self-taught computer user</td>
<td>-.44</td>
<td>-.43</td>
<td>Potential adopters</td>
<td>.57</td>
</tr>
<tr>
<td>2. Sharing experiences and knowledge about computers</td>
<td>.41</td>
<td>.25</td>
<td>Non-potential adopters</td>
<td>-1.19</td>
</tr>
<tr>
<td>3. Plan to restructure courses for more computer use</td>
<td>.39</td>
<td>.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Subject matter discipline: sociology</td>
<td>-.36</td>
<td>-.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Consider distance education an option for own education</td>
<td>.35</td>
<td>.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Would choose distance education for learning via Internet</td>
<td>.34</td>
<td>.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Would choose distance education for learning via satellite</td>
<td>.28</td>
<td>.38</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>$R_c$</th>
<th>Wilks’ Lambda</th>
<th>p</th>
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<tbody>
<tr>
<td>.69</td>
<td>.64</td>
<td>.59</td>
<td>&lt;.10</td>
</tr>
</tbody>
</table>

Note: $b =$ standardized canonical discriminant function coefficient; $s =$ within-groups structure coefficient; $R_c =$ canonical correlation coefficient.

The discriminant function resulted in an overall correct classification rate of 81%. Potential adopters of teaching at a distance were correctly classified 84% of the time whereas professors who are non-potential adopters were correctly classified 75% of the time. Random assignment of professors to adoption groups would result in correct classification 50% of the time. Classification of professors using the five discriminating variables resulted in 62% fewer errors than would be expected from random classification (tau = .62).

**Conclusions and Recommendations**

CUCBA professors were using computers to prepare for classes and were using computers on a much more limited basis to teach, disseminate materials, and communicate with students. Faculty in previous studies (Nordheim & Connors, 1997; Adam & Wilson, 1996) also were using computers for planning but using them less often as a teaching tool. To promote the adoption of computers and the Internet for traditional classroom teaching at CUCBA, programs are needed to enhance faculty confidence in their ability to use computers and the Internet. Based on Bandura’s (1986) theory, it is recommended that faculty be provided with authentic experiences with computers, be provided access to a network of colleagues with whom to discuss their experiences and knowledge about computers, and be provided with positive reinforcement to recognize their efforts.

Because the University of Guadalajara places a priority on hiring and rewarding faculty with the Ph.D. degree (Universidad de Guadalajara, 1998c), a significant proportion of the CUCBA faculty could benefit from advanced formal education. Distance education may provide a viable option for enhancing the educational level of CUCBA faculty. Faculty expressed interest in distance education for their own education and were very interested in learning more about computers and selected software programs. In planning for potential distance-learning programs, CUCBA administrators should target faculty whose highest level of education is the
bachelor’s degree, have relatively more teaching experience, have expertise in the area of veterinary sciences, and have participated previously in computer training. Administrators should also promote programs delivered via the Internet. In order to appeal to faculty who do not currently consider distance education as an option for their own education, administrators and faculty must address issues of interaction and concerns about quality.

A significant number of CUCBA professors were interested in teaching courses via distance education technologies. The most distinguishing characteristics of this group of faculty were similar to those of faculty who were potential adopters of distance education for learning. In fact, one of the most distinguishing characteristic of faculty interested in teaching at a distance was that they considered distance education to be an option for their own education. It is recommended that CUCBA administrators seek to involve the same faculty at the same time in distance education programs to enhance their educational level and to offer courses to CUCBA clientele. If faculty experience distance education as learners at the same time that they are responsible for teaching at a distance, they may be better prepared to design more effective instructional programs.

References


http://www.udg.mx/docs/realyfutu/SistemaEMS.html

http://wwudg.mx/udg/docs/realyfutu/UDGsActual.html


Fiscal Sustainability of Agricultural Extension: The Case of the Farmer Field School Approach

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Abstract
Agricultural extension programs or pilots based on the Farmer Field School (FFS) approach are being implemented in many developing countries in Asia and Africa. Evidence from the Philippines and Indonesia, two key areas in implementing this extension effort, shows that fiscal unsustainability of the FFS if applied on a large scale is a risk that cannot be ignored. Because of high costs per trained farmer, the amount of funding for extension in the Philippines cannot provide for significant farmer outreach. Farmer-led field schools are viewed by some as a way out of this fiscal dilemma if part of the cost is shifted to the community, but farm survey data from Indonesia indicate that the extent of the takeover of training responsibilities by farmers has been minor. Furthermore, farmer-led schools are still not funded mainly by community resources. The results suggest a need for great selectivity and caution in initiating FFS pilots, with a focus on the fiscal sustainability of the program if the intention is to scale up these activities.

Introduction
Agricultural extension can be described as the process of introducing farmers to knowledge, information, and technologies that can improve their production, income and welfare (Purcell and Anderson, 1997). In many developing countries agricultural extension is considered an important public good that deserves public support. However, fiscal sustainability has been a generic problem for large-scale agricultural extension systems in developing countries (Feder, Willett, and Zijp, 1999). High-cost national systems have been significantly scaled down or discontinued altogether in large part because the fiscal demands they placed on public budgets were not sustainable. In a review of World Bank supported agricultural extension projects in the 1977-1992 period, Purcell and Anderson (1997) found that “Inadequate funds to operate the services properly was a common phenomenon, with a high proportion (76 percent) of free-standing projects having an uncertain or unlikely sustainability rating” (p.4). They added that “… most borrowers encountered serious difficulties in meeting the recurrent cost expenditures of national extension services, to the extent that in many cases the sustainability of the instituted systems was in doubt” (p.84). Fiscal sustainability is a concern of public extension systems even in developed countries (Hanson and Just, 2001).

This paper is a two-country analysis that focuses on the issue of fiscal sustainability as experienced when using the farmer field school (FFS) approach as the main agricultural extension method for reaching farmers over a large geographical area. The farmer field school is a season long, non-formal training program for selected farmers within a locality, usually a village. We define fiscal sustainability as the financial ability to maintain the extension effort at a level that can realistically be expected to attain significant coverage (directly or indirectly) of the farming population nationwide.

The focus on fiscal sustainability is warranted even though a rigorous cost-benefit analysis of the FFS approach at a national level is not yet available. The experience of the high-cost Training and Visit (T&V) extension system provides useful insights justifying such a focus. In the period 1975-1995, the T&V extension approach was adopted in scores of countries, often with the active promotion and support of the World Bank. In most countries where the system was adopted, after several years of operation, the system was scaled back due to fiscal difficulties, and the structure was simplified or abandoned. In many countries where T&V was significantly scaled down or abandoned, no rigorous extension effectiveness or economic impact studies were done, but positive indicators of performance were provided by Monitoring and Evaluation units, extension administrators, and other
commentators, based on non-rigorous studies and subjective field observations. An interesting illustration of the point being made here is the case of Kenya. An econometric study conducted in the early nineties suggested very high economic rates of return to T&V extension investments in Kenya (Bindlish and Evenson, 1993). These results were later challenged in another study (Gautam and Anderson, 1999), but the system had already faced serious fiscal strains by 1996 and its operations were adversely affected. These experiences show that funding difficulties can adversely affect national extension operations, even in the face of positive indications on performance. These lessons justify the need for a careful examination of the fiscal dimensions of extension efforts intended as national systems, even in the absence of a complete analysis of the costs and benefits of these extension systems.

In keeping a focus on fiscal sustainability, this paper does not attempt a cost-benefit analysis or a full cost effectiveness study of the FFS approach, nor does it investigate other attributes which are pertinent to extension effectiveness (e.g., empowerment effects, environmental impact, quality of training). Alternative approaches to extension and their financing are described in Feder, Willett and Zijp (1999) and Van den Ban (2000). Hanson and Just (2001) elaborate on the economic principles and circumstances appropriate for moving from public to paid extension, and outline the potential for mixed public, private, and paid extension.

The paper is organized as follows. Section 2 briefly describes the farmer field school extension approach, while Section 3 discusses the potential of formal and informal farmer-led diffusion mechanisms to enhance the fiscal sustainability of this approach. Sections 4 and 5 present evidence on the fiscal sustainability issue from the Philippines and Indonesian experiences, respectively. We conclude in Section 6 with the implications of our findings for policy.

The Farmer Field School Extension Approach

The FFS approach was designed originally as a way to introduce knowledge on integrated pest management (IPM) to irrigated rice farmers in Asia. The Philippines and Indonesia were key areas in implementing this extension effort. Experiences with IPM-FFS in these two countries have since been documented and used to promote and expand FFS and FFS-type activities to other countries and to other crops. Currently, FFS activities are being implemented in many developing countries, although only a few operate FFS as a nationwide system. The World Bank has incorporated the FFS in some of its agricultural projects.

At present, a typical FFS educates farmer participants on agro-ecosystems analysis, or what can be more generally described as integrated pest and crop management (IPCM), as it includes practical aspects of “... plant health, water management, weather, weed density, disease surveillance, plus observation and collection of insect pests and beneficials” (Indonesian National IPM Program Secretariat, 1991, p.5). The FFS approach relies on participatory training methods to convey knowledge to field school participants to make them into “…confident pest experts, self-teaching experimenters, and effective trainers of other farmers” (Wiebers, 1993). An archetypal FFS now entails some 8-12 half-day sessions of hands-on, farmer experimentation and non-formal training to a group of 20-25 farmers during a single crop-growing season. Initially, paid trainers lead this village-level program, focusing on problem-solving approaches in pest management as well as delivering elements and practical solutions for overall good crop management practices. Through group interactions, attendees sharpen their decision-making abilities and are empowered by learning leadership, communication and management skills (van de Fliert, 1993).

Farmer Field Schools and Fiscal Sustainability

A major issue with promoting FFS as an agricultural extension approach is the financial commitment entailed in the continued operation of such an effort, particularly on a national scale. If government is to carry out a significant training program over a long period of time relying on official trainers, a significant fiscal obligation is implied. The experience of other extension systems has proven this to be a non-
sustainable proposition.

One approach to reducing the fiscal burden, thus enhancing sustainability, has been the principle of farmer-trainers. The concept is to encourage FFS graduates to train other farmers and thereby reduce the dependence of FFS on significant official funding support. For this purpose, selected and interested FFS alumni are invited to attend special training-of-farmer-trainer (TOFT) sessions so they themselves become schooled in experience-based learning methods and can organize and facilitate their own field schools using local resources. Farmer-to-farmer field school training is viewed as a promising route to multiplying FFS coverage, with the sustainability of the overall field-school approach resting on the spread and effectiveness of farmer-led schools.

In addition to farmer-led schools, which may be considered as a formal diffusion mechanism, one needs to consider the potential for transmission of the knowledge acquired in FFS through informal communication among farmers. In the case of specific technological innovations (e.g., high-yielding grain varieties), key aspects of the technology are the primary subjects of diffusion, and these have been observed in many studies to diffuse mainly through informal farmer-to-farmer communications (Rogers, 1983). However, the knowledge imparted in the course of an FFS is of a very different nature, as the objective of the training is "to help farmers develop their analytical skills, critical thinking, and creativity, and to help them learn to make better decisions" (Kenmore, 1998). "Farmers do not master a specific set of contents or 'messages', rather they master a process of learning that can be applied continuously" (Dilts, 1999). Accordingly, the curriculum of FFS includes complex agro-ecosystem concepts and decision making principles that, if conveyed casually through oral communications, are not likely to appeal to a farmer’s day-to-day interest. Furthermore, the casual transmission of specific components of technologies and practices, if done away from the field, is likely to be less effective and the receiving farmers may not obtain sufficient knowledge to enable them to develop useful adaptations to their particular conditions.

This paper will demonstrate that in the Philippines and Indonesia, where experiences with FFS as an extension approach are the longest, the extent of formal farmer-led school coverage is small, the impact of informal exchange is limited, the reliance on official financing is heavy and consequently, the sustainability issue remains unsettled.

**The Philippines Case**

In the Philippines, nationwide IPM-FFS activities, more formally known as the KASAKALIKASAN program, were first instituted as a five-year program (1993-1997) under the Department of Agriculture. Presently, the program remains financed mainly from the national budget. Annual funding levels are determined by what the central government can afford. Only limited program resources come from local governments, the private sector and some NGO's. The central government’s goal is to increase support from these latter sources because farmer coverage by the national effort is still limited.

An evaluation of KASAKALIKASAN by the SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA, 1997) notes that from 1993-1997, the program trained 183,829 farmers in 7202 farmer field schools. The web-site of the community IPM program for the Philippines (http://communityipm.org/philippines) indicates that by October, 2000 the program had trained almost 200,000 farmers. The budget allocated to the program for the 1993-1997 five-year period totaled PhP 235 million (US$ 8.75 million), or an investment of PhP 1280 (US$ 47.6) per trained farmer. Of this, 87.3% came from the Department of Agriculture and other central government agencies, whereas only 9.4% was paid for by local government units.

With continued reliance on public resources at current spending levels, it would take over 15 years to have one million Filipino farmers attend at least one FFS at a total cost of about US$ 47.6 million. This amounts to 20% of the estimated 5.0 million farm households nationwide. Given this slow pace, the prospects for significant coverage of the farming population through field schools are discouraging.

It is also important to note that the actual costs
are likely to be higher than those reported in the SEARCA 1997 evaluation. The reported budget estimates consist of direct program appropriations only, i.e., costs that have been charged to and paid for by funds allocated for the program. They do not include indirect expenses, including expenditures for administrative and other personnel resources of central, provincial, and municipal levels, not directly paid for from allocated program funds.

As argued in section 3, for it to be a sustainable national agricultural extension program, the FFS approach depends on the diffusion of FFS-acquired knowledge and skills either through informal farmer channels or through more formal farmer-led FFS efforts. However, the empirical evidence from the Philippines, on both counts, indicates that these channels of diffusion are not significant. First, a recent Philippine study by Rola, et al. (2000) affirms that like most farmers, FFS graduates share information informally, largely on a one-to-one basis and mainly with other farmers residing within the village. This study (based on a sample of 307 farmers) tested and scored the knowledge of three types of farmers: (a) FFS graduates, (b) non-FFS farmers identified as “FFS-knowledge-recipients” by FFS graduates and (c) farmers who had never been directly exposed to FFS. The knowledge tests consisted of crop and pest management questions on topics typically covered by field schools in the surveyed province. The results indicate some significant differences in knowledge scores between FFS graduates and non-graduates, but no significant differences between “FFS-knowledge-recipients” and other non-FFS farmers. The study indicates that there appears to be no significant transfer of FFS-acquired knowledge from FFS graduates to other farmers.

An earlier study by Rola, et al. (1998) explains why this is perhaps not too surprising. In the focus group discussions it conducted, this earlier study notes that “FFS graduates mentioned their willingness to share their notes, although it was not clear whether they were willing to spend time in teaching in the field” (p.20).

Second, there has been little reliance on farmer TOFT graduates in the Philippine FFS program. The SEARCA (1997) evaluation reports that between 1994-1997, only six TOFT sessions were conducted under KASAKALIKASAN,

with each having about 25 selected FFS graduates in attendance. In this context, unless there is an organized effort at farmer-to-farmer knowledge dissemination and official or NGO support of follow-up activities, the FFS approach in the Philippines will achieve very limited coverage. In the absence of such support, the maintenance of large-scale official involvement raises the problem of fiscal sustainability that has always dogged large extension systems.

The Indonesian Case

Farmer field schools focusing on IPM training were introduced in Indonesia through Food and Agriculture Organization (FAO) and United States Agency for International Development (USAID) assistance on a pilot basis in 1989. The World Bank-funded National IPM Training Project supported Indonesia’s nationwide IPM-FFS activities from 1994-99. To a greater degree than in the Philippines, the Indonesian national program aims at disseminating IPM and other knowledge through the encouragement and promotion of farmer-initiated and farmer-led FFS activities. All farmer graduates are encouraged to communicate information to their non-FFS counterparts, and specially trained farmer-trainers are expected to become the dominant element in organizing and facilitating FFS’s (Braun, 1997). Farmer-led FFS initiatives are important for raising program coverage and allowing FFS knowledge to diffuse more rapidly. Moreover, if some of the costs of farmer-led FFS’s (such as trainer honoraria, rents for experimental plots, food expenses and compensation provided to participants) are eventually borne by local communities, then there is not only more local ownership but also lower fiscal burden to be associated with publicly-funded investments in field schools.

With the end of the World Bank’s loan to the IPM Training Project in 1999, there are conflicting conclusions about the sustainability of the program. On the one hand, concerns have been raised about whether continuation of field school training by farmer-trainers is likely to take place on a significant scale. The World Bank’s internal operations evaluation process has raised doubts about the project’s sustainability. On the other hand, there are reports that argue that official trainer-led FFS’s
have already been succeeded by networks of farmer-trainers who carry out the majority of training in Indonesia (Kenmore, 1997; FAO, 1999). We examine empirical data on the nature and incidence of FFS training from two different farm-level surveys to assess the validity of these claims.

The first dataset we analyze was collected by the SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA) for an evaluation of the Indonesian national IPM-FFS training project. In 1999, SEARCA administered a farm-level survey to 1192 FFS participant and non-participant households in six Indonesian provinces that were key beneficiaries of the National IPM Training program. Evidence from this survey is reported in Tables 1-A to 4-A. The second dataset is a World Bank-funded 1999 farm-household survey that was administered to 454 households in the three main provinces on Java. This 1999 World Bank FFS Survey revisited the same respondents as were in a 1991 IPM-FFS survey conducted by the Center for Agro-Socio-Economic Research (CASER). Tables 1-B to 4-B from the 1999 FFS Survey provide additional evidence on the incidence of FFS training that has taken place over the years.

Tables 1-A and 1-B report the distribution of FFS graduates, by provider of FFS training, for the two surveys. Both surveys indicate that the vast majority of FFS graduates received their training from official (government of Indonesia staff) full-time trainers who were either PHP (Pengamat Hama dan Penyakit or pest observers) and/or PPL (extension agents). Of the 769 FFS graduates in the SEARCA survey, only 9.9 percent attended FFS’s where trained farmers (i.e., participants in TOFT) were the facilitators. In the World Bank survey (Table 1-B), only 4.9 percent of 225 FFS graduates attended farmer-led schools.

These data indicate that the IPM-FFS initiative has so far been largely a government-funded effort dependent on government trainers. In the post-World Bank project era, in the absence of significant government allocations, it is unlikely that there will be large-scale FFS activity; as evidently, there has not been an effective transfer of training responsibilities to farmers even during the project period when public funds to provide for farmer-trainer honoraria, farmer compensation, food and other supplementary assistance to farmer-led activities were more readily available. In this context, it is worth noting that the budgeted cost of a farmer-led school during the project period was actually higher than the cost of an official-led school, because two farmer-trainers with paid honoraria were needed to facilitate each farmer-led school (Braun, et al., 2000). As pointed out earlier, for farmer-led training to be less dependent on public funds in the post-project period, the communities will need to absorb a significant portion of the direct cost of schools.

While Table 1-A indicates an increased percentage of farmer-led FFS’s over time (from 2.7 percent before 1994 to 12.1 percent in 1994-99, complementary information (Table 2-A and 2-B) suggests that it is doubtful that graduates can take over the IPM-FFS movement on their own and spearhead FFS training on a wide scale. As Table 2-A shows, the number and percentage of FFS alumni who attended TOFT sessions have decreased among recent graduates. Whereas 14.1 percent of all FFS graduates before 1994 were TOFT participants, only 10.6 percent of the 1994-99 graduates were. The decline in participation in TOFT by FFS graduates is likely to have been even higher in the population. As explained in the annex, the SEARCA sample overstates the actual proportion of FFS graduates who were trained by other farmers. It is likely too that the SEARCA sample overstates the proportion of FFS alumni who eventually become FFS trainers. This is because the survey purposely selected villages where farmer-led FFS were held and these are also the villages more likely to have TOFT-trained facilitators. The bias is evident from national statistics of the IPM program (Community IPM web-site of December, 2000) which indicate that between 1993/94 and 1998/99, only 2.6 percent of FFS graduates also attended TOFT (as compared to 11.4 percent in the SEARCA sample). In addition, from the 1999 World Bank FFS Survey, Table 2-B shows that only 1 of 53 (or 1.9 percent of) FFS graduates in the 1994-99 period attended TOFT.
Table 1-A

Number & Percentage Distribution of FFS Graduates by Source of FFS Training

<table>
<thead>
<tr>
<th>Year attended FFS</th>
<th>PHP/PPLa</th>
<th>TOFTb</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Before 1994</td>
<td>174</td>
<td>94.6</td>
<td>5</td>
<td>2.7</td>
</tr>
<tr>
<td>1994 – 1999</td>
<td>498</td>
<td>85.1</td>
<td>71</td>
<td>12.1</td>
</tr>
<tr>
<td>Total</td>
<td>672</td>
<td>87.4</td>
<td>76</td>
<td>9.9</td>
</tr>
</tbody>
</table>

Source: 1999 SEARCA Survey
Notes: aPHP/PPL = pest observer/extension agent; bTOFT = participant of “Training of Farmer Trainers” Program

Table 1-B

Number & Percentage Distribution of FFS Graduates by Source of FFS Training

<table>
<thead>
<tr>
<th>Year attended FFS</th>
<th>PHP/PPLa</th>
<th>TOFTb</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Before 1994</td>
<td>167</td>
<td>97.1</td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>1994/95 – 1998/99</td>
<td>42</td>
<td>79.2</td>
<td>9</td>
<td>17.0</td>
</tr>
<tr>
<td>Total</td>
<td>209</td>
<td>92.9</td>
<td>11</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Source: 1999 World Bank FFS Survey
Notes: aPHP/PPL = pest observer/extension agent; bTOFT = participant of “Training of Farmer Trainers” Program

Table 2-A also shows that not all attendees of TOFT actually organize or facilitate a field school. Only 68.2 percent of farmer-trainers actually organized FFS activities. Furthermore, the level of training activity conducted by farmer-trainers is rather small. On average, each farmer-trainer organized or facilitated 1.1 FFS’s over the several years since they received the training (Table 3-A), but this figure overstates the extent of training led by farmers as it does not take into account the fact that typically two farmer-trainers join to facilitate a school (Braun, et al., 2000; van de Fliert, et al., 1995). The figures from the World Bank survey, Tables 2-B and 3-B are higher but the TOFT numbers in this survey are small making it difficult to draw reliable conclusions.

Tables 4-A and 4-B show that government budgets (central, provincial and district) were the main source of funds of schools facilitated by farmer-trainers. From the SEARCA survey, 37.7 percent of farmer-led FFS’s relied on central government (APBN) funds for support and 45.9 percent on provincial and district-level (APBD I/II) government budgets. For the training effort as a whole (i.e., all field schools, whether farmer-led or official-led), central funding amounted to 84 percent, while 13 percent came from provincial or district budgets. The apparent dependence on public resources for the farmer-led initiative, particularly after completion of the pilot phase, reinforces concerns regarding the sustainability of the effort.
Table 2-A

Participation in “Training of Farmer Trainers” (TOFT) and Execution of FFS Training by TOFT Graduates

<table>
<thead>
<tr>
<th>Year attended FFS</th>
<th>Total FFS graduates (1)</th>
<th>FFS graduates who attended TOFT (2)</th>
<th>% of Total FFS graduates (3)=[(2)/(1)]*100</th>
<th>FFS graduates who facilitated FFS training (4)</th>
<th>% of Total TOFT attendees (5)= [(4)/(2)]*100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1994</td>
<td>184</td>
<td>26</td>
<td>14.1</td>
<td>18</td>
<td>69.2</td>
</tr>
<tr>
<td>1994 - 1999</td>
<td>585</td>
<td>62</td>
<td>10.6</td>
<td>42</td>
<td>67.7</td>
</tr>
<tr>
<td>Total</td>
<td>769</td>
<td>88</td>
<td>11.4</td>
<td>60</td>
<td>68.2</td>
</tr>
</tbody>
</table>

Source: 1999 SEARCA Survey

Table 2-B

Participation in “Training of Farmer Trainers” (TOFT) and Execution of FFS Training by TOFT Graduates

<table>
<thead>
<tr>
<th>Year attended FFS</th>
<th>Total FFS graduates (1)</th>
<th>FFS graduates who attended TOFT (2)</th>
<th>% of Total FFS graduates (3)=2/1*100</th>
<th>FFS graduates who facilitated FFS training (4)</th>
<th>% of Total TOFT attendees (5)= 4/2*100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1994</td>
<td>172</td>
<td>10</td>
<td>5.8</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>1994/95 – 1998/99</td>
<td>53</td>
<td>1</td>
<td>1.9</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td>11</td>
<td>4.9</td>
<td>11</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: 1999 World Bank FFS Survey

Finally, we note that even if individual farmer trainers were to rely mostly on their own or local funds, farmer-led schools will be insufficient for covering a significant share of farmers in Indonesia based on the level of activity they have shown so far. Some 26,500 farmer-trainers (graduates of TOFTs), or about three percent of all FFS graduates, are estimated to have graduated from the Indonesia IPM Training Program between 1993-2000. If, as suggested by Table 3-A, each pair of TOFT graduates organizes 1.1 FFS’s over a period of six years, and if each of these farmer-organized FFS’s trains 20 new farmers on average, about 291,500 farmers will have been trained by all existing farmer-trainers over the course of the next six years. In other words, each FFS graduate would have given rise to only 0.33 (= 0.3 x 20.0 x 0.5 x 1.1) further graduates. The calculation selects six years as the reference period, noting (from Table 3-A) that there is no difference between "older" farmer-trainers (pre-1994) and more recent farmer-trainers in the intensity of their training effort over time. This calculation assumes that appropriate back-up technical support and supplies of teaching materials funded by public sources will be available, an uncertain proposition by itself. The extrapolation also ignores the impact of trainer honoraria as a source of incentives during the project period.
### Table 3-A

**Average Number of FFS Conducted**

<table>
<thead>
<tr>
<th>Year attended FFS</th>
<th>Average number for all TOFT(^a) (N=88)</th>
<th>Average number for all who conducted FFS (N=60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1994</td>
<td>1.2</td>
<td>1.8</td>
</tr>
<tr>
<td>1994 – 1999</td>
<td>1.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>1.1</td>
<td>1.7</td>
</tr>
</tbody>
</table>

*Source: 1999 SEARCA Survey*

*Notes:* “TOFT = participant of “Training of Farmer Trainers” Program. Difference in number of FFS conducted by pre-1994 and post-1994 TOFT is not significant. Typically two farmers are responsible for facilitating a farmer-directed FFS (see Braun et al., 2000, p.4; van de Fliert et al., 1995)

### Table 3-B

**Average Number of FFS Conducted**

<table>
<thead>
<tr>
<th>Year attended FFS</th>
<th>Average number for all TOFT(^a) (N=11)</th>
<th>Average number for all who conducted FFS (N=11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1994/95</td>
<td>2.9</td>
<td>2.9</td>
</tr>
<tr>
<td>1994/95 – 1998/99</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td>2.7</td>
<td>2.7</td>
</tr>
</tbody>
</table>

*Source: 1999 World Bank FFS Survey*

*Notes:* “TOFT = participant of “Training of Farmer Trainers” Program. Difference in number of FFS conducted by pre-1994/95 and post-1994/95 TOFT is not significant.

As for informal diffusion of FFS-acquired knowledge by field school graduates, we already noted that compared with specific technological innovations, it is much more difficult for the key FFS concepts (agro-ecosystem concepts and decision-making principles) to diffuse well in informal exchange. This is because these are complex ideas that are difficult to convey outside specific field experiences, such as the hands-on learning provided by the farmer field school. The observations by E. van de Fliert (1993, pp.202, 230) suggest that ineffectiveness of informal “horizontal communications” was an issue that was indeed encountered at the early phase of the Indonesian field school effort.

Our estimates of farmer-led FFS efforts call into question the significance of the likely coverage by the farmer-led extension approach in Indonesia where the Agricultural Census reports over 21 million agricultural households nationwide. If a farmer-led effort cannot be relied upon for large-scale diffusion, the issue turns back to dependence on officially funded extension efforts and to the problem of fiscal unsustainability associated with it, given the relatively high costs of the FFS training approach with a conservative estimate of $62 per farmer.
Table 4-A

Source of Funding for FFS Organized by Farmer-Trainers

<table>
<thead>
<tr>
<th>Year attended FFS</th>
<th>Village</th>
<th>Government budgets</th>
<th>Others (NGOs, farmers, and others)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Before 1994</td>
<td>1</td>
<td>5.3</td>
<td>15</td>
<td>78.9</td>
</tr>
<tr>
<td>1994-1998</td>
<td>1</td>
<td>2.4</td>
<td>36</td>
<td>85.7</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>3.3</td>
<td>51</td>
<td>83.6</td>
</tr>
</tbody>
</table>

Source: 1999 SEARCA Survey
Notes: *One reported having received funding from 2 sources

Table 4-B

Source of Funding for FFS Organized by Farmer Trainers

<table>
<thead>
<tr>
<th>Year attended FFS</th>
<th>Village</th>
<th>Government budgets</th>
<th>Others (NGO’s, farmers, and others)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Before 1994</td>
<td>1</td>
<td>10.0</td>
<td>5</td>
<td>50.0</td>
</tr>
<tr>
<td>1994-95 - 1998/99</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>10.0</td>
<td>6</td>
<td>54.5</td>
</tr>
</tbody>
</table>

Source: 1999 World Bank FFS Survey

Conclusions

This paper examined the issue of fiscal sustainability of the farmer field school extension approach to reaching farmers over a large geographical area. Our focus is motivated by the fact that fiscal unsustainability is a generic problem that affects many large-scale public agricultural extension systems. The sustainability issue must be addressed up front before promoting activities (including pilots) intended to set up any publicly-assisted, large-scale extension approach.

Our review of the IPM-FFS experiences in the Philippines and Indonesia suggests that the FFS approach to delivering new knowledge to farmers on a large scale is subject to the same risks of fiscal unsustainability as other large scale extension efforts where actual experience has so far been disappointing. As in the Philippines, FFS may be the mainstay of a national agricultural extension system and may rely on public funds for sustainability. However, because the per-farmer cost is high, the limited available budget for extension in the Philippines allows the training of only a modest number of farmers under the FFS approach. Farmer-led field schools are viewed by some as a way out of this fiscal dilemma, because they shift part of the cost to the farming community.

However, the experience in Indonesia suggests that farmer-led field-school activity cannot be relied upon to maintain a significant training effort under the FFS approach.

In assessing the general pertinence of the results presented here, it is worth noting that the situation in the Philippines and Indonesia in terms of the low political power of farmer groups and farmer lobbies, the long tradition of largely top-down and non-transparent governance systems and the level of day-to-day interactions among farmers is not that dissimilar to many other developing countries in Asia and Africa where FFS is already being actively promoted. Therefore, the insights from this study are quite relevant for the discussion of similar extension activities in these areas.

Our two country studies suggest a need for great
selectivity and caution in initiating FFS activities, with a focus on the fiscal sustainability of the program if the intention is to scale up these activities on the basis of the pilots. The same caution applies to any extension program with large recurrent costs that are expected to be government funded. The Philippine and Indonesian experiences with field schools cast doubts on the fiscal viability of the FFS approach for disseminating knowledge-intensive technologies such as IPM to large farmer populations. While several village-level studies and limited-size pilot experiences may attest to the viability of field schools in specific local circumstances, overall national-level experiences indicate that the fiscal sustainability issue can be difficult to surmount at “scaled-up” levels. A careful analysis of the projected public expenditures over time relative to the likely budgets of the relevant public agencies and local governments would be useful when evaluating the merits of proposed projects.

References


The Potential of Participatory Rural Appraisal (PRA) Approaches and Methods for Agricultural Extension and Development in the 21st Century

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Abstract

Agricultural extension approaches and methods in developing countries have been changing in recent years to reflect a new development paradigm that emphasizes sustainability, institutional change, and a participatory learning process leading to local capacity building and empowerment. The purpose of this paper is to reflect upon how agricultural extension approaches and methods have adapted to these changes in recent years by analyzing the main directions of reform in extension approaches and methods and the potential Participatory Rural Appraisal (PRA) has for moving the extension profession towards a development paradigm that embraces learning rather than teaching processes.

Introduction

Agricultural extension approaches and methods in developing countries have been changing in recent years to reflect a new development paradigm that emphasizes sustainability, institutional change, and a participatory learning process leading to local capacity building and empowerment. The purpose of this paper is to reconsider and reflect upon how agricultural extension approaches and methods have adapted to these changes in recent years by asking: 1) What are the main directions of reform in international agricultural extension approaches and methods for a new development paradigm? and 2) How much potential does Participatory Rural Appraisal (PRA) have for moving the extension profession towards a development paradigm that embraces learning rather than teaching processes?

Rethinking Extension: Where are we now?

After a century of practice in the field of agricultural extension and development, it is time to reflect upon past approaches and practices and explore new ones. However, this should be analyzed in the context of an emerging development paradigm that emphasizes participatory learning processes and sustainable development. Agricultural extension plays a crucial role in the field of development because most developing countries have rural based economies whose sustainability and productivity are directly linked to natural resources and their management. The traditional roles of transferring and disseminating agricultural technologies are proving insufficient in today's global context. Particularly in the last ten years, both development and extension programs have been subject to scrutiny and questioning both within and without the field, in part because there has been a significant change in rhetoric but little change in the practice of rural development (Chambers, 1994a, Roling & Pretty, 1997).

Extension has diverse definitions but can be summarized as a field where agricultural professionals play a role in identifying, adapting, and sharing technology that is appropriate to the needs of individual farmers within diverse agro-ecological and socioeconomic contexts (Landon Lane & Powell, 1996). In the 1950s and 1960s, it was assumed that farmers were not as knowledgeable as educated agricultural extensionists about necessary changes for improving their farming practices. Programs were established based on recommended technology packages, without farmer input (Landon Lane & Powell, 1996; Chambers, 1993). In the 1970s and 1980s, new hybrids and genotypes were introduced across agro-ecological and socioeconomic conditions in an attempt to remove farm-level constraints and increase production through widespread adoption of the packages developed by outside agents. The environmental and socio-economic repercussions of this decade, known as the ‘green revolution’, brought the need for increased farmer input to the forefront of development and extension discussions. The participation of farmers in the extension process began to change in the mid-1980s with the new
approach Farming Systems Research and Extension (FSR/E). FSR/E contributed to widespread understanding that farming systems are complex, that farm-level constraints do limit adoption, and that the role of the farmer is key (Hildebrand, 1986; Landon Lane & Powell, 1996; Cornwall, 1993). Despite the acceptance generated by FSR/E that farmers should participate in identifying both their needs and solutions, extension methodology has long been grounded in the diffusion model of agricultural development set in a context where professionals were viewed as the experts with answers. This resulted in an extension tradition in which technologies are passed from research scientists via extensionists to farmers (Roling & Pretty, 1997; Cornwall, 1993; Rogers, 1983).

While paradigm shifts, particularly those involving changes in underlying values come slowly, experiences in agricultural extension and development have demonstrated that traditional approaches will need to change in order to move towards sustainability. A participatory learning process needs to be incorporated where farmers and other development beneficiaries have real decision-making power and are part of the problem analysis and solution generation (den Biggler, 1991; Elliot & Martin, 1995; Picciotto, 1995; Roling & Pretty, 1997). Extension will need to involve farmers themselves in the process of research and development in such a way that their participation is highly interactive and empowering. This implies changes in values, attitudes, and behavior in order to ensure that significant learning takes place among all actors: researchers, extensionists, and farmers (Roling & Pretty, 1997).

Roling and Pretty (1997) identify three major lessons to be learned for extension from past experience: a) demonstrate the feasibility of sustainable practices through increased visibility and giving farmers the necessary tools for monitoring their own farm situation, b) utilize farmers’ knowledge for location-specific sustainable agriculture, and c) facilitate learning processes, instead of “transferring” technology (Roling & Pretty, 1997). In the 1990s, development programs worldwide have recognized that local participation is the key to the sustainable transfer and long-term adoption of new technologies and approaches. Interactive participation is the approach that facilitates this kind of learning environment (Chambers, 1993; Pretty & Chambers, 1993; Adhikarya, 1994; Ameur, 1994; Landon Lane & Powell, 1996; Pretty & Vodouhe, 1997).

An Emerging Learning Paradigm for Agricultural Extension

The “sustainability” question is greatly effected by extension programs because environmental issues emerge directly from human use of natural resources. A necessary condition for sustainable resource use is that large numbers of farming households must be motivated and willing to coordinate resource management. Collective decision-making represents a challenge for most communities and makes the extensionists' task more challenging because their role moves beyond analyzing farm level change to community level change. Facilitating group analysis and collective management requires new extension skills and tools. An approach that incorporates sustainability as a central principle therefore requires new ways of motivating collective action and learning, in addition to the skills and tools for working with individuals (Roling & Pretty, 1997).

Teaching has long been the normal mode of educational programs and institutions where agricultural extension skills are learned, one which emphasizes the transfer of knowledge from one whom “knows” to someone who presumably does not “know.” Universities and agricultural training institutions reinforce this teaching paradigm by promoting themselves as the custodians of knowledge and students and/or farmers the recipients of that knowledge. This kind of teaching threatens improved extension approaches because sustainable agriculture requires farmers, and future extensionists, to observe, anticipate, and intervene in a constantly changing natural system (Roling & Pretty, 1997). Extension for sustainable agriculture systems must therefore emphasize helping individual farmers critically assess their situations and promote local cooperation and coordination of common resources. In order to move from a teaching paradigm towards a learning paradigm, highly participatory interaction and knowledge sharing among all actors is critical for extension institutions both in applied extension programs and at teaching institutions (Roling & Pretty, 1997).
The Importance of Interactive Participation

An increasing number of project analyses have shown that participation by local people is one of the critical components of success in agriculture, irrigation, livestock, and water projects (Reij, 1988; Cernea & International Bank for Reconstruction and Development., 1991; Uphoff, 1992; Narayan, 1993; World Bank, 1994; Pretty et al., 1995; Pretty & Vodouhe, 1997). To illustrate, one major study of 121 rural water supply projects in 49 countries of Africa, Asia, and Latin America revealed that participation was the significant factor contributing to project effectiveness (Narayan, 1993). As a result, the term “participation” has now become part of the normal language of many development agencies, but the level of participation varies greatly (Reij, 1988; Bunch, 1991; Kerr, 1994). Seven categories describing participation in projects, from least to most participatory, have been developed (Pretty & Vodouhe, 1997; PLA Notes 31, 1998):

1. **Passive participation**, where locals are told what is going to happen and are involved because they are being informed of the process.

2. **Information giving**, where locals answer questions to pre-formulated questionnaires or research questions and do not influence the formulation or interpretation of the questions.

3. **Consultation**, where locals are consulted by external agents who may define both problems and solutions according to responses, but are under no obligation to do so, or share in decision making.

4. **Material Incentive**, where locals provide resources, such as labor or land, in return for other material incentives. Locals often do not have a stake in continuing activities once the incentives end.

5. **Functional participation**, where locals form groups, usually initiated by and dependent on external facilitators, participate in project implementation. These groups are usually formed after major decisions have been made, but may become self-dependent.

6. **Interactive participation**, where locals participate in joint analysis that leads to action plans and the formation of new local institutions or the strengthening of existing ones. The groups take control over local decisions and have a stake in maintaining the structures or practices developed.

7. **Self-Mobilization**, where locals take initiative independent of external institutions and may develop contacts with external institutions for resources and technical advice, but retain control over how resources are used.

Project effectiveness, usually measured by project sustainability, completion of project goals, and meeting needs of the local people, occur when people are involved in decision making during all stages of the project and the participation is interactive. The challenge is to find practical and applicable methods when working with communities that help move extension towards interactive participation. There are diverse participatory methods in use today, and they share certain assumptions. They assume cumulative learning by all participants, seek diversity in multiple perspectives, and appreciate that different individuals and groups make for different evaluations of situations. They assume a learning process best revealed through group inquiry and sharing and flexibility adaptable to site-specific socioeconomic and ecological conditions. The role of the professional in participatory methodologies is best thought of as being a facilitator helping people to carry out their own study. The interaction between professionals and diverse groups of local people creates a learning process that leads to increased consensus on directions for change, thus making the change more sustainable. In short, the sustainability and process-learning paradigm that agricultural extension is moving towards cannot be implemented successfully without the tools that facilitate a process where all participants are involved in a continuing process of participatory sharing and learning (Roling & Pretty, 1997; Pretty & Vodouhe, 1997).
Using Participatory/Rapid Rural Appraisal as a Learning Paradigm

Among emerging participatory methods, an important part has been played by two closely related families of approaches and methods, referred to as Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA). RRA was developed and spread in the 1980s, and its further evolution in the early 1990s developed into PRA. PRA is described as "a growing family of approaches and methods to enable local people to share, enhance and analyze their knowledge of life and conditions, to plan and to act (Chambers, 1994a, p.953)". Practiced in over 130 countries, PRA is one of the better known approaches that is addressing the need for reform in extension by providing the tools to agricultural professionals necessary for working within a learning paradigm of extension (PLA Notes 31, 1998). It is therefore important to review the role PRA has played in the last decade and analyze the potential it has for agricultural extension and development in the future.

As a concept, the participation of local people has had a long history in rural development and agricultural extension. However, not until the early 1990s have numerous innovations incorporated participatory techniques into project design, implementation, monitoring, and evaluation of extension and educational programs. PRA traces its origins primarily from five fields or traditions (Chambers 1994a; Pretty et al, 1995): a) activist participatory research, inspired by Paulo Freire (1968) to use dialogue and joint research to increase people’s awareness and self confidence to empower themselves and take action; b) agro-ecosystem analysis, developed by Gordon Conway and colleagues (Conway 1987), is an approach that combines systems thinking and ecological concepts, using techniques in mapping, diagramming, scoring, ranking and transects; c) applied anthropology, branching off of social anthropology in the 1980s and going beyond observation to becoming involved in cultures, helped development professions to appreciate the depth, richness and validity of people’s perceptions, as well as emphasize the importance of spending significant time with people; d) field research on farming systems represent two branches that demonstrated the ability of small farmers to analyze and experiment on their own farms; and e) RRA. Of these five, the most recent and direct source of PRA is RRA, an approach that emerged in the 1970s as an attempt to find better ways to learn about rural life and conditions in different countries. The development of RRA, in particular, was catalyzed by a dissatisfaction with the biases produced by "rural development tourism," (Chambers, 1994a), a term used to describe the brief rural visit by outsider development professionals that holds biases, which combined, hide the worst conditions of communities. Professionals had also become disillusioned with conventional methodologies that relied too heavily on questionnaire surveys, usually formulated by outsiders, to gather information because they tended to be draw-out, tedious, difficult to process, and too often failed to obtain accurate, reliable data. RRA came about from the search, by field practitioners, for ways that would enable outsiders to gain accurate and reliable insight and information about rural people and conditions in a cost-effective and timely manner (Pretty et al, 1995). Each of these fields contributed to the emergence of PRA and aspects of what today is considered the family of Participatory Learning and Action (PLA) because they have put participation, action research, and adult education at the forefront of development approaches whose purpose is to empower people to make beneficial changes in their lives (PLA Notes 31, 1998). The following table shows basic differences between RRA and PRA in use today.
Table 1

Comparing RRA and PRA along a Continuum

<table>
<thead>
<tr>
<th>RRA</th>
<th>Objective</th>
<th>PRA</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>To obtain valid information that reflects the complexity and richness of local knowledge</td>
<td></td>
<td>To strengthen local capacity for analyzing and resolving problems</td>
<td></td>
</tr>
<tr>
<td>Outside facilitators work with local community members/groups</td>
<td>Who does it?</td>
<td>A group of local people that may or many not include outside facilitators</td>
<td></td>
</tr>
<tr>
<td>Generates information that is used by outsiders and left with the community</td>
<td>Result</td>
<td>Builds local capacity, assessment and planning skills, and sometimes results in collaborations between the community and outside programs</td>
<td></td>
</tr>
<tr>
<td>Through studies ranging from 5 days to one month</td>
<td>Process</td>
<td>Through extended time, that may take from months to years</td>
<td></td>
</tr>
<tr>
<td>The validity of the information and capturing the richness and complexity of local situations</td>
<td>Focus</td>
<td>Communities that take more control over their own development process with time</td>
<td></td>
</tr>
</tbody>
</table>

<--------------------- Participatory Tools and Techniques are Common to both RRA and PRA --------------------->

The primary distinction between RRA and PRA is that RRA is intended for learning by outsiders to gather information from local people’s knowledge, while the basic purpose of PRA is the empowerment of local people by facilitating their analytical, planning and evaluation abilities. PRA is a process that takes place over time, usually beginning as RRA and developing on a continuum into a process led primarily by local people. True PRA implies significant personal and institutional change and more often than not, particularly as "participatory" rhetoric has become fashionable, institutions will tend to claim PRA approaches when their approach remains largely unchanged.

Much of the spread of PRA has taken place laterally in the southern hemisphere among developing countries (South-South), particularly between countries in Africa and Southeast Asia, through the sharing of field experiences, conferences, and training by international and local organizations, most of them non-governmental (Chambers, 1994a). Only recently has the spread become South-North as northern based universities and institutions are increasingly recognizing the potential of PRA and its contribution to development theory and applications.

Effective PRA/RRA requires that practitioners follow basic principles. Chambers (1994b) describes the principles shared by both RRA and PRA:

1. *A reversal of learning* where professionals learn from local people’s physical, technical and social knowledge, directly, on site, and face to face;

2. *Learning rapidly and progressively*, with conscious exploration, flexible use of methods, improvisation, cross-checking, and adaptability in the learning process rather than following a blueprint;

3. *Offsetting biases* by being relaxed, not rushing, listening and not lecturing, probing topics rather than moving to the next, being unimposing instead of important, seeking out the poorer people, and learning diverse concerns and priorities;

4. *Optimizing tradeoffs*, relating the costs of learning to the usefulness of the information and making tradeoffs between the quantity, relevance, accuracy, and timeliness. Optimizing tradeoffs also includes the principal of optimal ignorance – knowing what is not worth knowing, and of appropriate imprecision.
– not measuring more accurately than what is needed because it is better to be approximately right than precisely wrong;

5. **Seeking diversity**, meaning seeking variability rather than averages and maximizing the diversity and richness of information (Beebe, 1987; Dunn & McMillan, 1991); and

6. **Triangulating**, meaning the process of cross-checking and progressive learning and approximation through plural investigation, which involves assessing and comparing findings from several methods, sets of condition, points in a range or distribution, individuals or groups of analysis, places, times, disciplines, investigators and/or a combination of these.

The more developed and tested PRA methods include participatory mapping and modeling, visualizing where people live and work, and the location of important local resources, their uses, potential, and associated problems; transect walks; institutional diagramming; analytical and flow diagrams to indicate linkages, sequences, causes, effects, problems and solutions; seasonal calendars showing how food availability, workloads, family health, prices, wages and other factors vary during the year; trend and change analysis; and matrix scoring, scored with seeds, pebbles or other counters, to compare things, such as the merits of different crop varieties or tree species, or how conditions have changed over time (Chambers, 1994a).

PRA, like all methodology used for research has a theoretical base and requirements for showing its accuracy. As a research methodology, PRA would be considered as one approach within the framework of Participatory Action Research. The following table summarizes the major focuses of these approaches.

PRA uses qualitative research methods and proves its trustworthiness by the same criteria developed by Lincoln and Guba (1985) to demonstrate rigor and accuracy, with some additional criteria unique to PRA. The following key criteria for judging trustworthiness are adapted from Lincoln & Guba (1985), including explanations on those criteria most important for researchers using PRA (adapted from Petty et al., 1995):

Table 2

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Theory</th>
<th>PRA as Action Research</th>
<th>Constructivism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ontology</strong></td>
<td>Historical realism, reality shaped by social, political, cultural, economic, ethnic, gender values, made real over time</td>
<td>Relativism/ Reality shaped by social, political, cultural, economic, ethnic, gender values, but able to be changed through empowerment</td>
<td>Relativism, local and specific constructed realities</td>
</tr>
<tr>
<td>Epistemology</td>
<td>Transactional/ subjectivist; value-mediated findings</td>
<td>Transactional/ subjectivist; value-mediated findings</td>
<td>Transactional/ subjectivist; created findings</td>
</tr>
<tr>
<td>Methodology</td>
<td>Dialogic/ dialectical</td>
<td>Dialectical</td>
<td>Hermeneutical/ dialectical</td>
</tr>
</tbody>
</table>

Basic Beliefs of Alternative Inquiry Paradigms (adapted from Guba and Lincoln, 1998)
• Prolonged and/or intense engagement between the various (groups of) people for building trust and rapport, and learning the context.

• Persistent and parallel observation.

• Triangulation by multiple sources, methods and investigators for cross-checking information and increasing the range of different people’s realities encountered, including multiple copies of sources of information, comparing results from a range of methods and having teams with diversity of personal, professional and disciplinary backgrounds.

• Expression and analysis of difference for ensuring that a wide range of different actors are involved in the analysis and that their perspectives are accurately represented, including differences according to gender, age, ethnicity, religion, and class.

• Negative case analysis.

• Peer or Colleague Checking.

• Participant checking for testing the data, interpretations, and conclusions with people with whom the original information was constructed and analyzed. Without participant checks, investigators can make no claims that they are representing participants’ views.

• Reports with working hypothesis, contextual descriptions and visualizations. These are ‘thick’ descriptions of complex realities.

• Parallel investigations and team communications, if sub-groups of the same team proceed with investigation in parallel using the same approach and come up with similar findings, these findings are more trustworthy.

• Reflexive journals are diaries that individuals keep on a daily basis to record a variety of information about themselves.

• Inquiry Audit.

• Impact on Stakeholders’ capacity to know and act, for demonstrating that the investigation or study has had an impact, for example if participants are made more aware of their own realities as well as that of other people.

RRA approaches and methods have been used for appraisal, analysis, and research in many subject areas over the last 20 years, including agroecosystems, natural resources, irrigation, technology and innovation, health and nutrition, farming systems research and extension, pastoralism, marketing, disaster relief, and organizational assessment. PRA has evolved and spread so recently and quickly that cases are only recently being researched and documented. In agricultural related topics PRA cases have been applied in farmer participatory research/farming systems research, problem identification and analysis by farmers, livestock and animal husbandry, investigation of markets and small-holder marketing potentials, participatory watershed planning and management, and village resource management plans (See references by topic for an short inventory of documented cases using RRA and PRA in agricultural topics). PRA helps organizations understand local priorities and gives space for locals to make decisions about project implementation, at the assessment, monitoring and evaluation stages. For example, CARE has changed priorities in water security, small dam construction, reservoirs and irrigation in Zimbabwe based on PRA work with local beneficiaries where the people analyzed the project and made decisions about water security priorities (Harmmeijer, 1999). PRA was used as a bridge between research and development in the decentralization of the Gambia, for regional planning strategies (Truelove, 1998). An example how PRA can be used in evaluation can be demonstrated by the successful results of a field-test in Mexico where PRA was used for systematically measuring and assessing the impact of village development programs, called the Twenty Points of Progress Program (20PPP) (Woller & Mayfield, 1999).

PRA techniques push experts to see local knowledge in a new light and to really listen. Bud Hall commented at a recent PRA
conference that “in order to be successful agents of change in the present and future, we need to learn how to really listen to each other (PLA Notes 36, p. 42).” Cases have shown that after traditional extensionists first experiences with PRA they begin to see things in a new light and change their approach, rather than going through the motions of seeking participation without truly listening and learning from others (Toness, 2000). Reviewing the cases, one clear strength that stands out as a potential for agricultural extension lies in its diversity. There is a set of processes and a tool box of techniques, but no blueprint. PRA was developed in rural areas, but due to its wide applicability across topical areas, has spread to all natural resource management-related topics, health, education, youth, and even urban settings for analyzing and acting upon issues in migration, and urban poverty.

Despite numerous example of the effective use of PRA, the application and institutionalization of PRA in agricultural extension programs is still scarce. While many NGOs have institutionalized PRA methods, the only extension agencies documented that have officially adopted a PRA approach are the Soil and Water Conservation Branch of the Ministry of Agriculture in Kenya, the District Rural Development Agencies, Andhra Pradesh, India, and the Forest Departments of several Indian states (Chambers, 1994a). In the first years of PRA, academic researchers were slow to recognize the potential and spread of PRA and in the United States there are less than a handful of universities that offer courses or training in PRA (Chambers, 1994a; Chambers, 1994b).

Since many processes in PRA methodology are still in their early stages experienced trainers and practitioners have been mostly engaged in field-based training and appraisal rather than monitoring and evaluation, research, or training in institutions. Therefore, there are few documented evaluations of the impact of PRA as an extension method in the agricultural development. The most systematic evaluation and analysis of the impact of PRA, compared with alternatives, has been a participatory study conducted in Kenya in April-May 1993, in which six areas of a soil and water conservation program were studied. The study showed that performance indicators had been worst where the approach had not been participatory and were generally higher where catchment committees were freely elected and the highest where farmers had participated in planning and layout due to initiating the project site with PRA (Pretty & Thompson, 1993). Another case, an ex-post-study conducted between 6 months and 3 years after a series of PRA training (1993-1996) of 98 GTZ, a German development organization, staff participants showed the effectiveness of both the PRA training and PRA’s implementation in the field. Ninety-seven percent of the staff trained recommended the approach and methods to colleagues both within GTZ and elsewhere. Eighty-two percent saw tangible improvements in 32 projects after the training, particularly in self-organization and planning by the target beneficiaries, and the relationship between them and the extension officers (Gassner-Keita & Forster, 1999).

Despite scarce research on PRA, the rate of adoption and reports of practical use and evaluation indicate great potential for using PRA to improve extension and move the field closer to the development paradigm and strategies needed today. The number of countries in which PRA is strongly established is increasing and more universities and training institutions’ staff around the world are now using it.

After reviewing cases using PRA approaches and methods and reflecting upon its present range and versatility, it is evident that there are many actual and potential applications for agricultural extension and development. However, there is clearly a need to further research, apply, and evaluate PRA in the field of extension in order to understand its full impact and potential.

There are challenges and risks for practitioners using PRA. The spread of PRA and the widespread and sometimes careless use of the term “participation” are among those. Most importantly, negative repercussions can occur when extension professions learn to apply PRA through short training courses with little follow-up. PRA is a methodology lifts people’s expectations and begins a process of empowerment and knowledge sharing, that, if practiced without the corresponding commitment by institutions and professionals to share in decision-making, can create a backlash and disappointment among those meant to be
benefited (Toness, 2000). In a recent conference on PRA (Deepening our understanding and practice: A conference on participatory development and beyond, August 25-27, 1999, Ottawa, Canada), over 425 participants from 48 countries summarized that “there is a need to practice our practice ethically as the danger of abusing participatory development processes is eminent especially when everyone is becoming an ‘expert’. This may be due to the popularity of PD approaches and the ‘interest’ shown by donors in them. [For the future] there is a need for Universities and NGOs/ institutions to network closely and not perceive each other as rivalry. There is also a need to have sustainable institutions if participatory approaches are to be sustained, institutionalized, and internalized” (PLA Notes 36, 1999, p. 46)

Conclusion

There were two questions raised that are addressed in this paper: 1) What are the main directions of reform in international agricultural extension approaches and methods for a new development paradigm? and 2) How much potential does PRA have for moving the extension profession towards a development paradigm that embraces learning rather than teaching processes?

A review of literature and case studies show that the main direction of reform in international agricultural extension and development is towards a learning rather than teaching paradigm and towards the incorporation of new methodology and approaches that increase the real, interactive participation of local people in all levels of decision making. These methods require that the roles of researcher, extensionist, and local people be shared. Of these new participatory methods, PRA has great potential for moving the extension profession towards a development paradigm that embraces learning rather than teaching processes due to its versatility and wide applicability. Case studies using PRA methods and approaches for development and extension processes indicate that PRA is an innovative, rich, flexible, effective, valid, participatory, and quickly spreading set of approaches and methods. In part PRA’s potential is due to the nature of the PRA process itself, which increases awareness between all participants of each person’s unique knowledge and contributes to “laying the playing field” between outside professionals and local expertise.

University, governmental, and non-governmental staff working in agricultural extension and development should begin integrating these tools, particularly as they strive to meet the challenge of a new development paradigm that emphasizes sustainability and new learning processes similar to those of PRA. The following are four recommendations for incorporating PRA and other participatory methods into agricultural extension:

◆ Teaching PRA philosophy and tools as an extension approach in Agricultural Extension programs at the University level in order that professionals enter the field with a greater understanding of the underlying principles and applicability of the methods.

◆ Promoting research on PRA, its impact, effectiveness, diversity, use, and applicability, in order to gain greater insight and knowledge about participatory methods.

◆ Incorporating PRA methodology into courses on Critical Inquiry, Qualitative Research Methodology, and Action Research in order to bring these courses up to date on present applications and emerging methodologies in the field of research and development.

◆ Creating pilot projects in existing or new agricultural extension programs to test PRA and other participatory methods in diverse settings.

◆ Creating awareness of the risks involved in using PRA, making conscientious decisions about how and when to train and utilize PRA, and constantly asking ourselves the questions: Participation for whom?, Why?, And What are the unintended consequences?
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Village plans and preparing village resource management plans


Leadership Ability Dimensions in Relation to Rural Women’s Personal Characteristics: a Methodological Model For Further Consideration

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Thessaloniki, Greece

Abstract

The primary purpose of this study was to assess the perceived leadership abilities of rural women in a region of Northern Greece. Specific objectives were: (1) To determine the perceived leadership ability of rural women in the area and identify facets of this ability according to certain criteria, (2) to detect selected personal characteristics of women residing the area, such as age, marital status, highest level of schooling completed, community size, leadership experience, raising environment, work activities, involvement in agriculture, and main family engagement, and (3) to search for relations of the perceived leadership ability of the rural women with selected personal characteristics as variables. Next, to find out the relationships of the perceived leadership ability facets of the rural women with these characteristics, in identifying profiles describing the rural fitting to the leadership items.

Data were collected by the use of a questionnaire, which was administered, through personal interviews, to a representative random sample of 500 women coming from 46 villages and small towns (below 5,000 habitants) of Thessaloniki region, Greece. Findings include information on personal characteristics as well as on their leadership ability. Statistical techniques such as reliability analysis, non-linear principal component analysis and categorical regression were employed in meeting the objectives. According to the findings, profiles of the rural woman were recognized which might be useful information as tools for the extension planners as well as for the local extension agents.

Introduction

Most communities, rural or urban, are in need of effective leaders to aid their goals and needs. Effective community leaders are increasingly necessary in today’s complex and rapidly changing society. Furthermore, a problem facing rural communities is that the pool of individuals, and especially those helping the women movement, who are able to provide effective leadership is considerably smaller in number than for men or both men and women in urban areas.

Leadership has been defined as "the means by which one or more persons aid a group in setting and attaining desirable goals" (Kreitlow et al., 1965, p. 57). Wills (1974) defined a leader as a person who has the ability to get others to act in a certain and definite way. Contrary to popular opinion, leadership characteristics are not inherited; they are developed over a period of time.

The country area of Thessaloniki, Northern Greece is characterized with strong agriculture enterprises and it is important, therefore, for its development, to have strong leadership as it is well known the failure of the agricultural cooperative movement in Greece due to lack of skilled leadership. Yet, the fact that agriculture is not only a matter of the farmer but of all the family, it is well known that the women play an important role in the decision making process and the study of rural women’s leadership ability was felt more necessary. Leaders or officers in many rural communities and organizations are sometimes selected by default. Sometimes, leaders are selected because they are willing to accept the responsibility, and as Gordon (1977) indicated, being a leader in a group doesn't necessarily make one an effective leader. One still has to perform to gain acceptance and have an influence on the behavior of the group.

Citizens in rural communities and especially the rural women tend to have fewer opportunities to develop leadership abilities than do residents of urban communities. How then do the persons...
placed in leadership positions function effectively? Do women possess skills necessary to lead effectively? Where have they acquired their leadership abilities? This study was an attempt to answer some of these questions.

Several organizations and institutions have been involved in conducting public affairs leadership development programs for rural women leaders. Although these programs were determined to be successful, evidence is lacking which indicates the programs were developed based upon research that first determined the leadership needs of the women in the above area of Greece. It would appear logical that an important prerequisite to developing leadership programs would be to know the characteristics and current leadership capabilities of the potential participants.

Numerous studies (Bartol & Butterfield 1976, Frautschi 1999, Moss & Liang 1990) have been conducted to evaluate the results of leadership development programs. For over two decades, scientists have been interested in the relationship between gender and leadership. Simultaneously, studies suggest that men tend to be more task oriented in their leadership approach, while women tend to focus more on the maintenance of relationships (Kabacoff, 1998). However, few studies have been conducted which evaluate the leadership qualities of individuals prior to formal leadership development activities. None of the above studies has taken place in the target area.

An understanding of the characteristics, leadership qualities, and leadership development needs of rural women in Thessaloniki area will be useful in determining the need for leadership development programs in the area as well as in all rural Greece. Also, such findings might be useful for other areas of Balkan Peninsula in particular and of the world in general.

**Purpose and objectives**

The primary purpose of this study was to identify the profiles of rural women relying upon their perceived leadership abilities facets as those profiles are related to women’s characteristics.

Specific objectives of this study were:

To determine the perceived leadership ability of rural women in the area and identify facets of this ability according to certain criteria.

To detect selected personal characteristics of women residing in the area, such as age, marital status, highest level of schooling completed, community, leadership experience, adolescence environment, work activities, involvement in agriculture, and main family engagement.

To search for relations of the perceived leadership ability of the rural women with selected personal characteristics as variables. Next, to find out the relationships of the perceived leadership ability facets of the rural women with these characteristics, in identifying profiles describing the rural fitting to the leadership items of each facet selected.

**Population and sample, data collection**

The target population for this study was the rural women residing in Thessaloniki area, Northern Greece. For this reason the sample was randomly selected from 46 villages and small towns (50% of the existing ones) of the Thessaloniki prefecture.

According to the 1991 census, the population studied was approximately 15,000 women. Permission was sought and granted by the community secretariat to obtain the sample from their lists of residents. A systematic random sampling procedure was used to draw a sample and finally a total of 337 valid questionnaires resulted. The questionnaire along with a cover letter was administered the first months of 1998, using as interviewers properly trained students from the Farm Management Department’s of the Technological Educational Institute of Thessaloniki.
Instrumentation

Data for this study were collected by use of interview questionnaire. The questionnaire was developed by the researchers using related literature and previous research (Luft, 1986) as a basis. Assistance was obtained from a panel of experts. The questionnaire was divided into two parts. Part I asked respondents to provide background information. Part II consisted of 41 statements reflecting leadership characteristics. Respondents were asked to indicate their perceived leadership by indicating their level of agreement most descriptive of their feeling toward the statement. Available responses were on a Likert-type scale as follows: 1=strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree. All statistics were calculated using this coding.

The instrument was reviewed by the panel of experts, and revisions were made according to their suggestions. It was pilot tested for content validity using rural women of another area.

Data analysis

Data were analyzed with the SPSS. Frequencies and percentages were used to report results regarding personal characteristics of respondents. The sampled respondents were asked to respond to statements indicating leadership skills according to their level of agreement with the statements. Three hundred thirty seven valid cases (rural women) rated on the 38 items shown are in Table 1, in which descriptive statistics for individual items and the whole scale are reported.

Rural women in the target area perceive their leadership ability to be good. Twenty-four out of the 38 statements have ratings above 4.0 (the higher the scores the more the perceived leadership ability).

Reliability analysis (Bohmstedt 1977, Norusis 1997:ch.6, 13) for the 38 leadership ability items was first used to determine the extent to which these items are related to each other. This in getting an overall index of the internal consistency of the scale as a whole, and to identify items for exclusion. In fact, three items were excluded consequently from the total number of 41 items. The value of Cronbach’s alpha reliability coefficient is 0.86, large in size, indicating that the leadership scale is reliable to accept.

Respondents were asked to respond to questions seeking information regarding selected personal characteristics. Findings include that the respondents’ age was 57.3 % under 41 years, 85.6% of them were married, their highest level of schooling completed was relatively fair (none to 6 years 50.4%, 7-9 years 11.5%, 10-12 years 31.5%, and more than 12 years 6.6%). Also, 72.2% of them live in communities with smaller than 2000 inhabitants and the rest of them are from communities sized 2001 to 5000 inhabitants. Regarding their leadership experience, 55.9% had none, 87.0% were raised in farm families, their work activities included only homework (37.9%) while the rest had also various activities outside home. Finally, 54.8% of the respondents’ family were mainly engaged in agriculture, and 53.4% are involved in agricultural practices.

Optimal scaling procedures

Having accepted the consistence of 38 items, the average rankings for each respondent were used as numerical values of the dependent variable «leadership ability» along with categories of the nine independent variables (leadership experience, age, marital status, schooling, raising environment, community size, work activities, involvement in agriculture, and main family engagement).

Categorical regression -CATREG (Kooij and Meulman 1997, SPSS 1998:ch.2,7) was used as proper to handle optimally transformed the categorical variables. It yielded an R of 0.42 indicating a moderate relation between leadership ability and the group of selected predictors. However, since $R^2=0.18$, it is indicated that only 18% of the variance in the transformed leadership rankings is explained by the regression of the optimally transformed variables used (surely, if additional variables were searched for inclusion in the model, the findings would be more useful). The F statistic value of 7.97 with corresponding $\alpha=0.00$ indicates that this model is performing well.
### Table 1

**Perceived leadership ability items and basic descriptive measures**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Mean*</th>
<th>S.D.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I can motivate people</td>
<td>3.80</td>
<td>1.31</td>
</tr>
<tr>
<td>2**</td>
<td>I am unable to inspire people</td>
<td>3.35</td>
<td>1.51</td>
</tr>
<tr>
<td>3</td>
<td>Other people accept me as a leader</td>
<td>3.18</td>
<td>1.44</td>
</tr>
<tr>
<td>4</td>
<td>People look to me for advice</td>
<td>4.23</td>
<td>1.28</td>
</tr>
<tr>
<td>5</td>
<td>I persevere on a project until it is completed</td>
<td>4.58</td>
<td>0.94</td>
</tr>
<tr>
<td>6</td>
<td>I consider myself a flexible person</td>
<td>3.89</td>
<td>1.30</td>
</tr>
<tr>
<td>7**</td>
<td>Rarely do I take a chance on a new idea</td>
<td>3.39</td>
<td>1.61</td>
</tr>
<tr>
<td>8</td>
<td>I am unafraid to search answers to questions which I do not know</td>
<td>4.16</td>
<td>1.37</td>
</tr>
<tr>
<td>9</td>
<td>People seek guidance from me when they are having a difficult time</td>
<td>4.10</td>
<td>1.33</td>
</tr>
<tr>
<td>10</td>
<td>I believe that my ideas are practical in nature</td>
<td>4.40</td>
<td>0.90</td>
</tr>
<tr>
<td>11</td>
<td>I willingly listen to others</td>
<td>4.77</td>
<td>0.67</td>
</tr>
<tr>
<td>12**</td>
<td>I find it difficult to consider another person’s point of view</td>
<td>3.28</td>
<td>1.58</td>
</tr>
<tr>
<td>13**</td>
<td>I feel unconfident with my capabilities</td>
<td>4.07</td>
<td>1.44</td>
</tr>
<tr>
<td>14**</td>
<td>I am a dependent person</td>
<td>4.10</td>
<td>1.43</td>
</tr>
<tr>
<td>15</td>
<td>I am the type of person involved with professional and community affairs</td>
<td>3.01</td>
<td>1.74</td>
</tr>
<tr>
<td>16</td>
<td>I am concerned about maintaining good interpersonal relationships</td>
<td>4.91</td>
<td>0.41</td>
</tr>
<tr>
<td>17</td>
<td>I consider myself to be a valuable contributor to the human race</td>
<td>4.46</td>
<td>0.93</td>
</tr>
<tr>
<td>18</td>
<td>I enjoy success and strive for it</td>
<td>4.80</td>
<td>0.58</td>
</tr>
<tr>
<td>19</td>
<td>I can see both sides of an argument in question</td>
<td>4.45</td>
<td>0.85</td>
</tr>
<tr>
<td>20</td>
<td>I am self conscious about what I do</td>
<td>4.54</td>
<td>0.89</td>
</tr>
<tr>
<td>21**</td>
<td>Making mistakes tends to stimulate worry about making another mistake</td>
<td>3.47</td>
<td>1.58</td>
</tr>
<tr>
<td>22</td>
<td>I am an effective decision-maker</td>
<td>3.98</td>
<td>1.14</td>
</tr>
<tr>
<td>23</td>
<td>I understand that other people have feelings, motives, and goals of their own</td>
<td>4.77</td>
<td>0.66</td>
</tr>
<tr>
<td>24</td>
<td>I enjoy sharing information with others</td>
<td>4.50</td>
<td>1.06</td>
</tr>
<tr>
<td>25</td>
<td>Other people can depend on me to accomplish a task for them</td>
<td>4.00</td>
<td>1.35</td>
</tr>
<tr>
<td>26</td>
<td>I consider myself to be intelligent</td>
<td>4.18</td>
<td>0.92</td>
</tr>
<tr>
<td>27**</td>
<td>I do not like to be the one to initiate projects</td>
<td>3.15</td>
<td>1.63</td>
</tr>
<tr>
<td>28</td>
<td>I am a person who is original in my ideas and activities</td>
<td>3.31</td>
<td>1.42</td>
</tr>
<tr>
<td>29</td>
<td>I have a good sense of humor</td>
<td>3.95</td>
<td>1.34</td>
</tr>
<tr>
<td>30</td>
<td>People will confide in me because they consider me to be trustworthy</td>
<td>4.53</td>
<td>0.85</td>
</tr>
<tr>
<td>31</td>
<td>I like to see conflicts resolved</td>
<td>4.84</td>
<td>0.56</td>
</tr>
<tr>
<td>32**</td>
<td>I am a moody person</td>
<td>4.11</td>
<td>1.30</td>
</tr>
<tr>
<td>33</td>
<td>I encourage others to become involved in various projects</td>
<td>4.26</td>
<td>1.14</td>
</tr>
<tr>
<td>34</td>
<td>I use tact in everyday life</td>
<td>4.64</td>
<td>0.69</td>
</tr>
<tr>
<td>35</td>
<td>I am a cordial person</td>
<td>4.86</td>
<td>0.45</td>
</tr>
<tr>
<td>36**</td>
<td>I consider myself to be a follower</td>
<td>3.76</td>
<td>1.46</td>
</tr>
<tr>
<td>37**</td>
<td>I felt extra curricular activities in H.S. were not a very important part in my life</td>
<td>3.24</td>
<td>1.73</td>
</tr>
<tr>
<td>38</td>
<td>When someone comes to me with a problem, I try to put myself in their shoes so I can understand the problem</td>
<td>4.56</td>
<td>0.95</td>
</tr>
</tbody>
</table>

**Scale**  
55.60  8.51

**Item means**  
4.09  0.56

**Item standard deviations**  
1.46  0.82

---

* 1=strongly disagree; 2=disagree; 3=neither agree nor disagree, 4=agree; 5=strongly agree.

** Negatively stated leadership skills are inversely coded.
From the F values of the standardized coefficients it is indicated that the transformed experience, age and main family engagement are significant to indicate their possible effects on leadership ability.

However, the relative importance measures (Pratt 1987) of the independent variables show that the largest importance to predict leadership ability corresponds to leadership experience accounting for 48%, followed by main family engagement (21%) and schooling years completed (15%). The three variables’ additive importance accounts for about 84%. Moreover, the tolerances of all variables are found to be high enough to assure exclusion of the multicollinearity problem.

From the quantified values of the categories of variables and the corresponding plots in combination with the signs of standardized coefficients, it is shown that on one hand negative effects of leadership experience and on the other positive ones of schooling years completed and main family engagement to leadership ability are present. Specifically, the more a rural woman is engaged in leadership activities the less she tends to perceive possessing leadership ability. Also, she tends to perceive her leadership as she is more educated, and is engaged outside agriculture. In the case of schooling years the effect almost tends to be stabilized from 9 to 12 years.

The next step was to perform non-linear principal components analysis -PRINCALS (Leeuw and Rijckevesol 1980, Young 1981, Gifi 1990, SPSS 1998:ch.3, 8) as proper to identify, by handling optimally transformed categorical (ordinal) variables (items), homogenous groups of items. Hence, through this method the original data set of 38 leadership ability items were handled in clusters of closely related items. PRINCALS corresponds to categorical principal component analysis with optimal scaling and like classical principal component analysis it can be thought of as a method of dimension reduction.

Four dimensions were used in analysis by the rule based on the number of item categories minus one and practically to keep as meaningful interpretations as possible. The four dimensional solution, after 32 iterations for convergence test to be reached, have eigenvalues of 0.2068, 0.0961, 0.0523, and 0.0494. Since the last two eigenvalues are relatively small, and especially since the reliability coefficients for each of these components were small in size (about 0.5 to 0.6) it was decided to keep only the first two components with a reliability coefficients 0.86 and 0.73 respectively.

Table 2 presents the component loadings of the first two dimensions kept. Identification of each dimension was based on loadings having values 0.5 or more. Hence, the first component was identified as: P1: “the trustworthy-practical-encouraged ability in advising” component and the second one as P2: “cordial-listener with tactful ability in resolving conflicts” component, the amount of variation accounted for them being 20.68% and 9.61% respectively.

The second part of the third objective of this study was to find out the relationships of the perceived leadership ability facets of rural women in the target area with the selected personal characteristics as independent variables. By using the object scores for each of the two components as units of analysis, we proceeded to categorical regression analyses - CATREG (Young et al. 1976, Kooij and Meulman 1997, SPSS 1998:Ch.2, 7). For each regression analysis the component was utilized as a dependent variable and the nine personal characteristics as independent variables.

The two regression analyses yielded values of multiple correlation coefficients $R_1=0.360$ and $R_2=0.213$ respectively, indicating moderate relation between leadership abilities groups and the group of selective predictors. However, since all values of $R^2$ are small, it is indicated that no more than 11% and 5% of the variances in the leadership dimensions are explained by the two regression models of the optimally transformed variables used (surely, if additional variables be searched for the inclusion in the model, the findings will be more useful). The F statistic values are statistically significant at $\alpha=0.05$, indicating that this model is performing well for the two regression analyses.

From the F values of the standardized regression coefficients, for P1 component, it is indicated that the transformed variables leadership experience and main family engagement
Table 2
Component loadings

<table>
<thead>
<tr>
<th>Items</th>
<th>Principal components</th>
<th>Items</th>
<th>Principal components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C1</td>
<td>C2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.52*</td>
<td>0.35</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>0.42</td>
<td>0.25</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>0.45</td>
<td>0.28</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>0.56</td>
<td>0.20</td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>0.49</td>
<td>0.11</td>
<td>24</td>
</tr>
<tr>
<td>6</td>
<td>0.41</td>
<td>0.18</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>0.34</td>
<td>0.28</td>
<td>26</td>
</tr>
<tr>
<td>8</td>
<td>0.51</td>
<td>0.15</td>
<td>27</td>
</tr>
<tr>
<td>9</td>
<td>0.54</td>
<td>0.20</td>
<td>28</td>
</tr>
<tr>
<td>10</td>
<td>0.58</td>
<td>-0.09</td>
<td>29</td>
</tr>
<tr>
<td>11</td>
<td>0.46</td>
<td>-0.59</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>0.35</td>
<td>0.20</td>
<td>31</td>
</tr>
<tr>
<td>13</td>
<td>0.48</td>
<td>0.12</td>
<td>32</td>
</tr>
<tr>
<td>14</td>
<td>0.48</td>
<td>0.19</td>
<td>33</td>
</tr>
<tr>
<td>15</td>
<td>0.42</td>
<td>0.21</td>
<td>34</td>
</tr>
<tr>
<td>16</td>
<td>0.54</td>
<td>-0.66</td>
<td>35</td>
</tr>
<tr>
<td>17</td>
<td>0.62</td>
<td>0.08</td>
<td>36</td>
</tr>
<tr>
<td>18</td>
<td>0.58</td>
<td>-0.27</td>
<td>37</td>
</tr>
<tr>
<td>19</td>
<td>0.60</td>
<td>0.17</td>
<td>38</td>
</tr>
</tbody>
</table>

* Underlined loadings help in identifying the components

are significant to indicate their possible effects on the “trustworthy-practical-encouraged ability in advising.”

The relative importance measures (Pratt 1987) of the independent variables indicate that the largest importance to predict P1 leadership ability corresponds to leadership experience accounting for 38%, followed by main family engagement (36%). These two variables together with schooling years completed (12.4%) and age (12%) account for almost the total amount of variance (98%). The tolerances of all variables are high enough to assure exclusion of the multicollinearity problem.

From the quantified values of the categories of variables and the corresponding plots in combination with the signs of standardized regression coefficients, it is indicated that on one hand negative effects of leadership experience and on the other positive ones of main family engagement to P1 facet of leadership are present. Specifically, the more a rural woman is engaged in leadership activities the less she tends to perceive possessing “the trustworthy-practical-encouraged ability in advising”. Oppositely, she tends to perceive this type of leadership as she is engaged other than in agriculture. To a lesser extent age (negatively) and schooling (positively) affect women perception about P1 facet.

Following the same procedure for P2 component, it is indicated that the transformed variables leadership experience and age are significant to indicate their possible effects on the “cordial-listener with tactful ability in resolving conflicts.”

The relative importance measures of the independent variables show that the largest importance to predict leadership ability P2 corresponds to leadership experience accounting for 52%, followed by age (26.6%). The two variables’ additive importance accounts for about 78.6%. Finally, it is noticed as for P1 component, that the tolerances of all variables are high enough to assure exclusion of the multicollinearity problem.
From the quantified values of the categories of variables and the corresponding plots in combination with the positive signs of standardized regression coefficients, it is similarly indicated that negative effects both of leadership experience and of age to P2 leadership facet are present. Specifically, the less a rural woman is engaged in leadership activities and the less is aged, the more she tends to perceive possessing leadership ability on being a “cordial-listener with tactful ability in resolving conflicts.”

Conclusions and Recommendations

All three objectives were met. Among the findings, some might concentrate on the following: The rural women residing in rural region of Thessaloniki perceive their leadership ability to be quite good. Several differences in perceiving their leadership ability were found. According to the findings, a profile of an individual (rural woman) with the highest level of perceived leadership would be: the rural woman with less engagement in leadership activities who possesses more than 12th grade of schooling and is also engaged, besides agriculture, in other activities outside agriculture.

Furthermore, by using the non-linear principal components analysis –PRINCALS, the original data set of 38 leadership ability items were replaced by clusters of closely related items. Two components kept describe, the first, the leadership ability of those women who are characterized with “trustworthy-practical-encouraged ability in advising” (component P1), and the second, those characterized as “cordial-listener with tactful ability in resolving conflicts” (component P2).

In studying the above components, several differences on perceiving their leadership ability were found. These differences are identified when those women are studied in groups with the criteria mentioned previously. According to the above, a profile of an individual (rural woman) regarding component P1, would be: the rural woman with less engagement in leadership activities who also is more aged.

Having in mind those conclusions it can be recommended to the local extension agents to take advantage of the findings and grasping the gender movement to utilize women in achieving their objectives. The above criteria are not difficult to be used in the field. The women can easily be identified in groups and the extensionist can utilize the most applicable group in enhancing extension objectives to rural families.

The findings when this model is employed (surely, with additional variables to be searched for the inclusion in the model) can be useful for developing leadership programs in a region. Furthermore, the model itself could be helpful in similar work and it is recommended for further consideration and development.

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Evaluating Farmers’ Knowledge and Awareness of Integrated Pest Management (IPM): Assessment of the IPM Collaborative Research Support Project in Uganda

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Abstract

The IPM CRSP (Integrated Pest Management Collaborative Research Support Program) has been applying a farmer participatory IPM strategy at on-farm research sites in Eastern Uganda since 1995. Comparison groups composed of project participants and non-participants were used to evaluate the impact of project activities on IPM knowledge and awareness change among two hundred small scale farmers. The evaluation instrument used a summated ratings scale consisting of four attributes to measure farmers’ knowledge of IPM, and crop specific indices to measure pest management. The results demonstrate that more active participation increases knowledge of IPM pest management knowledge, providing preliminary support for the project’s participatory research and extension approach. However, project beneficiaries were relatively few and were slightly more socioeconomically advantaged. Recommendations for increasing the number of farmer participants and improving the evaluation process are made.

Introduction

Farmer participation and integrated pest management (IPM) are important trends in agricultural research and extension in sub-Saharan Africa. Over two decades, attempts to develop and disseminate IPM in developing countries have met with limited success (Yudelman et al., 1998; Kiss & Meerman, 1991). Increasing farmer participation in the development and implementation of IPM programs has emerged as a strategy for increasing the application of IPM, particularly among small-scale farmers (Dent, 1995).

IPM was first developed in response to environmental concerns about the abuse or overuse of chemical pesticides associated with intensive-input agricultural systems in developed countries. The traditional approach was to develop pest and disease control alternatives to reduce or eliminate the use of chemical pesticides. The role of extension was to transfer and disseminate these technologies and practices directly to farmers (Morse & Buhler, 1997).

More recently, alternative approaches have evolved for small-scale farming systems in developing countries. These approaches seek to combine indigenous farmer knowledge with scientific knowledge of cropping systems and pests to develop site appropriate IPM systems. Variously labeled as ecological or sustainable IPM (Mangan & Mangan, 1998; Schwab, 1995), these approaches are often described as being knowledge intensive (Morse & Buhler, 1997). Since they require enhanced knowledge and understanding of biological factors and ecological interactions for their successful implementation by small farmers (Dent, 1995), ecological IPM programs are increasingly linked to participatory research and extension approaches (Norton et al., 1999).
Uganda since 1995. Farmer participation at each stage of the research process provided the nexus for an emerging synthesis of both ecological and traditional approaches. Following five years of implementation it was decided to launch an evaluation to assess project impacts. Although participating farmers had consistently supported the project, an evaluation to assess project impacts was considered important to assess program effectiveness and suggest program modifications.

**Purpose**

The main purpose of this study was to evaluate the impact of project (IPM CRSP) activities on IPM knowledge and awareness change among small-scale farmers in Eastern Uganda. Evaluating the impact of traditional IPM programs generally has relied upon assessing adoption of new technologies and monitoring reductions in pesticide use in developed countries (Zalom, 1993). An ecological approach to IPM, however, places more emphasis on increasing knowledge and awareness of key concepts as a precursor to the adaptation and application of this knowledge by project beneficiaries. As a result, there is a need to develop and adapt methods and instruments to evaluate knowledge intensive IPM programs, particularly those implemented with small scale farmers in developing countries.

**Methodology**

Evaluation Approach: The assessment of project impacts used in this study followed the hierarchical target/outcome structure suggested in the Targeting Outcomes of Programs (TOP) model of Bennett and Rockwell (1995). Their model involves seven stages to guide both program development and assess program performance. This evaluation is conducted at the third stage, or KASA. The TOP model assumes that changes in knowledge, attitudes, skills and aspirations (KASA) lead to changes in practices, that in turn, create the desired change. Increased knowledge and awareness are generally considered prerequisites to the adoption of new practices and technologies, including IPM (Rogers, 1995).

**Population and Sample:** A multi-stage sampling procedure was used to select eight villages in two districts in Eastern Uganda. In each district, 4 sub-counties were selected, with two of these being sub-counties where the IPM CRSP had active programs and two others where the CRSP had not previously been active. The selection of sub-counties where the IPM CRSP had not been active was based on geographic proximity and agro-ecological similarity to those where the IPM CRSP had been active. Villages in each sub-county were then purposively selected: two were selected near NGOs that had worked with the IPM CRSP. In sub-counties where the IPM CRSP had not been active, villages were selected near an identified, active farmer NGO. Lists of farmers for each village were obtained from local council officials at the village level. A systematic random sample of 25 farmers was selected from each village, totaling 100 interviews in each district, and 200 interviews in all.

**Data Collection and Instrumentation:** The evaluation instrument was developed through the iterative process of farmer participation with scientists and extension agents. Farmer knowledge and knowledge gaps of on-farm ecological relationships, priority pests and diseases, and pest management practices, suggested questions for assessing knowledge and awareness change. This included a series of questions that required farmers to identify pests and diseases from enlarged photos and specific questions about pest and disease management practices.

Enumerators were selected based on their familiarity with local languages, survey methodology and past experience with IPM CRSP activities. A one-day enumerator training workshop was held prior to pre-testing the instrument by teams of enumerators in their respective districts. All questionnaires were completed by personal interviews. Female enumerators, two for each district, were instructed to interview female farmers knowledgeable of the farm operation when possible. Enumerators, both male and female, were instructed to follow the systematic selection process described above.
Comparison Group Identification: An important objective of the sampling procedure was to have comparison groups composed of both project participants and non-participants. Participation was established by asking respondents if they had participated in two or more IPM CRSP activities. Participation in the IPM CRSP is a trichotomous variable with (0) indicating no participation (N=142), (1) indicating participation in 1 or 2 activities (N=34), and (2) indicating participation in three or more activities (N=24). For some analyses, the participation variable was made dichotomous, yielding non-participants (N=142), and participants (N=58).

Group Comparability: To attribute outcomes to project activities, it was necessary to assess the degree of comparability of the two groups. Using a T-test of mean differences, the two groups were compared on the basis of socio-economic criteria including sex, age, years of education, farm income, and acres in crops. Sex was a dummy variable with women coded (0) and men (1). Age and years of education are continuous variables. Education was measured by the number of years of formal education completed. Farm income was operationalized by asking farmers to approximate their annual farm income in Ugandan shillings (UGS), using seven categories ranging from less than 50,000 to more than 500,000 Ugandan shillings, coded 0-6 (1000 UGS = $1 USA). Crop acreage was the amount of land in production at the time of the interview. Crop acreage was used instead of total farm size because it more accurately reflected each household’s resource capacity for putting land into production.

IPM Knowledge: The project did not begin with a rigid predetermined definition of IPM, because local and contextual pest management experience was not known. Since IPM is a multi-dimensional concept (Dent, 1995), it was decided to let important dimensions emerge from participatory activities. Early activities established that most farmers preferred to use, and many were frequently using, chemical pesticides; many farmers were unaware of alternatives to pesticides for managing pests; farmers were unaware of many crop diseases and small insects; and were generally unaware of beneficial insects. In recognition of farmers’ preference for using pesticides it was decided to retain and promote “IPM” as a brand name for pest management alternatives that would supplant or moderate chemical pesticide usage. Each of these knowledge attributes or dimensions was considered fundamental to a strong working knowledge of IPM. Through program activities, the IPM CRSP attempted to increase the knowledge and awareness of these dimensions.

A dichotomous measure of a multi-dimensional concept was considered inappropriate; thus a summed ratings scale consisting of these four attributes was devised to measure farmers’ knowledge of IPM. The coefficient of reliability for the knowledge of IPM scale was .72, indicating an acceptable level of reliability (Nunnally, 1978:245). The first item requested interviewers to evaluate farmers’ ability to define these dimensions or attributes of IPM on a 0-2 scale, where 0 indicated an inability to define IPM; 1, indicated a partial definition of IPM; and, 2, indicated a more complete definition. Partial and more complete definitions were scored if farmers mentioned one or more of the attributes of IPM including, reducing use of pesticides or using them selectively, using alternative practices besides pesticides to control pests, or protecting beneficial organisms. The second item asked farmers if they were aware of any harmful effects from using pesticides, and was coded 0 if they were unaware; and 1-3 if they were aware of potential harmful impacts from using pesticides. A third item asked farmers if they could name any beneficial insects, with a no response coded 0, naming one insect coded 1, and naming more than 1 insect coded 2. The fourth item asked farmers if they knew other practices to control pests and diseases besides using pesticides, with a no (0) response indicating that they were not aware of other means to control pests besides using pesticides and the mentioning of alternative control methods coded 1-3. Alternative control methods mentioned included crop rotation, fallowing, increasing plant populations, roguing diseased plants, hand-removal of pest species, using homemade concoctions or locally available bio-rational products, and using resistant or tolerant varieties.
Knowledge of Crop Specific Pests, Diseases and Management Alternatives: Farmers determined priority crops, pests, and diseases during the initial participatory assessment (PA). In Iganga District, the priority crops selected by farmers were maize, beans, and groundnuts; for Kumi District the priority crops were sorghum, groundnuts and cowpea. Following the PA, IPM CRSP activities focused on developing knowledge and awareness of priority pests and diseases, and, pest management alternatives. To assess knowledge accrual impact from IPM CRSP activities, a set of test questions were developed for each crop. Since pest and disease identification was an early activity of the IPM CRSP, some questions pertained to enlarged photos of specific pests, diseases, or plant damage. Other questions asked for specific responses about resistant varieties, post-harvest storage techniques, disease vectors, or control practices. Responses to these questions were coded either 0 for not-known, or 1 if the farmer knew the answer or identify the pest or disease. These responses were then combined to form an index of pest management knowledge for each crop.

Data Analysis: To test the effects of various levels of participation in IPM CRSP activities on knowledge of IPM, one-way analysis of variance was used. The simple hypothesis that guided this analysis was that increased participation in IPM CRSP activities would be associated with more knowledge of IPM. The impact of project participation on knowledge of crop specific pests, diseases and knowledge items was assessed using a t-test for equality of means. The hypothesis here was that there would be significant differences of crop specific knowledge between those who had and those who had not participated in the project.

Findings

Group Comparability: Comparisons of non-participants and participants on key socio-economic variables provide some indication that programmatic activities may be reaching older, larger and wealthier farmers (see Table 1), although mean differences were not dramatically large even for those that were

Table 1

Summary of T-Test Analysis: Means, Standard Deviations and Significance Level

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Non-participants (N = 142)</th>
<th>Participants (N = 58)</th>
<th>Degrees of Freedom</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>38.78 (12.53)</td>
<td>43.33 (11.58)</td>
<td>198</td>
<td>-2.38*</td>
</tr>
<tr>
<td>Sex</td>
<td>.507 (.501)</td>
<td>.414 (.496)</td>
<td>198</td>
<td>-1.196</td>
</tr>
<tr>
<td>Years of Education</td>
<td>6.65 (3.34)</td>
<td>7.27 (3.07)</td>
<td>198</td>
<td>-1.23</td>
</tr>
<tr>
<td>Farm Income</td>
<td>2.75 (1.64)</td>
<td>3.84 (1.69)</td>
<td>198</td>
<td>-4.23**</td>
</tr>
<tr>
<td>Acres in Crops</td>
<td>5.05 (4.28)</td>
<td>7.20 (6.00)</td>
<td>198</td>
<td>-2.84**</td>
</tr>
</tbody>
</table>

Values in parentheses () are standard deviations.
* t-test significant at p < .05
** t-test significant at p < .01
statistically significant. The reader should keep in mind that none of the farmers were well off economically. In US dollars, average farm income was $275, and rarely exceeded $500. Even given the lower cost of living in Uganda, none of the small scale farmers participating in this project were wealthy.

Additional T-tests of mean differences were conducted on the 100 participants (n=58) and non participants (n=42) from sub-counties where the IPM CRSP had active programs. The results were somewhat the same. Compared to non participants, participants were farmers with more acres in crops and more farm income. Within these IPM CRSP targeted sub-counties, participants were also more likely to be female and had higher levels of education. However, the difference in age was no longer statistically significant.

Knowledge of IPM: Table 2 presents the mean IPM Knowledge scores by the three different levels of IPM participation. The majority of respondents (71%) have not participated in IPM CRSP activities. This is not surprising considering that half the villages in the sample were deliberately selected because they had not participated in IPM CRSP activities. The hypothesis tested is that participation in IPM CRSP activities had a positive impact on knowledge of IPM. An analysis of variance (ANOVA) presented in Table 2 shows that overall, those who participated in more IPM activities have greater knowledge of IPM than those who have not participated.

Knowledge of Crop Specific Pests, Diseases and Management Alternatives: Since priority crops differed by district, the sample size for each crop was 100, except for cowpea in Kumi District, and beans and groundnuts in Iganga District, where not all farmers were growing these crops. A t-test was used to compare means between participants and non participants on a summed ratings scale of crop specific pest management knowledge (Table 3). For each crop specific knowledge scale, a statistically significant difference was found. In every case, mean scores were higher among farmers who had participated in the IPM CRSP.

**Discussion**

A measure of evaluation effectiveness is the information gained by those trying to improve programs. The results of this study indicate that more active farmer participation increased knowledge of IPM. This provides some preliminary support for the participatory research and extension approach being used by the project.

Table 2

<table>
<thead>
<tr>
<th>IPM CRSP Participation</th>
<th>N</th>
<th>Mean</th>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - none</td>
<td>142</td>
<td>1.61</td>
<td>Between Groups</td>
<td>563.304</td>
<td>2</td>
<td>281.652</td>
<td>97.443</td>
<td>.000</td>
</tr>
<tr>
<td>1 - some</td>
<td>34</td>
<td>3.76</td>
<td>Within Groups</td>
<td>5669.416</td>
<td>197</td>
<td>2.890</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 - active</td>
<td>24</td>
<td>6.58</td>
<td>Total</td>
<td>1132.720</td>
<td>199</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td></td>
<td></td>
<td>1132.720</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values in parentheses ( ) are column percentages.
F ratio for one-way analysis of variance significant at 0.5 level.
Table 3

Mean Scores on Crop Specific Pest Management Knowledge by Level of Participation

<table>
<thead>
<tr>
<th>Crop</th>
<th>Range</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>0 - 5</td>
<td>No participation</td>
<td>66</td>
<td>1.18</td>
<td>-6.74</td>
<td>.000</td>
</tr>
<tr>
<td>(N=100)</td>
<td></td>
<td>Participation</td>
<td>34</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beans*</td>
<td>0 - 4</td>
<td>No participation</td>
<td>64</td>
<td>0.406</td>
<td>-6.56</td>
<td>.000</td>
</tr>
<tr>
<td>(N=98)</td>
<td></td>
<td>Participation</td>
<td>34</td>
<td>2.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td>0 - 6</td>
<td>No participation</td>
<td>76</td>
<td>3.26</td>
<td>-3.44</td>
<td>.001</td>
</tr>
<tr>
<td>(N=100)</td>
<td></td>
<td>Participation</td>
<td>224</td>
<td>4.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cowpea</td>
<td>0 - 6</td>
<td>No participation</td>
<td>74</td>
<td>3.24</td>
<td>-4.88</td>
<td>.000</td>
</tr>
<tr>
<td>(N=97)</td>
<td></td>
<td>Participation</td>
<td>23</td>
<td>4.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gnuts (Iganga)</td>
<td>0 - 5</td>
<td>No participation</td>
<td>49</td>
<td>1.61</td>
<td>-3.59</td>
<td>.001</td>
</tr>
<tr>
<td>(N=77)</td>
<td></td>
<td>Participation</td>
<td>28</td>
<td>2.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gnuts (Kumi)</td>
<td>0 - 5</td>
<td>No participation</td>
<td>76</td>
<td>2.42</td>
<td>-5.44</td>
<td>.000</td>
</tr>
<tr>
<td>(N=100)</td>
<td></td>
<td>Participation</td>
<td>24</td>
<td>4.04</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Levene Test for Equality of Variances: F = 75.87; Sig:.000; Thus t-test for equality of Means, equal variances not assumed.

However, the analysis provided evidence that the number of project beneficiaries was small, and even among this group of small-scale, relatively poor farmers, beneficiaries were still the more socio-economically advantaged. Altogether, only 58 (29%) of the farmers sampled had participated in project activities, despite nearly 5 years of project activities and purposively sampling villages located near research sites. Ironically, an important reason why more farmers have not participated may be the emphasis placed on using a participatory approach. Activities such as participatory assessments, farmer field monitoring, on-farm trials and field evaluations were generally limited to small groups of farmers so that program quality could be maintained and to remain within project budgetary parameters. Others have noted that participatory programs are more demanding than conventional on-station, on-farm approaches and, as a result, have encountered similar difficulties in trying to expand participation (Douglah & Sicilima, 1997; Roling & van de Fliert, 1994).

The project made concerted attempts to ensure equal access to project activities, even going to the extent of working with NGOs with exclusive female membership and conducting farmer open days. This helps explain why female participation was higher in IPM CRSP active subcounties. Efforts to be more inclusive of poorer farmers may have been confounded by the noted phenomenon that attendees at training programs are often the more aggressively innovative farmers, that is, those with better education, larger acreage, and higher farm income (Haug, 1999; Dent, 1995; Rogers, 1995). Participatory agricultural research (PAR) programs may not be a remedy for reaching the most marginalized in society and the conduct of agricultural research, even PAR, may self-select for those with the capacity to innovate and accept risks. Addressing the needs of the poorest of the poor, although a desirable objective will always be difficult particularly when the majority of farmers in a targeted community are small and resource poor.
Implications

To reach a broader audience with a more compact format, a discovery and experiential learning-based IPM training module has been developed for extension agents to use with groups of farmers over the course of a single growing season next year. Additionally, in keeping with the participatory precept that knowledge is contextual, a new evaluation instrument has been constructed for use in the field with farmers during the growing season. Future assessments of this project will examine the impact of IPM knowledge and awareness change on adoption of pest management technologies.

Acknowledgments

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References


Skills Needed by Agriculturists in Costa Rica as Perceived by Employers

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Abstract

The purpose of this study was to identify the skills needed by agriculturists in Costa Rica. This descriptive study used a mailed survey to collect data from people in agricultural organizations in Costa Rica who are potential employers of agriculturists. Employers perceived that future agriculturists needed a variety of skills in business, computer, research, interpersonal, communications, dissemination, and technical agriculture areas. The findings should be considered by educational institutions desiring to revise and improve their curricula and/or develop partnerships with agricultural organizations and businesses.

Introduction/Framework

Agriculture is fundamental to the economy of Costa Rica. During the twentieth century, Costa Rica moved from a subsistence agricultural system to one that included exports. Agriculture in Costa Rica engages 28% of the workforce (South America, Central America and the Caribbean, 1991), and contributes 36.6% to the gross national product of the country (Almanaque Mundial, 1998).

Higher education plays a key role in agricultural development in Latin America. The job market requires professionals with educational backgrounds that will enable them to be entrepreneurs as well as employees in private companies. Colleges and universities are challenged to prepare graduates to deal with issues facing the agricultural industry, including problems related to deforestation, soil erosion, and water contamination (FAO & ALEAS, 1991). Sledge (1987) reported that higher education must develop human expertise for the food and agricultural sciences, including natural resources.

Opportunities for education in agriculture are widespread in Costa Rica. Agricultural high schools came about in the 1970s when technical high schools were established throughout Costa Rica (Crawford & Gonzalez, 1978). Fifty-one of these schools were established as part of a national plan to increase agricultural production (Graham-Brown, 1991). In 1992, curricula in these schools moved from a focus on production agriculture to a broader view of the agricultural industry, including environmental issues (Ministerio de Educacion Publia, 1991). Three of Costa Rica’s four state universities and two private institutions offer degrees in 17 different fields of study in the agricultural sciences and related areas.

In 1990, the Agricultural College of the Human Tropic Region (known by its Spanish acronym EARTH) opened with a 4-year curriculum leading to the degree of Ingeniero Agronomo with the title of Licenciatura (Agriculturist). Based on the European system of education, this credential is superior to the Bachelor of Science degree (French, 1993). EARTH is guided by a “learning by doing” philosophy that features experiential learning in laboratory and field settings and a curriculum that focuses on the preparation of youth from throughout Latin America in sustainable agricultural practices with an entrepreneurial perspective (EARTH, 1992-93).

Developments in agriculture have created a need for employees with new skills. Research conducted by German universities and U. S. land grant institutions has greatly influenced the contemporary approach to higher education in agriculture, which emphasized the development of student skills to meet the challenges and changes of the years ahead (Sherrard, 1994). Bjoraker (1987) called on colleges of agriculture to accept the responsibility for developing human expertise in the food and agricultural sciences:
the curriculum of the future must be sound and be able to produce the baccalaureate graduate with the necessary expertise. To achieve this goal colleges must identify the characteristics required of a graduate 20 years in the future and must develop guidelines for a revitalized curriculum (p. 5).

Sledge (1987) summarized the skills college of agriculture graduates of the year 2005 should possess:

- a global perspective of agriculture and an understanding of international trade
- greater knowledge in biotechnology and human nutrition
- greater competency in economics and business management
- problem-solving abilities and an understanding of systems analysis
- the ability to be “adaptive” and to be a “learner”
- mastery of communications skills and an understanding of telecommunications
- depth in a chosen professional area and an understanding of ethics in agriculture
- knowledge to aid in the preservation and wise use of natural resources

Future agriculturists in Latin America should have educational backgrounds that enable them not only to work for governmental agencies but also for private companies. Graduates from agricultural colleges should possess skills needed to provide services, as well as skills in agricultural production (FAO & ALEAS, 1991). The FAO and ALEAS (1991) reported that there is urgency in preparing professionals to:

- help strengthen small-scale agriculture
- generate appropriate technology in accordance with the resources available
- educate farmers and communities in new technologies and rural administration
- help farmer organizations with the marketing process
- help develop local agribusinesses
- help conserve natural resources that are being degraded
- contribute to the creation of a more efficient agricultural sector
- create multidisciplinary teams that can help empower the rural sector
- encourage the development of commercial and entrepreneurial agriculture
- respond to employers and societal expectations and demands

Research by FAO and ALEAS (1991) found considerable difference between what was offered by colleges and universities in Latin America and what was needed in the workforce. It has been over 10 years since the technical skills needed by agriculturists in Costa Rica have been assessed (CONARE, 1993), emphasizing the need for and the importance of this study.

**Purpose and Objectives**

The purpose of this study was to identify the skills needed by agriculturists in Costa Rica. The objectives were threefold: (1) to identify the importance of technical agriculture skills as perceived by employers; (2) to identify the importance of business, computer, and research skills as perceived by employers; and (3) to identify the importance of interpersonal, communications, and dissemination skills as perceived by employers.

**Methods and Procedures**

The study utilized a descriptive survey design to accomplish the objectives. Since a comprehensive list of potential employers of agriculturists in Costa Rica did not exist, it was necessary to generate such a list using a variety of sources, including the country’s telephone book, headquarters for various agricultural associations and companies, EARTH’s internship and job placement records, and individuals. The final list consisted of 149 entities (businesses, organizations, and agencies) with mailing addresses. Recognizing that research of this nature was relatively new in Costa Rica, all 149 organizations (considered as potential employers of future agriculturists) were asked to participate in the study by completing a survey.

Based on a review of the literature and the expertise of the researchers, a tentative list of the skills needed by agriculturists in Costa Rica was developed. Selected faculty at EARTH and the University of Costa Rica with in-depth knowledge of agriculture in Costa Rica were
asked to review the list for content validity. The survey used a 5-point Likert-type scale (1 = not important to 5 = very important) to measure perceptions. Open-ended questions were included to collect demographic data. A second group of agricultural professionals was used to review a revised version of the survey for content and format.

A cover letter and two surveys (in Spanish) were mailed to each of the 149 entities, requesting responses from one administrator and one technician (298 potential respondents). Two pre-stamped, return envelopes were also included in the mailing. Follow-up mailings and telephone calls were made to encourage participation in the study. Completed questionnaires were received from 148 respondents (76 administrators and 72 technicians), for a 49.6% response rate. Two limitations should be applied to the data: (1) it was not feasible to contact nonrespondents to see if a difference existed between respondents and nonrespondents, and (2) the reliability of the survey was not statistically tested, since this was an exploratory study. Thus, the findings should be considered as introductory, and generalizations beyond what the respondents said should be made with caution. Descriptive statistics, including percentages, means, and standard deviations, were used to analyze the data.

Findings

Characteristics of Respondents

Of the 148 respondents, 89.9% were male; 73.3% were employed in the private sector; 44.5% were between 31 and 40 years of age; 89.2% were from Costa Rica; 89.9% had a bachelor’s or higher degree; 45.9% had their highest degree in agronomy, agricultural engineering, or agricultural economics; 72.3% had earned their highest academic degree from an institution in Costa Rica; and 45.9% had less than 6 years of experience with their current employer.

Technical Agriculture Skills

The data in Table 1 show the means and standard deviations for 44 technical agriculture skills grouped under nine areas. With the exception of the skills in the animal production area, most of the skills had means above 3.0, indicating that respondents saw them as important skills for future agriculturists to possess. Areas with the highest means (above 4.0) were soil and water conservation, natural resources conservation techniques, and postharvest handling and transportation of products. In addition to the means for animal production skills, means for medicinal plants (local consumption and export), native forestry plantations, ecotourism, and processing products were below 3.0 on a 5-point scale.

Business, Computer, and Research Skills

Table 2 reports that the means for all of the 17 skills listed under the business, computer, and research areas had means above 3.32, indicating that employers recognized them as important skills for future agriculturists in Costa Rica to possess. Among the skills with the highest means were three business skills dealing with management (means ranging from 4.34 to 4.45). Both computer skills (manage basic computer programs and use of computer packages for data management) and three research skills (make decisions based on statistical results, interpret statistical results, and analyze statistical data) also had mean over 4.0 on a 5-point scale.

Interpersonal, Communications, and Dissemination Skills

Respondents placed relatively high importance on all 21 of the skills listed under the interpersonal, communications, and dissemination areas (Table 3). All skills had means (3.70 – 4.90) well above midpoint on a 5-point scale, with the highest ones being related to on-the-job attitude, decision-making, group work, adapting to job conditions, and solving conflict, all in the interpersonal area. In the communications area, both verbal and written skills had relatively high means (over 4.5).
## Table 1 Importance of Skills in Technical Agriculture Areas as Perceived by Employers

<table>
<thead>
<tr>
<th>Technical Agriculture Areas/Skills</th>
<th>Mean*</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Animal Production</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle for milk</td>
<td>2.78</td>
<td>1.61</td>
</tr>
<tr>
<td>Cattle for meat</td>
<td>2.73</td>
<td>1.64</td>
</tr>
<tr>
<td>Cattle for meat &amp; milk</td>
<td>2.70</td>
<td>1.61</td>
</tr>
<tr>
<td>Hogs</td>
<td>2.34</td>
<td>1.51</td>
</tr>
<tr>
<td>Poultry</td>
<td>2.32</td>
<td>1.54</td>
</tr>
<tr>
<td>Fish</td>
<td>1.95</td>
<td>1.38</td>
</tr>
<tr>
<td>Goats</td>
<td>1.77</td>
<td>1.17</td>
</tr>
<tr>
<td>Sheep</td>
<td>1.67</td>
<td>1.11</td>
</tr>
<tr>
<td>Crustaceans</td>
<td>1.82</td>
<td>1.26</td>
</tr>
<tr>
<td><strong>Crops Produced for Local Consumption</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>3.59</td>
<td>1.42</td>
</tr>
<tr>
<td>Grains</td>
<td>3.52</td>
<td>1.53</td>
</tr>
<tr>
<td>Horticulture</td>
<td>3.41</td>
<td>1.48</td>
</tr>
<tr>
<td>Industrial crops</td>
<td>3.28</td>
<td>1.49</td>
</tr>
<tr>
<td>Roots &amp; tubers</td>
<td>3.14</td>
<td>1.39</td>
</tr>
<tr>
<td>Ornamental plants</td>
<td>3.17</td>
<td>1.48</td>
</tr>
<tr>
<td>Medicinal plants</td>
<td>2.41</td>
<td>1.27</td>
</tr>
<tr>
<td><strong>Crops Produced for Export</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>3.47</td>
<td>1.46</td>
</tr>
<tr>
<td>Horticulture</td>
<td>3.27</td>
<td>1.49</td>
</tr>
<tr>
<td>Industrial crops</td>
<td>3.26</td>
<td>1.54</td>
</tr>
<tr>
<td>Ornamental plants</td>
<td>3.19</td>
<td>1.52</td>
</tr>
<tr>
<td>Grains</td>
<td>3.16</td>
<td>1.48</td>
</tr>
<tr>
<td>Roots &amp; tubers</td>
<td>3.13</td>
<td>1.44</td>
</tr>
<tr>
<td>Medicinal plants</td>
<td>2.48</td>
<td>1.36</td>
</tr>
<tr>
<td><strong>Forestry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forestry plantations</td>
<td>3.07</td>
<td>1.49</td>
</tr>
<tr>
<td>Forestry greenhouses</td>
<td>3.01</td>
<td>1.46</td>
</tr>
<tr>
<td>Native plantations</td>
<td>2.92</td>
<td>1.50</td>
</tr>
<tr>
<td><strong>Natural Resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conservation techniques</td>
<td>4.14</td>
<td>1.28</td>
</tr>
<tr>
<td>Management</td>
<td>3.89</td>
<td>1.26</td>
</tr>
<tr>
<td>Planning for potential use</td>
<td>3.75</td>
<td>1.28</td>
</tr>
<tr>
<td>Environmental impact</td>
<td>3.72</td>
<td>1.36</td>
</tr>
<tr>
<td>Ecotourism</td>
<td>2.53</td>
<td>1.39</td>
</tr>
<tr>
<td><strong>Agricultural Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil &amp; water conservation</td>
<td>4.26</td>
<td>1.06</td>
</tr>
<tr>
<td>Agricultural mechanization</td>
<td>3.59</td>
<td>1.25</td>
</tr>
<tr>
<td>Topography</td>
<td>3.42</td>
<td>1.33</td>
</tr>
<tr>
<td>Rural construction</td>
<td>3.04</td>
<td>1.28</td>
</tr>
<tr>
<td><strong>Sustainability Issues</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production with organic fertilizers</td>
<td>3.90</td>
<td>1.18</td>
</tr>
<tr>
<td>Production without commercial pesticides</td>
<td>3.66</td>
<td>1.34</td>
</tr>
<tr>
<td>Production while reducing contamination</td>
<td>3.42</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Postharvest Management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handling &amp; transportation</td>
<td>4.02</td>
<td>1.21</td>
</tr>
<tr>
<td>Storage</td>
<td>3.61</td>
<td>1.34</td>
</tr>
<tr>
<td>Packaging</td>
<td>3.47</td>
<td>1.32</td>
</tr>
<tr>
<td><strong>Processing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative uses for products</td>
<td>3.46</td>
<td>1.34</td>
</tr>
<tr>
<td>Value added</td>
<td>3.41</td>
<td>1.38</td>
</tr>
<tr>
<td>Processing products</td>
<td>2.96</td>
<td>1.39</td>
</tr>
</tbody>
</table>

*Scale: 1 = not important, to 5 = very important*
### Table 2

**Importance of Skills in Business, Computer, and Research Areas as Perceived by Employers**

<table>
<thead>
<tr>
<th>Business, Computer, and Research Areas/Skills</th>
<th>Mean*</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Think and behave as a manager</td>
<td>4.45</td>
<td>0.80</td>
</tr>
<tr>
<td>Apply total quality management style</td>
<td>4.35</td>
<td>0.76</td>
</tr>
<tr>
<td>Manage and control a budget</td>
<td>4.34</td>
<td>0.89</td>
</tr>
<tr>
<td>Conduct financial analysis of a company</td>
<td>3.94</td>
<td>1.07</td>
</tr>
<tr>
<td>Conduct feasibility studies</td>
<td>3.88</td>
<td>1.02</td>
</tr>
<tr>
<td>Be able to include environmental cost and make decisions based on the results</td>
<td>3.84</td>
<td>0.97</td>
</tr>
<tr>
<td>Develop marketing strategies</td>
<td>3.80</td>
<td>1.26</td>
</tr>
<tr>
<td>Understand and apply practical accounting concepts</td>
<td>3.74</td>
<td>0.98</td>
</tr>
<tr>
<td>Develop plans for exporting products</td>
<td>3.47</td>
<td>1.24</td>
</tr>
<tr>
<td><strong>Computer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manage basic computer programs</td>
<td>4.41</td>
<td>0.85</td>
</tr>
<tr>
<td>Use computer packages for data management</td>
<td>4.31</td>
<td>0.85</td>
</tr>
<tr>
<td><strong>Research</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make decisions based on statistical results</td>
<td>4.42</td>
<td>0.73</td>
</tr>
<tr>
<td>Interpret statistical results</td>
<td>4.25</td>
<td>0.83</td>
</tr>
<tr>
<td>Analyze statistical data</td>
<td>4.21</td>
<td>0.89</td>
</tr>
<tr>
<td>Plan &amp; conduct applied research</td>
<td>3.78</td>
<td>1.17</td>
</tr>
<tr>
<td>Plan, organize, and conduct surveys</td>
<td>3.36</td>
<td>1.22</td>
</tr>
<tr>
<td>Plan &amp; conduct research with laboratories &amp; centers</td>
<td>3.32</td>
<td>1.26</td>
</tr>
</tbody>
</table>

*Scale: 1 = not important, to 5 = very important

### Conclusions and Recommendations

Respondents placed relatively high importance ratings (above 3 on a 5-point scale) on 68 of the 82 skills studied. Especially high ratings (above 4) were found for 18 of the 21 skills in the interpersonal, communications, and dissemination areas. Skills in the business, computer, and research areas also had relatively high ratings, 8 with means above 4.0. Skills in these areas with the highest ratings were related to business management, use of computers, and use of data in making decisions. The observed importance for future agriculturists in Costa Rica to possess skills in problem solving/decision-making, verbal and written communication, and dissemination of technical information concurs with earlier work by Sledge (1987).

Of the technical agriculture skills, 31 of the 44 studied had means above 3.0 on a 5-point scale, indicating that respondents perceived them as important skills for future agriculturists in Costa Rica to possess. All of the skills studied in the animal production area had means below 3.0, midpoint on the 5-point scale. This finding may be partially explained by the fact that in Latin American the broad study of agriculture (including animal science) is commonly called agronomy (Macias-Lopez, 1990).

Three skills, “natural resources conservation techniques,” “soil and water conservation,” and “postharvest handling and management,” had means above 4.0. These observations support the urgency reported by the FAO and ALEAS (1991) to prepare professionals to help conserve natural resources.
### Table 3

**Importance of Skills in Interpersonal, Communications, and Dissemination Areas as Perceived by Employers**

<table>
<thead>
<tr>
<th>Interpersonal, Communications, and Dissemination Areas/Skills</th>
<th>Mean*</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interpersonal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintain a positive attitude towards the job</td>
<td>4.90</td>
<td>0.34</td>
</tr>
<tr>
<td>Make decisions</td>
<td>4.82</td>
<td>0.45</td>
</tr>
<tr>
<td>Work in groups</td>
<td>4.76</td>
<td>0.50</td>
</tr>
<tr>
<td>Adapt to different job condition</td>
<td>4.72</td>
<td>0.61</td>
</tr>
<tr>
<td>Solve conflicts</td>
<td>4.68</td>
<td>0.68</td>
</tr>
<tr>
<td>Work without supervision</td>
<td>4.64</td>
<td>0.71</td>
</tr>
<tr>
<td>Motivate &amp; provide incentives to personnel</td>
<td>4.55</td>
<td>0.76</td>
</tr>
<tr>
<td>Delegate responsibilities</td>
<td>4.53</td>
<td>0.73</td>
</tr>
<tr>
<td>Select, supervise, &amp; evaluate personnel</td>
<td>4.40</td>
<td>0.86</td>
</tr>
<tr>
<td><strong>Communications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communicate ideas verbally</td>
<td>4.66</td>
<td>0.57</td>
</tr>
<tr>
<td>Communicate written ideas effectively</td>
<td>4.65</td>
<td>0.60</td>
</tr>
<tr>
<td>Understand and follow instructions</td>
<td>4.52</td>
<td>0.66</td>
</tr>
<tr>
<td>Comprehend technical information written in Spanish</td>
<td>4.49</td>
<td>0.76</td>
</tr>
<tr>
<td>Write technical reports</td>
<td>4.48</td>
<td>0.71</td>
</tr>
<tr>
<td>Train personnel</td>
<td>4.37</td>
<td>0.83</td>
</tr>
<tr>
<td>English reading comprehension</td>
<td>4.08</td>
<td>1.03</td>
</tr>
<tr>
<td>Use of visual aids to help deliver information</td>
<td>3.83</td>
<td>1.20</td>
</tr>
<tr>
<td>Effective communication skills in English</td>
<td>3.70</td>
<td>1.10</td>
</tr>
<tr>
<td><strong>Dissemination</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide technical information</td>
<td>4.42</td>
<td>0.87</td>
</tr>
<tr>
<td>Plan, organize, &amp; conduct extension activities</td>
<td>4.15</td>
<td>1.01</td>
</tr>
<tr>
<td>Plan, organize, &amp; conduct rural development activities</td>
<td>3.83</td>
<td>1.13</td>
</tr>
</tbody>
</table>

*Scale: 1 = not important, to 5 = very important

The findings of this study reveal that future agriculturists in Costa Rica need to possess skills in a variety of areas, including interpersonal, communications, dissemination, business, computer, research, and technical agriculture. The shift from a subsistence agricultural system in Costa Rica to one that includes exports has created a need for agriculturists who are prepared to work in the service and business sectors of agriculture. This conclusion agrees with FAO and ALEAS’s (1991) report that future agriculturists should be prepared to provide services as well as to deal with agricultural production issues.

The findings of this study should be considered by all educational institutions in Costa Rica that are involved in the preparation of human resources for the food and agricultural sciences. Colleges and universities dedicated to the preparation of agriculturists at the bachelor and licenciatura degree level should consider these findings as they seek to revise and improve their curricula. The findings have implications for secondary school programs desiring to introduce students to employment opportunities in agriculture and to articulate their agricultural education offerings with those of colleges and universities. The findings also suggest that there are opportunities for partnerships between educational institutions and employers. This study should be replicated when a more comprehensive population of potential employers of agriculturists is identified to provide data to supplement the findings of this exploratory study.
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