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From the Editor

I would like to take this opportunity to introduce myself. I am Jim Connors, Assistant Professor, in the Department of Agricultural and Extension Education at the University of Idaho. I received my PhD from Michigan State University and have worked at both the University of Arizona and now at the University of Idaho. My international experiences have taken me to the Russian Federation, Lithuania and Costa Rica.

On January 1, 1999, I had the pleasure of assuming the duties of the Editor of the Journal of International Agricultural and Extension Education. As I begin my term as Editor, I would like to sincerely thank Satish Verma for his three years of outstanding service to the Journal and the Association of International Agricultural and Extension Education. Under Satish=s leadership, the Journal continued to grow and has developed into a well-written professional publication.

As Editor, I have high hopes of moving the Journal forward into the next century. If the Journal of International Agricultural and Extension Education is to become more widely distributed publication, we, the members of AIAEE must make every effort to promote it with our friends and colleagues around the world. If you know of an organization or individual in agricultural and extension education who you think could benefit from receiving the Journal, please let me know. I would be happy to send them a complimentary issue to promote the Journal and increase subscriptions, paper submissions and readership.

Helping me coordinate the business and scholarly review of the Journal of International Agricultural and Extension Education is the Editorial Board (listed on the previous pages). These agricultural and extension professionals from around the world have volunteered their time and effort to improve the operation and professional standards of the publication. If you ever have any comment or suggestion, please let one of them know, or contact me directly.

Finally, I look to you, the membership of the Association of International Agricultural and Extension Education, to help to improve the Journal. I look forward to receiving your Feature Articles, Tools of the Profession and Commentary Articles. The Journal of International Agricultural and Extension Education will only improve with your active participation in this scholarly endeavor.

Jim Connors

TRAINING FOR EXTENSION IN THE ENVIRONMENT AND SUSTAINABLE AGRICULTURE: LESSONS FROM A STUDY IN SOUTH-EAST ASIA

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Abstract

The study formed part of a wider research project on the implications of environment and sustainability (E/S) issues for the organization and practice of agricultural extension in three countries in Asia. It focused upon the training of both field staff and rural clients through the development of case studies of course curricula. These provided much positive evidence that some of the curricula did show an increasing responsiveness to E/S issues; with positive moves towards more interactive, learner-centered and experiential learning methods. In several cases curriculum development processes were becoming more participatory and, in some cases, had begun to take account of changing patterns of demand. In some instances, however, participatory approaches were still lacking; there was continuing emphasis on theory rather than practice, and a lack of training needs analysis. The need for a more integrated approach to extension training; one which models Agreener,@ more holistic approaches in both learning systems and training management is advocated.

Introduction

This research formed one component of a wider project entitled: *Implications of Environmental and Sustainability Issues for the Organization and Practice of Agricultural Extension*, funded by the UK Department for International Development (Garforth and Lawrence, 1997). The author was a member of the research team, studying extension training curricula which involved four collaborating institutions in Asia.[1] The conclusions drawn and the guidelines provided in this paper are entirely the responsibility of the author, and should not be attributed to the Department for International Development (DfID).

[1] Contributions from Professor M. A. Kashem and Abdul Momen Miah of Bangladesh Agricultural University; Professor K. S. Krishna of University of Agricultural Sciences, Bangalore, South India; Professor J. Vasanthakumar of Annamalai University, Tamil Nadu, South India; Dr Samuel S. Go, Salvador C. Dagoy and Alicia S. Go of Visayas State College of Agriculture, The Philippines are gratefully acknowledged.

The Rationale for Institutional and Curriculum Reform

Recent literature has highlighted the need for both training institutions and curricula to reflect the global concerns for the environment and sustainability. For example: "education is critical for promoting sustainable development and improving the capacity of people to address environmental and development concerns@ (Agenda 21 - quoted in Van Crowder, 1996:134). The UN Food and Agriculture Organization (FAO) recently commissioned case studies of the integration of environmental and sustainable development themes into the agricultural curricula of 10 universities from different countries and regions of the world and concluded that, Athe ultimate goal to which higher agricultural education should contribute is the fullest possible awareness of and commitment to environmentally responsible behavior in all segments of society" (FAO, 1993, p.5).

The present study, however, showed that in some cases the faculties of agriculture were not the main initiators of efforts to integrate environmental education and sustainable

development, but lagged behind both public agencies and non-governmental organizations (NGOs) involved in extension and training.

Other researchers have recently highlighted the difficulties that training organizations have experienced, in achieving the necessary Aparadigm shift@ (Roling and van der Fliert, 1994, p. 38-39), both in their training curricula and in moving towards a more participatory curriculum process, including the involvement of a range of stakeholders. Stocking (1994, p. 13-14) indicated the common mismatch between the nature of the institutions involved in agricultural education and extension and the character of environmental problems and the "pedagogic challenge in current debates ... which involves 'ways of learning' and 'ways of knowing=.@ Yassin (1996, p. 43) suggested that training for environmental and sustainability issues needs to follow the Aemancipation principle", fostering self-reliance, local resource control, empowerment and participation; training which offers "opportunities for self-satisfying actions." Rowe (1994, p. 107) in describing the process of the "greening" of the curriculum in one UK agricultural college argued that changes proposed in academic curricula could only be effective if, Athey were reflected in all aspects of the institution's business, including land management and domestic organization..."

Within the overall design of the research project reported upon here, it was recognized that an investigation of current training curricula, both for extension workers (EWs), and for their clients, would provide very important information in relation to issues of E/S and their implications for extension. In all the study areas, training, of both staff and clients, had been operationalized at different levels, from the agricultural universities, through sub-degree level training institutes or colleges, to various kinds of training centers in both public and private sectors. In addition to the pre-service or foundation training provided to new entrants to the field services, it was accepted that all field staff required to be updated through in-service training if they were to provide effective extension, and that rural people needed to receive inputs of new knowledge and skills through some form of structured learning experience.

What is meant by ACurriculum@ and by ACurriculum Process

One of the challenges facing this research was the limited view, so commonly held, of Acurriculum@ as being a written document; essentially a menu or checklist of topics to be taught, and a prescription of the manner in which that is to be done. That this was too restricting was emphasized by the fact that in many of the cases, any such documents were virtually non-existent. In several, especially those from NGOs and other providers of short courses, the only documentation made available was a handbook or prospectus, with the briefest of information about the training, which they provided. It was, then, important to develop a wider understanding of the context within which training was taking place, and the processes by which it was planned, implemented and evaluated. Training needed to be seen as facilitating learning over a longer period, including the role of pre-training needs assessment and post-training follow-up. Thus, the case studies attempted to encompass a holistic view of the curriculum process.

A guiding hypothesis of the study was that there are clear links between the levels of participation engendered; the educational innovativeness of the learning process, and the access to relevant content on issues of E/S. This is well supported from much of the recent PRA/RRA literature (see for instance Thrupp et al, 1994; Pretty & Chambers, 1994). The latter argue that participatory approaches and methods "support local innovation and adaptation.... and so are more likely to generate sustainable processes and practices." Also that support for participatory methods "gives innovators the freedom to act and share" (p188). Van Crowder (1996, p.142) quotes Fujisaka in stating that, "evidence shows that farmers are willing to adopt conservation practices on a widespread and sustainable basis if their participation is....
a critical component of technology development and transfer.@

The case studies included an analysis of the

processes by which curriculum was developed and reviewed, including the participation of various groups of stakeholders from outside the organization; reflecting the notion that where curriculum process is itself open and participatory it is more likely to lead to changes which incorporate new issues which are significant, either locally or globally; such as those relating to the environment and sustainability (FAO, 1993, p. 14-15).

Methodology

The methodology was developed at a planning workshop held in Reading, England, for all the partners of the research project in early 1995. The first step was to design an instrument, which could be applied in each of the study areas, and to all the different types of training programs offered. Country groups worked on the question, "What are the key areas of knowledge, attitudes and skills required for field level extension workers in order to perform effectively in meeting the environmental and sustainability objectives of (a) their organizations and (b) their clients?" Their suggestions were then grouped under three headings:

(i) generic knowledge and attitudes (i.e., in relation to general environmental problems, basic ecological cycles and processes, etc.);

(ii) technology specific knowledge and skills;

(iii) extension knowledge, attitudes and skills (including e.g. communication, interaction).

Important dimensions for curriculum analysis were agreed to be the training objectives; subject areas; amount of time allocated to each area; methods of training and learning; level/type/cadre of trainees; evaluation/assessment methodologies used.

Following a period of iterative consultations, the five research teams formed a common instrument for use in the case studies.

During the workshop the collaborating institutions identified a total of 20 institutions and organizations which they intended to survey (Lawrence, 1995, p. 13). In each country these included organizations offering both pre-service and in-service staff training (as well as client-training in a few cases), and both formal institutions (mainly state-funded) and organizations offering non-formal training (mainly NGOs, commercial or quasi-government organizations). The fieldwork involved visits to the 20 organizations to conduct semi-structured interviews with training staff and to examine curriculum materials (where available).

Inevitably with such a large project, involving several collaborating institutions in a number of different countries, there were some limitations, which have been detailed elsewhere (see Wallace, 1998, p. 117-118). Despite these limitations the case studies were all completed and provided some clear indications of trends in all types of extension training in the study countries; including those for staff and for client groups; in both formal and nonformal settings.

Findings from the Research[2]

Inclusion of E/S material in training curricula

There was considerable evidence that training curricula in all the study areas, and from different types of institutions and programs, did include material, which made explicit reference to E/S issues. Even traditional basic science and production-oriented courses often included much implicitly-related content, and in some cases had a high level of explicitly-related content (e.g., in several formal institutions entomology was reported to have developed a clear focus upon Integrated Pest Management). Amongst the NGO programs, the Bangladesh Rural Development Board (BRDB) short courses, which were targeted mainly for resource-poor farmers, still had a high production/economy focus, but now included explicit E/S objectives. For instance the topic of fertilization in the course reviewed was dominated by the use of cow-dung, compost and green manure. This

[2] The section following is based on a full account of the case studies in Wallace, 1997.

seemed a logical approach, given that many of their clients were quite unable to afford chemical fertilizers. Another interesting example from an NGO was ASSEFA in South India, which explicitly embraced Gandhian principles and was reported to be reviving the ideas of "rural self-sufficiency and emancipation of the poor," including a strong emphasis on low external input, sustainable production.

More interactive learning

There was evidence of increasing commitment to interactive learning in some of the rural training programs, and of implicit linkages between changes in modes of learning and the fostering of E/S concerns. A good example was ASSEFA, where training programs were reported to "pave the way to keep in touch with field-level workers and farmers", and that exposure to new information was seen to Aplay a pivotal role in adoption of sustainable technologies in agriculture".

Towards experiential learning

There was some evidence of growing linkages between training organizations and external groups leading to valuable opportunities for experiential learning for trainees through field visits and village stays, as well as assisting in the follow-up of former trainees. Major spin-offs from such linkages can be an increasing contribution from training organizations to local development and the potential for their own learning as a result of these interactions (Pretty & Chambers, 1994). An example from the study was the AVillage Stay Program,@ which is an integral part of the degree offered at Annamalai University in South India. Students spent a period of one month living in a village, being involved in learning from farmers and participating in a practical way in organizing extension. ASSEFA in South India was also interesting because of its "people and action-oriented" training methodology, which aimed to encourage mutuality and self-help amongst client groups, and to enable them to apply economic and technical inputs in the context of the "social, cultural and moral situation in the community."

Evaluation of training

Most of the short-term, in-service courses did not have any formal assessment, but often included follow-up visits as part of their post-course evaluation. For instance FARMI in the Philippines used the adoption of new learning as its major criterion of training effectiveness, and former trainees were also invited to participate in an evaluation of the curriculum. An innovative approach was that of The Bangladesh Rural Advancement Committee (BRAC), where action plans were developed by trainees as part of their course and then assessed by local field workers after their return to their homes. In the same way the BRDB organized follow-up visits to trainees by local field organizers and trainers. During these, uptake of new practices (e.g. use of organic manures, IPM, crop rotation and crop diversification) were recorded and evaluation workshops were also organized with ex-trainees in the field.

Changes in curriculum processes

There were some clear indications of more participatory approaches to curriculum development, which were leading to some issues of importance to stakeholders, other than the trainers, getting into training agendas. For instance, at the Visayas State College of Agriculture (ViSCA) and the Eastern Samar State College in the Philippines the views of former graduates, employers and client groups were considered in the process of curriculum reform. The Rural Development Training Center (RDTC) in South India was noticeable in that it aimed to ensure that every course which it offered met the needs and interests of the particular group of trainees; there was a pre-training needs assessment for every training event. This involved "teachers, trainees, ex-trainees and farm leaders."

The Agreening@ of curriculum content

Some cases indicated conscious attempts to ensure that new or reformed curricula took greater account of E/S issues. An example was the seminar held at ViSCA for the academic staff in 1995 which aimed to, "enhance integration of sustainable agriculture and environmental issues

in both technical and non-technical courses" (Wallace, 1997, appendix 5.4.1). The Extension course for the degree here included elements of land use, air and water quality, soils and biodiversity, whilst the Farming Systems course had a clear bias towards conservation farming. The environmental focus had led to a greater interweaving of the technical and non-technical (e.g. social science) aspects of the curriculum.

On the whole, the NGOs and quasi-government providers of short courses and in-service training appeared to be more responsive to E/S imperatives than the formal institutions. Their target audiences came from real-life situations in the field where technologies are changing, and this was often reflected in their teaching. The Central Coffee Research Institute in South India now included topics such as raising ladybird beetles, shade management, compost making, and cradle pot preparation in its courses.

Another factor leading to wider and more open curricula in some pre-service courses was an increasing responsiveness to changing demands in the rural labor market. Both the Annamalai degree course in South India and the diploma offered at nearby Ghandigram Institute had previously aimed mainly at production of trained manpower for the state Department of Agriculture, but had now developed a much broader set of aims which sought to prepare people for careers in commercial organizations, financial institutions, input suppliers and NGOs.

Continuing Weaknesses

Despite the many encouraging signs of change towards greener curricula and more participatory approaches to curriculum, some negative tendencies were also observed. These included a wide lack of learner-centered approaches in training, a continuing emphasis on theory rather than practice and common failures to conduct any form of training needs analysis or rural labor market studies.

Some Conclusions and Guidelines for the Future

There appeared to be a need in most of the formal institutions, and in some of the nonformal organizations for a more integrated approach to the whole business of training. Rather than the straightforward delivery of "lessons" on a series of subjects and topics, training needed to be seen as a cycle of related activities; starting from the identification of needs, leading to an iterative phase of curriculum development and materials preparation, followed by a complex but well-managed phase of implementation, and ultimately to the development of relationships and linkages sustained through follow-up and participatory evaluation which feed back into further reviews of the curriculum review.

Training involves partnership with learners and other stakeholders; responsiveness to changing situations and needs, and openness amongst training providers leading to the creation of "learning organizations." Effectiveness in promoting changes in E/S related behavior amongst both extension workers and their clients requires an approach which models "greener," "softer" and more "holistic" life-styles, management approaches and learning systems within the training system itself.

The funders of the study (DfID), required that the research should lead to a set of guidelines for enhancing the role of E/S issues in extension training programs in the Region. These arise from the findings discussed above, and are summarized below.

- The changing roles of the farmer and of extension need to be recognized.
- The Importance of E/S should be explicitly stated and modeled in training.
- Extension training should develop appropriate understanding and analytical skills.
- Technical and economic training should be clearly related to E/S issues.
- Preservice extension training should equip new entrants for more flexible career paths.
- Curriculum processes need to become increasingly open and participatory.
- The E/S content and relevance of existing curricula need to be regularly reviewed.
- Close links with rural communities and

organizations are necessary.
- Integration of training and extension functions should be encouraged.
- Rural training should be both participatory and holistic in its approaches.
- Competent practical training should form an integral part of the preparation of future extension workers.
- Both training managers and trainers themselves need to be retrained.

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PERCEPTIONS OF EXTENSION AGENTS REGARDING SUSTAINABLE AGRICULTURE IN THE KHORASAN PROVINCE, IRAN

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Abstract

As Iran addresses the goal of self-sufficiency in the production of food and fiber products, sustainable agriculture is gaining interest within Extension and the Ministry of Agriculture as a means of achieving this goal. Dependence on pesticide and insecticide imports, compounded by a growing population, limited arable land, and high soil erosion, has led to the call for more appropriate agricultural practice. Little is known, however, about extension agents= perceptions regarding sustainable agriculture practices. A random sample of extension agents in the Khorasan Province was surveyed by mail. Agents perceived sustainable agriculture to mean lower chemical inputs, natural resource and environmental protection, effective and efficient agricultural production system, and reliance on organic matter. Agents also indicated a preference for sustainable agricultural practices. Younger and less experienced agents tended to prefer sustainable over traditional agriculture practices. Agents also indicated the need for more local research. Implications for these results are given and recommendations made.

Introduction

Farmers= concern for effective and efficient use of their land is influenced by a variety of factors including personal views, family views, technology, profitability, complexity, public opinion, research, change agents, and marketing (Betru, 1998; Kotile & Martin, 1998). According to the authors, sustainable agricultural practices offer farmers hope for greater efficiencies and effectiveness. In Iran, sustainable agriculture is gaining popularity among extension agents, farmers, various organizations and ministries and, in particular, the Extension service and the Ministry of Agriculture (Chizari, Pezeshki & Lindner, 1998).

Crosson (1992) defines sustainable agriculture as meeting the demand of future generations, for food and fiber at socially acceptable economic and environmental costs. York (1989) states the goal of sustainable agriculture should be to maintain production levels necessary to meet the increasing aspirations of an expanding world population without degrading the environment. It implies concern for generation of income, promotion of appropriate policies, and conservation of natural resources.

Several factors are influencing change agents and various agencies to consider sustainable agriculture practices. Iran has limited arable land, compounded by high soil erosion. Its population is growing. It is dependent on rice, wheat, and meat imports. It is also dependent on pesticide and insecticide imports.
Not many years ago Iran was self sufficient in agriculture (Nosratie, 1997). The goal of self

sufficiency in Iran has been the focus of recent research (Chizari, Karbasioun & Lindner, 1998; Chizari, Pishbin & Lindner, 1997; Chizari, Lindner & Bashardoost, 1997; Pezeshki-Raad, Yoder & Diamond, 1994). Extension agents have played a key role in helping agriculture systems overcome many problems. However, for agents to help with sustainable agricultural practices they must first understand sustainable agriculture concepts (Agunga, 1995).

Assessing educational needs of extension agents is recognized as an important element among extension services and seen as a critical factor in the success of the organization. According to Buford, Bedeian and Lindner (1995), as Extension agents face the challenge of learning new skills to maintain their proficiency or become qualified for promotion, the importance of an effective staff training program for extension agents becomes evident. These authors state further that to ensure extension agents are well trained, extension management must determine training needs to increase agents' capabilities. Similarly Chizari, Karbasioun and Lindner (1998) note that Extension will be seriously limited in its ability to plan and execute effective educational programs and other technology transfer activities without an adequate number of well-trained agents.

According to Alonge and Martin (1995), the first step toward adoption of new ideas by farmers is to provide information on sustainable practices. What has emerged, however, is evidence of bipolar values among extension agents on this subject. Agencies and institutions engaged in information dissemination and educational activities often have personnel specifically charged with information and education responsibilities who themselves have information and education needs (Rollins & Golden, 1994).

Shahbazi (1993) warned that to deny the lack of knowledge and the educational needs of extension agents of Iran regarding sustainable agriculture is to deny that technologies related to agriculture are changing. Karami (1995) wrote that the problems facing sustainable agriculture in Iran primarily focus attention on ecological aspects. However, the author notes that perceptions, attitudes, educational training, and beliefs of extension agents are equally if not more important factors.

Agunga (1995) noted that extension agents need to be trained in sustainable agriculture in order to develop their understanding, competence, and ability to teach and communicate the concepts to farmers and others. He further stated that the logic is simple: If Extension agents are not convinced of the value of sustainability, how can they be expected to educate farmers? Extension services, due to their large network of personnel, are in a better position to formulate a cohesive structure for promoting sustainable agriculture education.

Purpose and Objectives

The purpose of this study was to identify perceptions of extension agents regarding sustainable agriculture in Khorasan Province, Iran.Specific objectives were:

1. Describe the meaning of sustainable agriculture as perceived by extension agents regarding sustainable agriculture in Khorasan Province, Iran.
2. Describe extension agent perceptions toward current research and extension efforts in sustainable agriculture.
3. Explore relationships among extension agents' perceptions toward traditional agriculture versus sustainable agriculture methods.
4. Explore relationships toward sustainability by selected extension agent demographics.

Methods and Procedures

Population

Extension agents (N = 125) in Khorasan Province, Iran were the target population for this study. Extension agents (89) were selected by simple random sample to participate in this study (Krejcie & Morgan, 1970). The Ministry of Agriculture-s Extension organization directory was used to locate the agents in each township within the province. The researchers verified the list before distribution of the survey to control for frame and selection threats to external validity.

Khorasan Province is the largest province of Iran (315,000 square kilometers), and produces many agricultural crops: rice, wheat, rye, barley, cotton, potato, sorghum, corn, fruits, and sugar cane. It is located in the northeast part of the country and has 150,000 hectares of arable land. The province has a population of 6.1 million, of which 3 million live in rural areas.

Research design and data analysis

The research design used for this study was a descriptive survey. A questionnaire was developed from the review of literature. The questionnaire consisted of three separate sections according to the purpose and objectives of the study. Likert-type scales were used to quantify the responses. Content and face validity was established by a panel of experts consisting of faculty members and graduate students at Tarbiat Modarres University, Iran. A pilot test was conducted with 12 extension agents in two townships of Tehran Province three weeks before the study. As a result of the pilot test, minor changes in wording were made in the questionnaire. Questionnaire reliability was estimated (based on the pilot test) by calculating Cronbach-s alpha. Reliability for the overall instrument was .79.

Data were collected through a questionnaire mailed to the 89 agents in the Khorasan Province, Iran. Those who failed to respond were sent a postcard reminder. If the reminder failed to elicit a response, a follow-up letter and duplicate questionnaire were mailed. The response rate was 99%. An early versus late respondent comparison was made to determine if nonresponse was a threat to the validity of the study (Kerlinger, 1986; Miller & Smith, 1983). Using this procedure, no statistically significant differences between the groups were found. Therefore, findings from this study are assumed to be generalizable to the population from which it was drawn. Data collected were analyzed using the Statistical Package for the Social Sciences, Personal Computer Version (SPSS Inc., 1991). Appropriate statistical procedures for description (frequencies, percents, means, and standard deviations) were used.

Results

All the participants had a Bachelor of Science in an agriculture-related degree. However, only 8% of the respondents were agricultural extension majors. Fifty-two percent of respondents held an agronomy and plant breeding degree. Eleven percent of respondents had a horticulture degree. All subjects were male. Thirty-seven percent of the respondents were between the age of 25-32 years. Thirty-five percent had one to five years experience working for Extension. Most of the agents (60%) were married.

Objective One

Participants were given a set of statements representing different meanings of sustainable agriculture. Respondents were instructed to choose those statements that represented the meaning of sustainable agriculture. A limitation of this study is that the narrow definition of sustainable agriculture as presented may not completely represent the complexity of sustainable agriculture. Furthermore, the study does not represent what sustainable agriculture is, but what agents perceive sustainable agriculture to mean.

As shown in Table 1, 98% of the extension agents agreed or strongly agreed that using less chemical inputs while maintaining profitability was the meaning of sustainable agriculture. Ninety-four percent of the agents agreed or strongly agreed that protecting natural resources and environment protection was the meaning of

sustainable agriculture. Sixty-six percent of the participants agreed or strongly agreed that sustainable agriculture meant using a lot of organic matters. Sixty-one percent of the Extension agents agreed or strongly agreed that sustainable agriculture was a system that is effective, productive and efficient. No other statement representing the meaning of sustainable agriculture received the 50% agreement or strong agreement level.

Objective Two

Table 2 summarizes extension agents' perceptions about the current condition of research and extension efforts in sustainable agriculture. Ninety-three percent of agents stated they needed to do a better job of diffusing sustainable agriculture principles to farmers. Only 15% of agents indicated there were insufficient number of information centers and resources on sustainable agriculture. Also, only 8% of Extension agents thought enough research regarding sustainable agriculture has been conducted.

Table 1

Extension Agents' Perceptions of the Meaning of Sustainable Agriculture.

Rank	Statement	Frequency[a]	Percent	M[b]	SD
1	Using less chemical inputs while maintaining profitability	87	98	4.6	0.6
2	Protecting natural resources and environmental protection	84	94	4.5	0.6
3	A system that is effective, productive and efficient	54	61	3.6	0.9
4	Using a lot of organic matters	59	66	3.5	1.1

[a]Number of agree and strongly agree responses
[b]Scale: 1 = strongly disagree; 2 = disagree; 3 = no opinion; 4 = agree; 5 = strongly agree

Table 2

Extension Agents' Perceptions of Current Research and Extension Efforts in Sustainable Agriculture.

Rank	Statement	Frequency[a]	Percent	M[b]	SD
1	Extension agents need to do a better job of diffusing sustainable agriculture principles to farmers	83	93	4.6	0.7
2	Information centers and resources about sustainable agriculture are lacking	13	15	2.5	0.9
3	Enough research on sustainable agriculture in Iran has been conducted	6	8	2.2	0.8

[a]Number of agree and strongly agree responses
[b]Scale: 1 = strongly disagree; 2 = disagree; 3 = no opinion; 4 = agree; 5 = strongly agree

Objective Three

Respondents were asked to indicate their preference for sustainable over traditional agriculture practices. As shown in Table 3, the highest ranked sustainable agriculture practice was fertility (96%). Agents indicated it is better to use green fertilizer, organic matter, and crop rotation than chemical fertilizer. Crop mix (87%) and crop production management (87%) were the next highest ranked sustainable agriculture practices as evidenced by agents= preferences for lower purchased inputs and higher labor costs rather than higher purchased inputs and lower labor costs. Agents (85%) expressed social concerns in terms of protecting natural resources for future generations. Agents (74%) preferred as few tillage operations as possible. Agents (71%) indicated traditional agriculture practices have contributed to overall environmental pollution. According to agents, preference should be given to varieties that require low chemical inputs and produce average yields (67%) over varieties that require high chemical inputs and produce greater yields. Weed control (9%) was the only farming practice where agents preferred traditional agriculture practices. They preferred chemical weeding to mechanical weeding. This finding contradicts some of the findings of this study and indicates the difficulty of adopting sustainable agriculture systems, which to be successfully implemented must be adopted across the entire farming operation.

Table 3

Extension Agents= Preferences for Sustainable Agriculture Practices.

Rank	Statement	Frequency[a]	Percent	M[b]	SD
1	Fertility	85	96	3.0	0.2
2	Crop mix	77	87	2.9	0.4
3	Crop production management	77	87	2.9	0.5
4	Social concern	76	85	2.9	0.4
5	Tillage system	66	74	2.7	0.5
6	Environmental protection	64	71	2.6	0.6
7	Variety selection	60	67	2.6	0.7
8	Weed control	8	9	1.6	0.7

[a]Number indicating a sustainable agriculture practice
[b]Scale: 1 = disagree; 2 = no preference; 3 = agree

Objective Four

The first hypothesis in this objective was to test for significant differences in preferences for sustainable agriculture practices by degree major. At an alpha level of .05, the null hypothesis was not rejected, $F(6, 82)=2.21$, and it was concluded that preferences for sustainable agriculture practices were not significantly related to degree major (Table 4).

Table 4

Extension Agents' Preferences for Sustainable Agriculture Practices by Degree Major (n = 88).

Degree Major	Percent	M[ab]
Soil Science	6	4.4
Agronomy and plant breeding	51	4.3
Other	6	4.2
Horticulture	11	4.1
Extension education	8	3.9
Animal science	8	3.9
General agriculture	10	3.7

[a]F (6, 82) = 2.21, $p \leq .05$
[b]Scale: 1 = strongly disagree; 2 = disagree; 3 = no opinion; 4 = agree; 5 = strongly agree

The second hypothesis in this objective was to test for significant differences in preferences for sustainable agriculture practices by years of experience. At an alpha level of .05, the null hypothesis was rejected, $F(2, 86)=3.03$. It was concluded that years of experience was significantly related to agents' preference for sustainable agriculture practices (Table 5). Agents with less experience are more likely to support sustainable agriculture practices.

Table 5

Extension Agents' Preferences for Sustainable Agriculture Practices by Work Experience (n = 88).

Work experience	Percent	M[ab]
1 to 5 years	35	2.8
6 to 15 years	33	2.6
More than 15 years	33	2.5

[a]F (2, 86) = 3.03, $p \leq .05$
[b]Scale: 1 = disagree; 2 = no preference; 3 = agree

The third hypothesis in this objective was to test for significant differences in preferences for sustainable agriculture practices by age. At an alpha level of .05, the null hypothesis was rejected, $F(2, 86)=3.03$. It was concluded that age was significantly related to agents' preferences for sustainable agriculture practices (Table 6). The younger the agent, the more likely they were to support sustainable agriculture practices. Although including both age and experience as variables could be questionable, the researchers chose to do so because of the lack of national research regarding the correlation of age and experience.

Table 6

Extension Agents= Preferences for Sustainable Agriculture Practices by Age (n = 88).

	Percent	M[ab]
25 to 32 years	37	2.8
33 to 41 years	33	2.6
Over 41 years	30	2.6

[a]F (2, 86) = 3.03, p ≤ .05
[b]Scale: 1 = no preference; 2 = traditional agriculture practices; 3 = sustainable agriculture practices

Conclusions and Recommendations

Based on the findings of this study, the following conclusions were drawn and recommendations made.

According to Agunga (1995, p. 170), ASustainable agriculture is an innovation that seeks to replace or modify current beliefs and practices about industrial agriculture@. Our research indicates that extension agents in the Khorasan Province perceive sustainable agriculture to mean lower chemical inputs, environmental and natural resource protection, an effective and efficient agricultural production system, and reliance on organic matter. These results are consistent with York=s (1989) goal of sustainable agriculture. Most extension agents, however, reported that they need to do a better job diffusing sustainable agriculture information to farmers. They indicated that there are adequate information centers and resources regarding sustainable agriculture, but, they also recognized a need for continued research.

Although sustainable agriculture is a relatively new concept in Iran, extension agents in Khorasan Province indicated a preference for sustainable agriculture practices related to fertility, crop mix, crop production management, social concerns, tillage systems, environmental protection, and variety selection; however, they preferred traditional agriculture weeding practices. These perceptions were consistent regardless of academic degree. However, younger, less experienced agents were more likely to prefer sustainable agriculture practices than their counterparts.

Continued reliance on traditional agriculture practices can result in damage to the credibility of change agents and detract from the ability of conventional farmers to adapt to sustainable farming practices (Higgins, 1996). Research is needed to determine if these findings hold true for other extension agents in Iran. The results from such a study could have implications in developing techniques and strategies for implementing sustainable agriculture programs in the country.

More research needs to be conducted in the several provinces to determine the educational needs of extension agents regarding sustainable agriculture. Extension agents will be better equipped to deal with the barriers to implementing sustainable agriculture practices once they are better educated and trained. Iran=s goal is to become self sufficient in food and fiber production. Results from this study may serve as a basis for further research regarding sustainable agriculture, and educational needs of extension agents.

The extent to which problems and issues associated with natural resource management and profitable farming systems will be solved systematically remains uncertain. Research is needed to determine the relationship between the goal of self sufficiency and sustainable agriculture practices. Research is also needed to determine the best economic returns when implementing sustainable agriculture systems. The significant drop in percentages of extension

agents who agree or strongly agree that sustainable agriculture is a system that is effective, productive, and efficient suggest this is another area of needed research. What does effective, productive, or efficient mean or measure? Is increased labor more effective, productive, or efficient or is it more environmentally friendly and socially acceptable? What do these terms mean to extension agents as they try to answer the question?

Our final comments are directly attributed to an anonymous reviewer of this manuscript. These comments capture the complexity of researching sustainable agriculture and provide a challenge to those of us who attempt to do so.

> I don=t believe sustainable agriculture is more efficient. I believe it is more management, knowledge, and information intensive. To have a successful sustainable farming system of mixed crops and livestock the farmer will need more knowledge/ information on biological, chemical, microbial, mechanical interactions of plants and animals to improve production, minimize pests (weeds, insects and diseases) to economically acceptable levels, while protecting the environment and natural resources, and providing the farmer with an economic return. The farmer will have to spend more time thinking, developing a farming system management strategy, and then more time implementing the strategy to attain a sustainable agriculture production farming unit. Likewise, extension agents will need considerably different training and willingness to make a commitment to providing more management information on sustainable agriculture.

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STAKEHOLDER VIEWS ON AGRICULTURAL EDUCATION IN AUSTRALIA

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Abstract

Australian research funders, research providers, educators and agricultural producers were surveyed to elicit their views on future directions and needs of agricultural education. Information was gathered concerning the missions, challenges and likely major changes facing universities and state government agencies associated with agriculture over the next decade. An overriding focus on environmental management and sustainability was evident in answers with a need for closer interaction between providers of education and research and users of knowledge, particularly agricultural producers. Attracting high-performing students to fields servicing agriculture, and integrating agricultural and environmental knowledge, were highlighted as particular needs. It was concluded that existing provision of educational services is failing to meet expectations of producers in terms of information delivery, creation of attractive learning environments, and involvement of stakeholders in decision making. An education and research provider partnership with industry was seen as a logical outcome of current debates.

Introduction

Changes in Australian agricultural education over its 130-year history have mainly followed developments in the agricultural industries. From the 1880s to the 1970s, increasing production from available resources was the basis for agricultural courses. An initial focus on land productivity gradually shifted to a focus on labor and capital productivity. Management practices and social sciences in agricultural courses were expanded in the 1970s with graduates realizing the importance of communication skills to back up technical knowledge (Dunn, 1990).

Social and demographic changes in Australian society may have also influenced changes in attitudes of the general population towards agriculture. The effect of goldmining in the latter half of the 19th century which supported towns in inland Australia has been largely lost, causing a drift to a predominantly urban population (Lees, Da Roza & Carey, 1982). In 1921, the proportion of the Australian population living in metropolitan areas was 43%; other urban areas, it was 20%; and 37% in rural areas. In 1976, the proportions were 65%, 21% and 14%, respectively (OECD, 1987). With the greater proportion of the population living in metropolitan areas, there is less general empathy and a rising level of ignorance about rural life and agriculture.

Industry and educators have expressed concern at the low proportion of the agricultural workforce which is tertiary qualified (Ferguson & Simpson, 1995; Kilpatrick, 1996). A survey found that the costs involved with living away from home, lower parental income, and inconsistencies of government subsidies based on asset testing were the main reasons restricting young farmers from engaging in further studies (Dent, 1995). A survey of

young farmers determined that the decrease in number of young farmers undertaking tertiary study was due in most cases to their preferring to enter the workforce. Other farmers thought that tertiary study was not necessary to be a Agood farmer@ (Hamilton, 1995). A survey of farmer clients of consultants found that 43% had tertiary qualifications, compared to 16% of all farm operators (Hamilton, 1995). Surveys of Tasmanian farmers found a significant correlation between attendance at structured courses and farm cash operating surplus which confirmed earlier findings that most farmers believe that further education leads to improved farm business management (Kilpatrick, 1996). A more educated and trained workforce may be better equipped to address issues such as environmental problems and may in the long run present a more positive picture of agriculture to the rest of the community (Dunn, 1990). However, Australian farmers have traditionally placed little importance on formal tertiary education (Bell and Pandey, 1987).

The need for courses to be both relevant to industry needs and accessible is widely recognized. Some suggest that employers need to be directly involved in the development of course curricula (Lees et al., 1982). They claim that previous changes to agricultural and related curricula have been due to stimuli from within the educational system rather than as a response to industry needs. As the number of Australian students selecting studies in agriculture as their first preference declines, such impetus of industry has become more important.

According to McColl, Robson & Chudleigh, (1991), attributes sought by private sector employers include the ability to work in a team situation, think critically and conceptually, communicate effectively, and plan and manage time. Other attributes sought by employers include problem-solving, flexibility, entrepreneurship, interpersonal skills, loyalty, integrity, and lateral thinking (Anderson, 1994). According to Derera, (1994), specialization in courses is viewed as a necessary component for Australia to be internationally competitive, but at the undergraduate level there is a need for generalist teaching to ensure a strong knowledge base. McColl et al. (1991) determined that while there was some specialization in agricultural science, courses overall provided opportunities to develop general knowledge in other areas. Nevertheless, they reported shortages of graduates with specific training in soil science, production horticulture, agricultural economics, and food science and technology. Current community concerns include the environment, product quality, chemical residues, and food safety (McColl et al., 1991), as well as animal welfare, biotechnology, and rural infrastructure decline (Wilkins, 1995).

Various analyses of agricultural education in the U.S. provide indications of issues which may be of relevance to Australia insofar as cultural similarities allow comparisons. Issues elicited from current U.S. studies include: the need for a focus on customer needs; increased linkages with industry; formation of partnerships among government, industry, and the general public; the need to meet demand for lifelong learning in the general public and for upgrading in industry; creating greater community awareness of agriculture; and decreasing the gap between rural and urban understanding (NRC, 1995 & 1996a & b; WK Kellogg Foundation, 1994; Dillman et al., 1995; CAST, 1996; NASULGC, 1996; RMF, 1995; NCAE, 1997). The need for closer involvement of stakeholders from industry, government, and the public in planning and delivery of agricultural education echoes opinions and anecdotal studies in Australia.

Recommendations of the U.S. studies are reflected in a review by Meyer (1997) and provide a basis for comparisons with Australia. Using U.S. findings as a basis for comparison, a study of stakeholders of Australian agricultural education was conducted in cooperation with the National Farmers= Federation (NFF).

Purpose and Objectives

The purpose of the study was to determine whether the issues which have been and are being identified in the U.S. are similar to those facing Australian institutions. Specifically, the survey sought the opinions of informed agricultural producers, government officials, researchers, research funders, and educators about the mission and challenges of universities and government with respect to agriculture, and challenges currently facing education, research and extension programs.

Methodology

The study was based on surveys of informed persons to gather information of direct relevance to currently perceived problems. The initial questionnaire included persons involved in funding, use and policy setting of education and its linkages to research and extension. Eighteen leading persons were selected from NFF Round Table Conference leaders and surveyed as Informed Respondents to answer questions drawn from the literature about perceived issues in agricultural and related education (round one). Their replies were consolidated and resubmitted to the same persons for ranking in order to determine the main issues and possible solutions for each of the six critical areas (round two). Once these were ranked, surveys were circulated to 156 persons from production, research funding, research provider and education backgrounds (round three) these being the full list of participants in the NFF meeting.

The survey technique was a modified Delphi process as described in Delbecq, Van de Venah & Gustafsondh, (1975). The methodology followed that of Meyer (1992) in which opinion leaders were selected to provide the initial information for a wider survey. In an attempt to reduce bias, the Table Coordinators selected by the NFF for their Round Table Conference on Research and Education were engaged as participants for round one. The NFF had selected table coordinators as informed leaders within the wider agricultural research and producer profiles of the private and public sectors. In that selection, some agricultural educators were represented, these were omitted from round one in the methodology as a further measure to reduce bias in a questionnaire related to agricultural education.

The survey was conducted by mail with provision for reply by fax, email or mail within a six-week deadline. In rounds 1 and 2, follow-up by telephone was conducted while for round 3, follow-up letters were sent by mail with the survey instrument on two occasions.

A comparison of respondents and non-respondents indicated no compositional differences between the groups.

The survey instrument was based on the questions:

1. What should be three major components for mission statements for universities and state government agencies involved in providing research, education and/ or extension for the next ten years?
2. What will be the major challenges faced by agricultural units in universities in the next 10 years?
3. What will be the major challenges faced by state government agencies concerned with agriculture and the environment in the next 10 years?
4. What will be the major changes facing undergraduate and postgraduate programs relating to agriculture in the next 10 years?
5. What are the major challenges which should be addressed in agricultural and related research programs in the next 10 years?
6. What are the major challenges which should be addressed in agricultural and related extension programs in the next 10 years?

Responses from round one were collated and similar statements summarized to generate single statements, using the original wording suggested by the respondents wherever possible. Prioritizing the key issues in round two allowed three major points and three

subsidiary points to be elicited for each of the six survey questions. In round three, the points were ranked by the wider group.

Chi-square tests were employed to analyse data generated from round three to determine whether the differences found between responses and responding groups were significant. For each test only the top responses (that is, number one ranking) were used. Differences were considered significant at $p < 0.05$.

The number of respondents by employment category for each of the rounds is presented in Table 1.

Table 1

Number of Respondents by Employment Category for Each Round of Questionnaire.

Employment Category	Round One	Round Two	Round Three
Educator			16
Producer	9	9	41
Researcher	4	4	20
Research Funder	5	5	16
Total	18	18	93
Total as Percentage of Those Sent	82.0%	100.0%	60.0%

Round One: Eighty-two per cent of respondents replied to round one of the questionnaire. Replies received were diverse and, in the case of question one for example, included 53 statements. These were classified into seven general statements of: competitiveness and responsiveness to change; sustainability; relevant skills; research development and extension; excellence; customer-focus, and delivery. The content of each of these categories was distilled into short explanatory statements for round two of the survey. This process was followed for each question.

In the case of question two, the 50 reply statements were categorized into the five groupings of; attracting students; structures; information; funding, and customer needs. For question three, 49 replies were categorized into the four groups of: sustainability, research and extension; structures and management systems, and resources and funds. For question four, 48 responses were categorized into five groupings: sustainability; excellence; structures; programs, and funding and resources. Question five grouped 51 responses into the five areas of: sustainability; research and development; production, producers and products; funding, and customers. In question six 47 responses were grouped into the five areas of: funding; technology transfer; extension; education, and innovation.

Round Two: Round Two of the survey allowed the same respondents to rank the succinct statements relating to each grouping in order of priority. This process elicited minimal comment as the respondents were effectively ranking comments which incorporated their own views from round one. Response rates and timeliness were of a high level; all respondents

replied with only 5.5% requiring follow-up. In all questions, ranking allowed the selection of six areas (in two groups of threes) above others for inclusion into Round Three.

Round Three: Round Three was circulated to 156 persons and had a 60% response rate. Respondents overwhelmingly nominated points within the three top issues, even though they had provision to treat the three subsidiary points on an equal basis, and to make additional comments.

Results

In addressing the question AWhat should be the three major components for Mission Statements for universities and state government agencies involved in providing research, education and/or extension for the next 10 years?@--the three responses ranked above others by the respondents were:

1A. To attract adequate investment to ensure that agricultural production in Australia continues to be globally competitive.
1B. To ensure that the management of natural resources is productive as well as ecologically sustainable.
1C. Providers of services to Australian agriculture need to be able to adjust to the needs of their clients.

The proportions and Chi-squared analysis of the sample ranking these three as most important is presented in Table 2. Chi-squared analysis indicated that there were significant differences ($p < 0.05$) between the number of responses to each statement. However, when divided into the four general employment categories of producers, educators, researchers, and research funders, there were no significant differences found between their responses to each statement (Table 3).

In terms of assessing ›the major challenges faced by agricultural units in universities over the next 10 years:-, respondents answers were:

2A. To attract quality students and increase levels of enrolment in agricultural disciplines.
2B. To deliver quality courses and foster development of leadership and management skills.
2C. To adopt a closer, more integrated structure with other agricultural agencies to ensure networking and collaboration.

There was a significant difference ($p < 0.05$) between overall responses for each statement in Question 2 (Table 2); this favored the delivery of quality courses and leadership and management. In terms of employment categories, however, a greater number of researchers ranked the challenge to attract quality students and increase levels of enrollment first (not significant), and in the case of educators, no respondents selected the option of adopting a closer, more integrated structure with other agricultural agencies (Table 3).

In terms of ›the major challenges faced by state government agencies concerned with agriculture and the environment in the next 10 years, these were seen to be:

3A. To ensure agricultural practices and processes are environmentally friendly to allow for a sustainable future.
3B. To have greater involvement with industry in research and extension for more cooperative research ventures.

Table 2

Proportions and Chi-squared Analysis of Respondents Ranking Each Statement First.

Question	No. ranking 1	Percentage of total respondents
1A	16	13.9 *
B	47	40.9 *
C	23	20.0 *
2A	32	26.7 *
B	41	34.2 *
C	19	15.8 *
3A	38	35.2
B	26	24.1
C	28	25.9
4A	33	30.0
B	30	27.3
C	25	22.7
5A	38	34.9
B	21	19.3
C	34	31.2
6A	14	12.7 *
B	44	40.0 *
C	32	29.1 *

* $p < 0.05$

3C. To be able to change their focus from supply to one of demand within a quality ethic; for example through flexibility and adaptation to customer needs.

While ensuring that agricultural practices and processes are environmentally friendly received the greatest number of responses (Table 2), there were no significant differences between the responses to each statement. Differences between employment groups were not significant, although more educators appeared to feel most strongly about environmental and sustainability matters while producers focused more on the ability to change to a demand focus with improved quality (Table 3).

In terms of ›the major changes facing undergraduate and postgraduate programs relating to agriculture in the next 10 years, these were ranked as:

4A. Assisting industry to meet the challenges posed by sustainable land and water use.

4B. Increase flexibility to address industry needs and keep up with the rapidly expanding changing information technology.

4C. Attracting bright young people by improving the image of agriculture and professionals in the industry will become essential.

There were no significant differences between responses for each statement (Table 2). More educators allocated Aattracting bright young people by improving the image of agriculture and professionals in industry@ as most important (Table 3), varying from the other groups who ranked this statement last (not significant).

Table 3

Chi-Square Test Between Various Employment Groups in Response to Questions 1-6 of the Questionnaire.

Employment	A	B	C
Question 1			
Educator	2	8	5
Producer	10	17	11
Researcher	2	12	4
Research Funder	2	10	3
Question 2			
Educator	6	10	0
Producer	11	17	12
Researcher	11	5	4
Research Funder	4	9	3
Question 3			
Educator	10	2	4
Producer	11	17	13
Researcher	9	3	8
Research Funder	8	4	3
Question 4			
Educator	6	3	7
Producer	16	15	8
Researcher	5	7	6
Research Funder	6	5	4
Question 5			
Educator	9	3	3
Producer	12	10	20
Researcher	13	3	4
Research Funder	4	5	7
Question 6			
Educator	2	8	5
Producer	3	20	16
Researcher	6	8	7
Research Funder	3	8	4

In terms of the Amajor challenges which should be addressed in agricultural and related research programs in the next 10 years,@ these were ranked as:

5A. Sustainability, environmental issues and long term resource stabilization.
5B. To provide producers with technology to enable them to be competitive.
5C. To improve productivity, profitability and efficiency.

While there were no significant differences between the statements responded to, a very low proportion of responses were given to the statement regarding the provision of technology to improve competitiveness. Within employer groups, there was little consistency, with more educators and researchers ranking sustainability issues first while producers and research funders focused on the improvement of productivity and efficiency.

In terms of Athe major challenges which should be addressed in agriculture and related extension programs in the next ten years,@ these were ranked:

6A. Developing an understanding of the innovation process in agribusiness.

6B. Developing a learning ethos throughout the industry.
6C. Integration with research and consultation with industry.

There were significant differences ($p < 0.05$) between overall numbers of responses, to each statement in Question 6, with the highest priority being given to developing a learning ethos throughout industry. The same trends were evident in each employment category (Table 3).

Implications

Suggested Mission Statements for Universities and State Government Agencies: The majority of respondents believed that the roles of universities and state government agencies are related and require further integration. However, some respondents thought that the roles of these institutions differ and should remain separate. Most respondents were concerned with sustainability and natural resource management, servicing clients, and investment. Overall, the emphasis was on integrating productivity and on ecologically sustainable management, in order to provide an appropriate resource base for the next generation. This finding is consistent with studies conducted in the United States (RMF, 1995; NRC, 1996a; NRC, 1996b) which found that stewardship of resources was a unifying theme between institutions and the public thereby suggesting that there may be benefit in following the U.S. debate of agricultural education. An orientation to environmental sustainability and natural resource management in agricultural education in Australia has likewise been widely advocated.

The second ranked choice highlighted the need for universities and state government agencies to meet client demands. Clients were seen to include students, government and industry, the same grouping proposed by Falvey and Bardsley (1995). Both state government agencies and universities were seen to need to increase accessiblity and orientation to the needs of their customers, including industry.
Increased client orientation was a main concern of stakeholders in the U.S. studies (W. K. Kellogg Foundation, 1994; RMF, 1995; NASULGC, 1996), one of which reached a conclusion remarkably similar to that expressed by Australian stakeholders (NRC, 1996). From that study, recommendations were made for increased links between universities, the government, customers, and units within universities. This broadens the view expressed in earlier Australian literature, to design courses to meet the needs of the wider community (Dunn, 1990; McColl et al., 1991).

Attracting adequate investment to ensure that agricultural production in Australia continues to be competitive was ranked third. Respondents emphasized the need for adequate investment in research, education, and extension to ensure that Australian agricultural industries remain competitive. This was also said to include being profitable and responsive to market changes and the changing needs for Australian agriculture.

Challenges Faced by Agricultural Units in Universities: Delivering quality courses and fostering the development of leadership and management skills was considered the most significant challenge over the next decade. Researchers tended to differ from the other employment groups by placing the attraction of high-achieving students first, above the delivery of quality courses, and leadership and management.

The need to develop generalist skills in leadership and management has been expressed by Anderson (1994) and McColl et al. (1991). This contrasts with studies in the U.S. which placed greater emphasis on environmental awareness and natural resource management being introduced into curricula to improve the quality of courses (RMF, 1995; NRC, 1996a and b). An earlier study in the United States called for generalists rather than specialists in agricultural and related education (Lucas, 1986).

In a global context, Falvey and Maguire (1997) note that today-s agricultural graduates must compete with scientists, MBA graduates, sociologists, and marketing specialists. In the broad field of agriculture, this may indicate the benefits of producing competent, motivated agricultural graduates with broad-based skills.

These results may also represent the evolution of thought over the past decade, and suggest the need to consider postgraduate education in future analyses of the relative needs for generalists and specialists.

Adopting a closer, more integrated structure with other agricultural agencies ranked significantly lower than the two more frequent responses and was not ranked first by any educators. Some respondents emphasized integration between universities, industry and the community. It was also suggested that universities improve links to federal and state government research agencies for better collaboration in addressing industry needs, particularly in view of reduced government funding. Such conclusions are consistent with views in Scotland which gave rise to the formation of the Scottish Agricultural Colleges with its integration of industry, government, and the community (SAC, 1996).

Studies in the U.S. noted a need to strengthen the present structure of research, education, and extension across institutions, along with greater linkages with business, industry, government, and communities (W.K. Kellogg Foundation, 1994; RMF, 1995; NASULGC, 1996 NRC, 1996a). There have also been several supporters of an integrated system in Australia, notwithstanding the historical separation of these elements (Lees et al., 1982; McColl et al., 1991; Falvey and Bardsley, 1995; Wilkins, 1995). With research, education, and extension functions often developing in isolation from each other, Bawden (1992) described the Australian system as uncoordinated, inefficient and one which creates professional tensions. The results of this survey suggest that leaders in the field may share these views while those involved in service delivery, especially educators, disagree, or are perhaps less informed or concerned with the broader philosophy of integrated service delivery.

Challenges Faced by State Government Agencies: The highest ranked challenge faced by state government agencies was that of ensuring environmentally sound agricultural production for sustainable agricultural production in the future. It seemed to be assumed by respondents that producers need to raise the priority they give to environmental and sustainability issues, and to balance these with development. Certain respondents noted difficulty in convincing people in business to invest in long-term environmental benefits when incentives favored short-term decisions. It was suggested that one of the challenges to state government agencies is to reverse the trend to isolate research within institutions and bring about greater involvement by industry in the research process with increased emphasis on economic and environmental issues. Conflicts between production and conservation industries were noted, as was the need for state government agencies to balance these needs.

The finding that more importance needs to be placed on responsiveness to environmental and sustainability concerns by both industry and educational sectors aligns with U.S. studies (NASULGC, 1996; W.K. Kellogg Foundation, 1994). While Australian educators tended to place importance on environmental and sustainability matters, producers thought they should focus on customer needs.

The third-ranked challenge, to have greater involvement through cooperative research ventures with industry in areas of research and extension, suggests the benefit of merging research and extension into one function. This finding is consistent with those of the United States which confirm the strength of that system=s commitment to maintaining research, education and extension in a single organization (Danbom, 1992; NASULGC, 1996).

Changes Facing Undergraduate and Postgraduate Programs: The major change seen to be facing undergraduate and postgraduate agricultural programs over the next decade was confirmed through this question to be sustainability. In this case, it was expressed in the form of assisting industry to meet the challenges posed by sustainable land and water use.

The major concern of educators was that of attracting bright young people to undergraduate

and postgraduate programs, through courses attractive to high achievers who would subsequently make a valuable contribution to the sector. Comments from those surveyed included the need to change the perception of agriculture as a declining industry, and to focus on primary and secondary educational levels which were said to exert influence on interests and attitudes to a greater extent than tertiary education. Overall, attracting excellent and appropriate students was ranked third.

Attracting more students to agriculture and improving the image of agriculture was a major emphasis of studies in the United States and Australia (McColl et al., 1991; Wilkins, 1995; NRC, 1996a). The disparity between rankings of educators and others may suggest that the problem has not been experienced by users of the services of graduates. It is possible that the strong emphasis on student achievement, as measured by academic entrance scores may not be an appropriate measure in terms of capability of graduates in the eyes of producers.

Addressing industry needs and using information technology was seen overall as the second major change to agriculture programs. Traditional methods of teaching will not be able to meet future demands in either the U.S. and Australia (Dillman et al., 1995). This is supported by the analysis of Falvey (1996) that electronic learning aids will increase both quality of and access to agricultural education. The need for greater interaction with industry was again noted in responses from the stakeholder survey although few respondents linked information technology to communication with industry.

Major Challenges Which Should Be Addressed in Agricultural and Related Research Programs: In responses to the major challenges to research programs, sustainability again ranked first overall, along with general environmental issues and long-term resource stabilization. Responses in round one included the need to bring productivity and sustainability together in a systems approach; to improve understanding of environmental processes for soil, water, contaminants, and the impacts of agriculture on urban areas; and the need to address the practical economics of sustainable agriculture for the long-term with particular attention to the proper balance between economic viability and sustainability.

While educators and researchers tended to rank sustainability issues first, producers and research funders saw the major challenges to be addressed as the improvement of productivity, profitability and efficiency of research programs, a finding similar to that of U.S. studies (RMF, 1995; NASULGC, 1996). Some survey respondents also noted the need for uniform measures of quality, predictability of quality and market relevance of agricultural output. Research programs were seen to require a shift towards improved communication between producer, processor, and consumer and to be directed towards the promotion of differentiated, quality-specified, consumer products. The need for investment in research to be maintained or increased was again mentioned, as in responses to previous questions. An increasing trend of contracting out research and extension services was seen to stimulate greater private sector investment in fields previously the responsibility of the public sector (Marsh and Pannell, 1997). Review of the SAC indicated benefits from the ›user-pays‹ system in Scotland (SAC, 1996).

Major Challenges Which Should Be Addressed in Agricultural and Related Extension Programs: The challenge ranked as being of greatest importance to extension was to develop a learning ethos throughout industry. This was followed by integration with research and in consultation with industry. The view that greater integration with research and linkages with industry is necessary is supported by

Prinsley et al. (1994) who reported a lack of private sector input into public sector policy and research. They note that most communication and dissemination of information between input and output sectors and between the public sector and agribusiness is at an informal level based on personal relationships. Marsh and Pannell (1997) note that state departments of agriculture are beginning to orient activities to the needs of their clients.

The lowest ranked challenge to agricultural extension was the development of an understanding of the innovation process in agribusiness. Innovation, it was suggested, is being blocked or constrained by extension activities as well as statutory and cooperative marketing arrangements. Responses to this question were similar to those for question five, including acknowledgment of the needs of customers and sustainable practices. This finding appears to challenge the assumption of many extension programs that producers do not understand the relationships between research and development programs and their potential benefits.

Recommendations

From these findings, we recommend that:

- Australian institutions should participate in the global debate concerning future directions of agricultural education, especially that in the United States.
- University administrators should involve stakeholders in regional planning to ensure that their requirements of university courses, staff, and graduates are known and observed, and that a common understanding of social issues including sustainability is developed.
- Curricula should be redeveloped to present agriculture in a broader context of natural resource management and to attract high achieving students.
- Policy makers should acknowledge the benefit on linking research, education, and extension functions in Australia, and the environmental management context of agricultural education,and that universities should grasp opportunities which may arise as a consequence of government restructuring.

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HOME/PARENTAL-RELATED PROBLEMS ASSOCIATED WITH HOME-BASED VOCATIONAL AGRICULTURE PROJECTS: THE CASE OF SWAZILAND

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Abstract

The study identified home/parental-related problems and possible solutions of home-based enterprises established and managed by vocational agriculture students. High school students in grades eleven and twelve were surveyed to determine their perceptions of the problems and possible solutions based on their personal experience with their respective home-based projects. Findings revealed that as many as 12 of the 19 problems were encountered. Unavailability of structures at home for projects was a major problem. All possible solutions suggested were generally agreed upon by respondents, including parental and the community assistance in the establishment and management of projects. Male and female students held similar views on problems and most solutions. It was concluded that limited resources impeded effective operation of projects. Parental and community expectations in the establishment and management of projects also needed to be clarified.

Introduction

Recognizing that an effective and relevant high school education in practical studies to meet the needs of citizens and support economic development is a critical component of national development, the Ministry of Education in Swaziland introduced vocational education in agriculture in 1989. At the same time, assistance to vocationalize the high school agricultural curriculum came from a European Union grant to six pilot schools. Some of the issues and pressures that contributed to this move included (a) a discrepancy between employment and the number of school leavers/completers because of limited job opportunities and access, (b) high repeat and dropout rates resulting from internal inefficiencies of the school system, and (c) the fact that most secondary school level students cannot attend postsecondary education.

A major component of the secondary vocational agriculture curriculum is home-based enterprise projects. A home-based enterprise project is a supervised occupational experience in agriculture in which parents, agriculture teachers, and school administrators are partners in assisting the vocational agriculture student learn from experience. It is a demanding assignment that offers students a challenging initiation to operating a small farm business. AIt builds confidence and self-reliance while simultaneously sobering immature expectations. Students gain a vicarious insight into the reasons for the high mortality rate of small businesses in the real world; the enterprise project is a simulated microcosm of harsh economic reality@ (Macfarlane & Tomlinson, 1993, p.36).

Sociological research indicates that parent-child relationships, a family=s social status, and the cultural environment affect not only an individual=s socialization but also his/her educational achievement, and subsequent life work choice. Parents have a considerable influence on the subsequent behavior of their children (Tien & Lin, 1994).

Benefits of home-based enterprise projects were reported by Stewart and Birkenholz (1991). They found that the benefits perceived by parents related to work attitudes, occupational development, and human relations. Some of highest perceived benefits were keeping records, a sense of responsibility and pride in ownership, and increased production of animal and crop

products.

Support from teachers, administrators, and parents is critical for the success of an occupational experience program. In managing a vocational agriculture home-based enterprise project, students practice in real situations, model appropriate behaviors and receive appropriate feedback and reinforcement. In the process new problems and situations arise that may cause students to secure additional information and new ways of applying knowledge gained in the classroom.

Purpose and Objectives

The purpose of the study was to determine the perceptions of high school vocational agriculture students regarding home/parental-related problems they experience in managing home-based enterprise projects and possible solutions. The specific objectives were:

1. Identify major problems, and possible solutions, with respect to parental support of home-based enterprise projects.
2. Determine differences between male and female students= perceptions of problems encountered, and possible solutions.

Methodology

A two-stage survey design guided the study. In the Delphi phase (Dlamini, 1997) twelve Grade 11 and Grade 12 vocational agriculture students who had operated home-based projects in the six pilot schools were randomly selected to respond to open-ended questions. The Delphi instrument was validated for content by eight agriculture teacher educators. The students were asked to (a) identify problems they had encountered in establishing and managing their home-based enterprise projects, and (b) suggest solutions to the problems.

Responses to the Delphi questions were used to develop a survey instrument comprising 19 problem statements and 6 possible solutions statements. A 6-point Likert-type scale from strong agreement (6) to strong disagreement (1) was provided to respond to the statements. The instrument was validated for content by a panel of six agriculture supervisors/inspectors. A total of 94 students in the six pilot schools who had home-based enterprise projects were administered the questionnaire. Reliability coefficients for the problems and solutions domains were .99 and .78, respectively.

Means and standard deviations were used to summarize scalar responses. For purposes of interpretation, the measurement scale used to collect data was converted into an interpretive scale. Mean values of 3.49 and below meant that respondents disagreed with the statement as either a problem or a possible solution. Mean values of 3.5 and above meant that respondents agreed with the statement (Mndebele, 1994). This interpretive scale was used for objective one. For objective two, one-way analysis of variance was used to determine statistically significant differences between male and female respondents with regard to problems encountered, and suggested possible solutions.

Findings

Table 1 shows the rankings of home/parental-related problems perceived by vocational agriculture students. Students agreed that as many as 12 of the 19 stated problems were encountered in establishing and managing home-based projects (means $\geq$ 3.50). The highest ranked problem was: AUnavailability of house structures for the project at home@ (mean = 4.62). The lowest ranked problem was: AComplaints from parents about bad smell from the animal droppings [if raising chickens]@ (mean = 2.91). From these findings it was determined that both the home situation and parental support were problematic for students.

Table 1

Students= Perceptions of Home/Parental-Related Problems in Home-Based Vocational Agriculture Enterprises[a].

Rank	Problem	Mean[b]	SD
1	Unavailability of house structures for the project at home.	4.62	1.46
2	Getting material which can be used as equipment.	4.40	1.43
3	Transport for moving inputs from the supplier to home.	4.40	1.53
4	Getting home during school hours to take care of the project.	4.39	1.72
5	Unavailability of space at home for the project.	4.39	1.72
6	Unavailability of nearby shops where inputs for the project can be purchased.	4.09	1.63
7	Water far from home causing project animals to go without water at	4.09	1.83
times.		4.03	1.74
8	Living in a home next to the school which is not the students' parental home.	3.99	1.68
9	Jealous neighbors destroying the project.	3.91	1.62
10	Enterprise too small to satisfy all customers.	3.87	1.75
11	Parents demanding use of the project money on home needs.	3.86	1.61
12	Student=s produce stolen from home while students at school.	3.48	1.50
13	Getting customers for students= produce around the home area.	3.47	1.74
14	Unavailability of land for growing vegetables.	3.39	1.91
15	Difficulty in transporting inputs home because there is no road leading home.	3.31	1.61
16	Difficulty in transporting produce to the market because there is no road leading home.		
17	Parents lack of interest in farming thus discouraging students from starting home-based projects.	3.23	1.64
18	Discouragement by parents from keeping chickens for fear of mites.	3.21	.65
19	Complaints from parents about bad smell from the animal droppings (if raising chickens).	2.91	.65

[a] N = 89-94

[b] Rating Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Slightly Disagree; 4 = Slightly Agree; 5 = Agree; 6 = Strongly Agree

Table 2 presents ranking of possible solutions perceived by students to home/parental-related problems encountered in establishing and managing home-based projects. Students agreed that all six solutions could possibly alleviate these problems. The highest ranked solution was: ACommunities should provide land for students to establish their projects@ (mean = 4.41). The lowest ranked solution was: AStudents should be encouraged to use materials locally available for equipment such as feeders@ (mean = 3.83). The findings showed that students expect parents and the communities in which they live to assist in the establishment and management of projects.

Table 2

Students= Perceptions of Possible Solutions to Home/Parental-Related Problems with Home-Based Vocational Agriculture Enterprises[a].

Rank	Solution	Mean[b]	SD
1	Communities should provide land for students to establish projects.	4.41	1.61
2	Students not living in their parental homes must be allowed to have their home projects at school.	4.14	1.76
3	Parents must provide the structures needed by the students for home projects.	4.11	1.60
4	Parents must be educated about home projects by instructors.	4.09	1.74
5	Parents must provide the students with capital for home projects.	3.89	1.72
6	Students should be encouraged to use material locally available for equipment such as feeders.	3.83	1.61

[a] N = 89-93

[b] Rating Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Slightly Disagree; 4 = Slightly Agree; 5 = Agree; 6 = Strongly Agree

Table 3 compares male and female students= mean ratings regarding home/parental-related problems. AUnavailability of house structures for the project at home@ was ranked the most important problems by both male (mean = 4.58) and female (mean = 4.66) students. The problem rated lowest by both male and female students was: AComplaints from parents about bad animal smell from the animal droppings [if raising chickens]@ (male : 2.86; female: 3.08). There were no statistically significant differences between male and female students pertaining to problems encountered in establishing and managing home-based projects. It could therefore be concluded that boys and girls held similar views on problems encountered.

Table 4 compares male and female students= mean ratings of possible solutions to home/parental-related problems. Ratings of only one possible solution, ACommunities should provide land for students to establish their projects@, were statistically significantly different (male = 4.70; female = 3.95). This reflects perhaps the position of women in Swazi society in respect to land ownership. In Swazi culture, women cannot have individualownership of community land in rural areas under their name.

Table 3

Comparison of Male and Female Students= Perceptions Regarding Home/Parental-Related Problems.

Rank	Problem	Mean[a] Male[b] Female[c]	SD Male Female	F-Value
1	Unavailability of house structures for the project at home.	4.58 4.66	1.45 1.49	.06
2	Getting material which can be used as equipment.	4.42 4.40	1.59 1.19	.00
3	Transport for moving inputs from the supplier to home.	4.52 4.21	1.41 1.71	.89
4	Getting home during school hours to take care of the project.	4.40 4.44	1.74 1.68	.02
5	Unavailability of space at home for the project.	3.75 4.11	1.85 1.74	.89
6	Unavailability of nearby shops where inputs for the project can be purchased.	3.98 4.26	1.69 1.64	.66
7	Water far from home causing project animals to go without water at times.	4.24 3.90	1.78 1.91	.79
8	Living in a home next to the school which is not the students= parental home.	3.93 4.16	1.75 1.75	.39
9	Jealous neighbors destroying the project.	3.61 4.61	1.64 1.52	.71
10	Enterprise too small to satisfy all customers.	3.93 3.89	1.65 1.63	.01
11	Parents demanding use of the project money on home needs.	3.67 4.24	1.72 1.73	2.45
12	Students= produce stolen from home while students at school.	3.87 3.90	1.61 1.61	.01
13	Getting customers for students= produce around the home area.	3.40 3.62	1.56 1.44	.48
14	Unavailability of land for growing vegetables.	3.46 3.47	1.85 1.62	.00
15	Difficulty in transporting inputs home because there is no road leading home.	3.22 3.71	1.98 1.77	1.52
16	Difficulty in transporting produce to the market because there is no road leading home.	3.30 3.40	1.64 1.55	.08
17	Parents= lack of interest in farming thus discouraging students from starting home-based projects.	3.09 3.45	1.69 1.57	1.02
18	Discouragement by parents from keeping chickens for fear of mites.	3.13 3.36	1.67 1.64	.42
19	Complaints from parents about bad smell from the animal droppings (if raising chickens).	2.86 3.08	1.58 1.76	.41

[a] Scale: 1=Strongly Disagree; 2=Disagree; 3=Slightly Disagree; 4=Slightly Agree; 5=Agree; 6=Strongly Agree
[b] N = 63-56, [c] N = 36-38

Table 4

Comparision of Male and Female Students' Perceptions Regarding Home/Parental-Related Problems.

Rank	Problem	Mean[a] Male[b] Female[c]	SD Male Female	F-Value
1	Communities should provide land for students to establish their projects.	4.70 3.95	1.42 1.76	5.10*
2	Students not living in their parental homes must be allowed to have their home projects at school.	3.91 4.47	1.75 1.77	2.32
3	Parents must provide the structures needed by the students for home projects.	3.94 4.32	1.63 1.56	1.20
4	Parents must be educated about home projects by instructors.	4.06 4.14	1.86 1.58	.04
5	Parents must provide the students with capital for home projects.	3.92 3.81	1.67 1.83	.10
6	Students should be encouraged to use material locally available for equipment such as feeders.	3.68 4.00	1.61 1.56	.90

*p < .05

[a] Rating Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Slightly Disagree; 4 = Slightly Agree; 5 = Agree; 6 = Strongly Agree

[b] N = 52-55

[c] N = 37-38

Discussion

Home-based projects are meant to be conducted at the homes of students. The expectation is that parents will support their children=s vocational agriculture business enterprises by providing the resources needed to establish and manage projects (Dlamini, 1997). The findings of this study showed that parental support was somewhat difficult to secure, and access to land was problematic. Brewin (1993) also noted that living away from the parental home posed problems for students in establishing and managing home-based projects. Audile (1980) stated that students often faced limited home and community resources such as land, and subsequently found it difficult to establish and operate their home-based agricultural enterprises.

It was noted in the study that problems and proposed solutions rated as most important by male and female students tended to be associated with capital outlay production factors such as land and farm structures.

The solution preferred by female students that schools provide land for students not living in their parental homes could be in support of the norm of Swazi (and African) culture that girls are more useful in carrying out home chores than boys. Girls are occupied with home chores in the homes of relatives with whom they stay, and thus find it difficult to spare time for the home project. To cut down on the walking distance between parental home and school, it is a common practice for students to seek accommodation with relatives whose homes are nearer to school. While living with relatives, students are expected to be engaged in family chores. Girls tend to be more helpful than boys in such chores.

Male and female students differed statistically on the possible solution of providing land for students to establish their enterprises. This difference could be explained by the cultural practice that women in Swazi society cannot

hold land under their name. Communal rural land is under the jurisdiction of the Chief who reserves the right to apportion land for Afree@ to his/her subjects. Women cannot hold land located in the rural area, nor can communally owned land be sold. However, women can buy and hold title to urban land. Land, particularly arable land, is limited in urban areas. Therefore, most schools offering vocational agriculture are in rural areas.

Conclusions and Recommendations

The following conclusions regarding problems associated with the home and community environment were drawn from the study:

1. Resources needed to establish and manage a home-based project are limited or not available for project use.
2. Transport for movement of materials, input and produce, pose a barrier to the operation and management of the projects. Furthermore, use of suitable local materials is limited.
3. Lack of adequate release time during school hours to work on the project is problematic. Girls need relatively more release time to attend to their projects than boys because much of their time is taken up by home chores.
4. Home-based projects are an essential integral component of vocational education in agriculture.
5. The role of parents and the community as partners must be redefined because vocational students expect parents and the community to assist.
6. There are no strategies and guidelines for parents to follow in helping vocational students with their projects.

The following conclusions were drawn with regard to possible solutions:

1. Land should be made available to students to establish and operate home-based projects.
2. Parents need to be taught the importance and relevance of home-based projects to vocational instruction in school.

Based on the findings and conclusions, the following recommendations are proposed:

1. The inspectorate, teacher educators, and vocational instructors should develop information that could be used to teach local community members about the importance and scope of home-based enterprises.
2. Special efforts should be made to encourage vocational agriculture teachers to offer vocational agricultural education short courses/workshops to young and adult farmers partly as a strategy to link the vocational agriculture department and the community. In this way, support for farm-based experiential learning in the community may be gained.
3. Further research is needed to assess the capability of the home or community to provide the resources and services to sustain home-based projects.

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PERCEPTIONS OF FORESTRY AND RANGE ORGANIZATION MANAGERS OF THE ROLE OF EXTENSION IN PROTECTION OF FORESTS IN IRAN

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Abstract

The purpose of this study was to determine the perceptions of forestry and range organization (FRO) managers in selected provinces and townships in Iran of forest protection and forestry extension. The population included all administrators, their associates, and heads of forest dwellers= cooperatives. Data were collected by mail. Major conclusions were that well-trained extension personnel are needed to provide forest owners and dwellers with information and education on forest protection; that youth in schools need to be taught the importance of forests and natural resources; that specific forest use and land use legislation is necessary to conserve forestry resources; that FRO managers need better knowledge of extension management, program and resource monitoring, and the value of involving rural women; and that FRO managers perceive that a variety of methods would be effective in extension work on forestry protection.

Introduction

The loss of large expanses of forests is a serious threat to human welfare and the global environment. Houghton (1990) reported that between 1950 and 1980 about 15% of the earth=s forests and woodlands disappeared as a result of human activities. The largest decline was in North Africa and the Middle East (60%), followed by South Asia (43%), Tropical Africa (20%), and Latin America (19%). In the 1980s more forest was lost than in any decade in history (FAO, 1993).

Factors responsible for this loss are the conversion of forestland to produce food for a burgeoning world population, especially in developing countries (FAO, 1993; Swanson, 1997), as well as logging for timber and fuel. These are legitimate human needs and uses of forestland. But, lack of knowledge, and legal and social systems often encourage excessive, non-sustainable land clearing resulting in long-term adverse social and environmental impacts (Jones, 1987). The challenge is to manage forests without degrading them and the natural resources associated with forest lands (FAO, 1993). Sharma (1992) maintains that people around the world want natural forests to be protected, and insists that nations must manage forest resources more efficiently to benefit present and future generations. Education and involvement of people in wise management of forests are important considerations in this effort (Jones, 1987).

The forestry situation in Iran is no different than other vulnerable areas in the world. A diverse genetic pool of some 12,000 plant species and a forest reserve of 12.4 million hectares are threatened by unsound forest management activities, including overgrazing of pastures,

intensive agricultural operations, and indiscriminate forest activities and timber use (Report of the Islamic Republic of Iran on Forestry Development and Key Events 1996; Khosrowshahi & Ghavamie, 1994). As a result, between 1971 and 1991, soil erosion is reported to have increased by 250% in various parts of the country due to lack of care for natural resources (Khosrowshahi & Ghavamie, 1994).

The Forest and Range Organization (FRO) of Iran and its Research Institute are responsible for the management of 64 forest reserves. FRO managers are charged with the task of managing these forest reserves. An Office of Extension and Training was established in the FRO in 1990 to educate and work with these managers and with target audiences of forest landowners and forest dwellers (indigenous inhabitants of forest areas deriving income from wood and non-wood forest products) in supporting and participating in forestry protection measures. Farhadian (1998) studied the FRO=s mission and recommended that a strong linkage should be forged between the Office of Extension and Training and the Research Institute. He emphasized that a key responsibility of managers and staff of the FRO was providing for the participation of people in the planning and implementation of forestry development.

Lanly (1992) supports the view that rural people should be involved in proposals for forest management because they are keenly aware of the value of forests and often have solutions to forest management and protection problems. He further contends that what rural people need is not exhortation or advice but help in doing what they know needs to be done. Extension systems can perform this task, but they need to be sensitive to the culture of indigenous people and not just purveyors of technological information (Child, Heady, Hickey, Peterson & Pieper, 1984). Regardless of a project=s logic, scientific soundness, management desire, or possibilities of economic enhancement, local people can implement or destroy a project, depending on whether or not they see it as beneficial to them. According to FAO (1993), most forests in the developing world are on land on which indigenous groups and rural communities depend for their livelihood. Therefore, it is essential that they be involved in forest management programs. In a similar vein, Sharma (1992) emphasized that attitudes of people influence how they manage and use forests.

Mohseni (1994) commented on the lack of belief and knowledge among extension organization managers for developing and implementing extension activities in the Central Province of Iran and argued that proper routine evaluation of the managers could result in overall development of extension personnel as well as programs. Farhadian (1998) observed that a problem with most FRO extension managers was that they had agricultural degrees and little or no pre-employment extension training. He indicated this was a problem worth further study. In a Report of the Islamic Republic of Iran on Forestry Development and Key Events presented to the Twelfth Session of the Near East Forestry Commission, it was stated that while forests in different regions of the country are important, those of the Caspian Sea Region are the only economically productive forests in Iran (1996). Considering this situation, a study of FRO managers in selected provinces and townships falling in the Caspian Region forests was considered worthwhile.

Purpose and Objectives

The purpose of this study was to determine the perceptions of forestry and range organization managers in selected provinces and townships in Iran regarding the role of extension in protecting forests. Specific objectives of the study were:

1. Determine factors perceived by forestry and range organization managers to contribute to deforestation.

2. Determine factors perceived by forestry and range organization managers to be effective in protection of forests.

3. Determine forestry and range managers= perceived knowledge of forestry extension.

4. Determine forestry and range organization managers= perception of the effectiveness of extension methods.

Methodology

Population

The population included all administrators, their associates, and heads of forest dwellers= cooperatives (N = 72) in Gilan and Gorgan-Gonbad Provinces, and Noshahr and Sarie townships. These individuals are listed in the forestry and range organization directory for the selected provinces/townships.

Research Design and Data Analysis

The research design used for this study was a descriptive survey. The survey instrument had five sections. The first section included demographic data on the target population. The remaining four sections contained questions related to the study=s objectives. A 6-point Likert-type scale from strong agreement (6) to strong disagreement (1) was used to elicit responses to specific statements about forestry protection and conservation, and importance of extension teaching methods. A 6-point scale prevents respondents from taking a neutral position (Clason & Dormody, 1994). A 5-point Likert-type scale was used to assess managers= self-perceived knowledge of extension work. Content and face validity were established by a panel of faculty and graduate students in the Department of Agricultural Extension and Education at Tarbiat Modarres University, Tehran, and the extension specialist in the Forestry and Range Organization. The instrument was piloted with 16 FRO managers in Tehran Province two weeks prior to the study, and needed modifications were made. Cronbach=s alpha reliability coefficients for sections 2-5 of the instrument ranged from .68 to .90.

Data were collected from FRO managers by mail. First-round nonrespondents were sent a postcard reminder. Where this did not elicit a response, a follow-up letter and duplicate questionnaire were mailed. The final response rate was 90%. Early-late respondents= comparison was done to determine if non-response was a threat to the validity of the study (Kerlinger, 1986; Miller & Smith, 1983). No statistically significant differences were found, and it was concluded that results could be generalized to the population.

Results

Objective 1

Table 1 shows the rank importance of 26 factors contributing to deforestation as perceived by managers. The number and percent of managers who strongly agreed or agreed that these were important contributory factors are included.

A majority of managers agreed that 14 of 26 factors were important contributors to deforestation. The top five factors were lack of adequate, well-trained personnel, lack of understanding of the economic importance and value of forestry, and appropriate land use, and lack of money. Inappropriate productivity by cooperatives and government companies, lack of forestry mandates, fires, and threat of pests and diseases were considered to be the least important factors.

Table 1

Rank of Factors Contributing to Deforestation as Perceived by Forestry and Range Organization Managers.

Rank	Factor	Number[1]	Percent[1]
1	Lack of adequate well-trained personnel	49	72
2	Lack of understanding and concern regarding the role of forests in economic development among forest dwellers	48	70
3	Lack of understanding of the value of forestry	46	68
3	Lack of money	46	68
5	Lack of knowledge regarding pastures, appropriate land use and grazing among forest dwellers with livestock	45	66
6	Presence of livestock in forests	44	65
7	Illiteracy among forest dwellers	42	62
8	Lack of stable policy in administrative (executive) and developmental tasks	39	57
9	Lack of laws or related laws regarding preservation	38	56
10	Inappropriate use of forests by rural people living near forests	37	54
10	Changing forestlands to agricultural fields	37	54
12	Inappropriate productivity (too much) from forest by private-sector organizations	35	51
12	Continuous changes in policies, legislation, and programs	35	51
14	Cutting trees by women for fuelwood	34	50
15	Making roads inside forests	33	48
15	Population increase and the need for more productivity from Forests	33	48
17	Need of forest dwellers for wood fuel	32	47
18	Lack of education among personnel	31	45
19	Lack of independent right in decision making regarding executive tasks	30	44
19	Lack of participation by forest dwellers in protection of Forests	30	44
21	Cutting trees by rural people for building houses	29	42
21	Inappropriate productivity by cooperatives	29	42
23	Lack of forestry mandate	26	38
23	Inappropriate productivity by government companies	26	38
25	Natural and unnatural fires	16	23
26	Threat of pests and diseases to plantations	15	22

[1] Number and percent of managers strongly agreeing A6@ or agreeing A5@ to factors.

Objective 2

Table 2 shows the rank of 18 factors perceived by managers to be effective in protecting forests. The number and percent of managers who strongly agreed or agreed that these factors were effective are included.

Over one-half of the respondents agreed that 15 of the 18 factors were effective in protecting forests. Educating youth and students about natural resource benefits was the top-ranked factor. Also considered effective were measures such as having foresters reside outside forests, making livestock areas illegal, legislating protected areas, and evacuating-resettling farmers and nomads. Three factors rated as least effective were stopping forest productivity licenses, delegating the responsibility of forestry to people by using a participative approach, and continuity of staff and provision of equipment.

Table 2

Rank of Factors Effective in Protection of Forests as Perceived by Forestry and Range Organization Managers.

Rank	Factor	Number[1]	Percent[1]
1	Diffusion of information on natural resource benefits to youth, especially students	57	84
2	Placing (residing) foresters outside of forests	55	81
3	Making livestock presence in the forest illegal	55	81
4	Law of forests as protected area	52	76
5	Delegation of all lands outside of forests to farmers, nomads, and their evacuation from forests	51	75
6	Providing fuel for foresters	51	75
7	Increasing the general knowledge of rural people	50	73
8	Appropriate planning regarding forest productivity by specialists with government supervision	48	70
9	Establishing productivity factories by using forest inputs in creating jobs	48	70
10	Designating and fencing a place for livestock, as well as providing inexpensive feed	47	69
11	Establishing and strengthening special army units for protection of forests	46	68
12	Planting of trees	44	65
13	Implementation of forestry projects by the government	44	65
14	Delivering educational programs in raising livestock	44	65
15	Delegating the responsibility of forest protection and preservation to cooperatives	37	54
16	Stopping forest productivity licenses	32	47
17	Delegating the responsibility of forestry to people by using participative approach	28	41
18	Continuity of staff and provision of equipment	22	32

[1] Number and percent of managers strongly agreeing A6@ or agreeing A5@ to factors.

Objective 3

Managers were asked to indicate their knowledge of forestry extension work (concepts) on a 5-point Likert-type scale from know nothing (1) to know very much (5). Table 3 shows the means and standard deviations of the managers= perceived knowledge of 18 extension concepts.

Using a mean value of 3.50 and above to represent high knowledge , 3.49-2.50 intermediate knowledge, and less than 2.50 low knowledge, the data reveal that managers perceived themselves to have high knowledge of 4 concepts, and intermediate knowledge of the remaining 14 concepts. Managers had high knowledge of the objectives, philosophy and tasks of forestry extension, extension responsibilities of FROs, and extension linkages with research and education. Among the concepts that managers had least knowledge of were extension policy formulation, evaluation and monitoring, improving rural women=s access to extension services, and extension systems in other countries.

Table 3

Self-perceived Knowledge of Extension Concepts Among Forestry and Range Organization Managers.

Rank	Concepts	Mean Awareness[1]	SD
1	Objectives and philosophy of forestry extension	3.70	0.82
2	Tasks of forestry extension	3.64	0.90
3	The reasons for having an extension department in FRO	3.52	0.96
4	Linkage of extension, research and education	3.51	1.12
5	Use of educational technology in extension	3.47	1.08
6	Process of making contacts with rural people in extension	3.45	1.02
7	Considering various target audiences in extension programs	3.45	1.02
8	Leadership in extension	3.32	0.99
9	Rural sociology, and its importance in extension activities	3.31	1.22
10	Alternative approaches to organizing extension	3.27	0.96
11	Planning extension programs	3.25	1.08
11	Using rapid or participatory rural appraisal	3.25	1.01
11	Management in extension	3.25	1.05
14	Formulating extension policy	3.21	1.00
15	Evaluating extension programs	3.19	1.01
16	Improving rural women=s access to extension services	3.06	1.26
17	Monitoring extension programs and resources	3.03	1.09
18	Extension systems of other countries	2.84	1.04

[1] Mean computed from responses on a scale: 1= Aknow nothing@ to 5= Aknow very much.@

Objective 4

Managers were asked to indicate on a 6-point scale their agreement-disagreement with the effectiveness of 18 extension methods in teaching forest dwellers about forest protection. The ranking of these methods according to number of managers strongly agreeing or agreeing that they were effective is shown in Table 4.

The most effective method was use of local leaders as teachers, followed by television programs, videotapes/slides, study tours/field visits, and result demonstrations. The least effective methods were lecture presentations, method demonstrations, and farm/home visits.

Table 4

Rank Effectiveness of Extension Methods as Perceived by Forestry and Range Organization Managers.

Rank	Methods	Number[1]	Percent[1]
1	Local leaders as teachers	56	82
2	Television programs	51	75
3	Videotapes/slides	50	73
4	Study tours/field visits	50	73
5	Result demonstrations	44	65
6	Symposium/conferences	43	63
7	Forest days	39	57
8	Informal discussions	36	53
9	Group discussions	35	51
10	Posters	31	45
11	Extension publications	31	45
12	Exhibitions	30	44
13	Radio programs	28	41
14	Workshops	27	40
15	Role playing	26	38
16	Lecture presentations	21	31
17	Method demonstrations	18	26
18	Farm/home visits	8	12

[1] Number and percent of managers strongly agreeing A6@ or agreeing A5@ that methods are effective.

Conclusions and Implications

An adequate number of well-trained extension personnel is needed to provide forest owners and dwellers with information and education on forest protection and conservation. This conclusion is supported by the finding that managers viewed lack of well-trained forestry and extension personnel and a lack of understanding among forest dwellers of the economic importance and value of forestry and appropriate use of land as the most important factors contributing to the problem of deforestation in the study area. Swanson (1990) has reported that 40% of extension personnel worldwide are inadequately trained in technical subject-matter and extension methodology. Salmanzadeh (1988) emphasized that competent personnel, constantly updated, are required to plan and carry out education programs to meet people=s needs and accomplish educational objectives.

Education of youth at the elementary and secondary school level is also necessary and important in forest protection and conservation. This conclusion is supported by the finding that managers felt that an effective factor in protecting forests is to provide information to youth, especially students, regarding the benefits of natural resources. It is recommended that managers emphasize to the Ministry of Education in Iran the need for including an appropriate course on natural resource conservation in the school curriculum.

Legal and organizational considerations are impacting forest protection and conservation. This conclusion is supported by the finding that managers perceived that making foresters live in the forest areas, and enacting legislation to ban livestock from forests and to protect forests would be effective measures in protecting forests. Currently, resources of foresters and extension personnel are inadequate to monitor forest dwellers. A sound and effectively implemented system of land use in which forest

areas are demarcated and set aside as permanent forest estate is necessary for sustainable forest management.

While managers have high knowledge of most concepts that are important in extension work, they need to improve their understanding of such concepts as management, program and resource monitoring, evaluation, and policy formulation in order to carry out their job responsibilities. They also need to better understand the need for and implement education programs to reach rural women. According to Sharma (1992), women have a central role in providing and using fuelwood for the home and can best understand fuelwood problems, what interventions are likely to succeed, and which groups in the community should be involved in designing and implementing interventions. Pezeshki-Raad, Yoder and Diamond (1994) confirmed that extension specialists and agents in Iran lacked some of these needed professional competencies and recommended that they receive training.

A range of extension methods was considered by managers to be effective in teaching clientele. Surprisingly, farm and home visits were rated lowest on effectiveness. Perhaps, managers were reflecting financial and personnel constraints in their response. The literature, on the other hand--for example Van den Ban and Hawkins (1996) and Swanson (1997)--indicates that farm and home visits are very effective. These authors also suggest that local leaders can be useful in supplementing the efforts of extension personnel. This was also the view of managers in the study who perceived use of local leaders as the most effective extension strategy.

The study showed that FRO managers have a good understanding of factors influencing forestry production, management, and conservation, and extension concepts and methods needed to educate forest landowners and dwellers in forestry practices. Some shortcomings in the knowledge and managerial competencies of FRO managers revealed in the study need to be addressed by the Forestry and Range Organization and appropriate government organizations and agencies. FRO personnel--managers, researchers and extension workers--have a key role in the wise management of the country=s forest reserves. It is vital that this role be appropriately supported and strengthened.

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YEAR 10 STUDENTS' PERCEPTIONS OF AGRICULTURAL CAREERS: VICTORIA (AUSTRALIA)

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Abstract

This study was conducted to assess the knowledge and perceptions of metropolitan and non-metropolitan Year 10 students in the Australian state of Victoria, concerning careers in agricultural and environmental fields. A survey of 550 Year 10 students was undertaken to determine factors involved in decision making: about careers by high school students, the knowledge of such students about careers available in agricultural science; and whether the perceptions of students about agriculture affect decisions to undertake university study in agriculture and related fields. The study showed that a greater number of non-metropolitan students had considered a career in agriculture than metropolitan students. It was also found that the most important influence on student knowledge about agricultural careers came from parents, school, and the media; that overall student knowledge of the various careers available to graduates of agricultural science was limited, and, where such knowledge existed, it was biased by misconceptions of the role and activities of agricultural scientists. Furthermore, students were interested in high paying careers, yet did not consider that agriculture offered these.

Introduction

The number of students enrolling in agricultural and related tertiary courses in Australia has increased over the past decade. The percentage growth in graduates in agriculture from 1981-1990 was 40%; however, in comparison, the increase in areas such as health, business and economics, and law were over 100% (Elliot, 1995). The selection system for universities in Australia is based on Year 12 students prioritizing courses and being granted admittance to a course and institution on the basis of their school results. The number of students choosing agriculture as their first preference has decreased over this same time (VTAC, 1996).

Falling numbers of students with high academic results has seen institutions reduce their minimum entry scores in order to attract sufficient student numbers (McColl, 1991; Monteith & Field, 1995). Negative community attitudes concerning agriculture=s affect on the environment are also considered to be one of the influences on the number of students opting to study agriculture and related areas (Monteith & Field, 1995; Wilkins, 1995).

The public image of agriculture in the United States is that of farming (Meyer, 1992) which is seen as destructive of the natural environment. In Australia, the negative image of agriculture held by the largely urban-based community is reflected in the general press (Monteith & Field, 1995). Destruction of the environment, floods, drought, and bankruptcy, are typical of images portrayed in the media (Wilkins, 1995).

Problems of land degradation and pollution amongst other environmental damage caused by previous agricultural practices have, understandably created a poor image of agriculturalists. According to many connected with agriculture and related areas a common perception amongst the public at large is that

agricultural and related education is a training ground for individuals who, by working in agriculture, are somehow likely to have negative impacts on the environment.

According to Wilkins (1995) community concerns lie in the areas of environment, animal welfare, and food safety along with biotechnology and rural infrastructure decline. Such concerns are not unfounded considering the past record of agricultural practices, particularly the areas of land degradation and overgrazing which continue. While farmers are making concerted efforts to rectify such problems, it is perhaps understandable for the community to retain a negative view of the industry.

The portrayal of the embattled farmer by media releases showing remediation of salination and stream eutrophication aim to create a sympathetic view towards farmers. However, they do not display agriculture as being a dynamic, socially and environmentally responsible, profitable industry. A more profitable agriculture may therefore be viewed as a more environmentally robust production system. Furthermore, greater publicity concerning improved farming practices for example in irrigation and usage of particular chemicals would also help foster a more positive public image of farmers as responsible caretakers of the land.

It would assist agriculture for more students in total, including more academic high-achieving students, to be attracted to study agriculture, concurrent with a better informed urban community on agriculture and its related economic benefits and the ways resources are used and conserved. If students do possess a negative image of agriculture, it is suggested that improving the image of agriculture in the community would be one step towards improving the number of student enrollments in agriculture and related areas. An improved image focusing on better farming practices and research and development in agriculture would serve to increase the profile of agriculture, along with careers available in agriculture and related areas, thus helping improve student enrollment.

The general decline in rural populations has lead to an increased proportion of students from urban areas entering college and university courses related to agriculture. The opinions of these students toward agriculture are influenced by negative media coverage which is likely to contribute to the declining numbers of students choosing careers in agriculture (Mallory and Sommer, 1986).

In a survey of Western Australian university students' choices, agriculture was ranked below engineering, economics, environmental science, and science, in terms of perceived job prospects, and nearly 80 % of students had not considered agriculture as a field of study (UWA, 1996). A related study indicated that, while students claimed they chose university courses on the basis of career prospects, academic results, interest, prerequisites and flexibility, their school teachers believed that a student's academic score was the primary determinant of their course of study. A study of new entrants to courses related to agriculture, forestry and natural resource management at the University of Melbourne suggested that the reputation of an institution exceeds the importance of course content in student choice of an institution.

A study of school students in Canberra conducted as a comparison with USA secondary students indicated that negative perceptions of agriculture were less prevalent in the Canberra sample (Mallory and Sommer, 1986). Canberra students taking agricultural courses in Years 9 and 10 showed a higher interest in agricultural careers than their peers in schools without such programs. The study recommended more agricultural programs in later high school years, improved media presentations of agriculture and careers, greater student contact with agriculture, and a focus on students before Year 11 (Cecchettini, Sommer and Leising, 1991).

Most studies of Australian student choices concerning agricultural and related subjects have concentrated on students in Years 11 and 12, or at a tertiary level (Falvey, 1997). This study, therefore, investigated student perceptions and factors influencing career choice at Year 10 level, which is when students make their first subject selections limiting future choices about fields of study.

Purpose of Study

The purpose of this study was to investigate students' knowledge of agriculture and careers, factors important in career choices, students attitudes to agriculture, and opinions about major environmental issues and the role agriculture plays in the environment.

The main objectives of the study were to determine:

1. Students= knowledge sources about agriculture and careers in agriculture.

2. Factors students consider important when choosing a career and whether they consider that agriculture would meet these factors/needs.

3. Students= knowledge of agriculture and the careers available by studying a degree of agricultural science.

4. Attitudes of students toward agriculture and the study of agriculture and whether those with a greater knowledge of agriculture would be more inclined to pursue a career in that area.

5. What students consider to be the major environmental concerns of today and whether they perceive agriculture as having a positive or negative influence on the environment.

Methodology

A mail-out questionnaire, following procedures by Dillman (1978) achieved a significantly large sample size. A total of 564 questionnaires were sent out and a 97.5% response rate was received. A trial survey was administered initially to 20 Year 10 students from a metropolitan secondary school in Melbourne. The results from the trial were used to amend the survey. Changes to layout and in particular the wording of one question were made for easier interpretation of questions.

An optimum sample size of 400 was chosen using the simple random sampling method (Levy & Lemeshow, 1991). The population was first divided proportionately on the basis of metropolitan and non-metropolitan areas. Schools were further divided into Government, Independent and Catholic according to State Government definitions (Directorate of School Education, 1995). Once separated into categories, each school was numbered alphabetically and using random numbers generated from the Minitab computer program the schools were selected. Of the schools selected, each one was sent a letter addressed to the Science Coordinator asking if they would participate by administering the survey to one class of Year 10 students with a minimum 25-30 students required from each school, this being the size of approximately one class. Twice as many schools as required for the optimum sample size were contacted.

The survey was handed out during a class and completed in approximately 10-15 minutes. Forms were not to be completed at home as one of the objectives of the survey was to test the knowledge of the students of different areas of agriculture.

A total of seven questions were asked. These focused on:

- whether students had previously considered a career in agriculture
- factors influencing their knowledge of careers in agriculture
- importance of certain factors in their career decision making
- extent to which the same factors were considered to apply to a career in agriculture
- knowledge of various listed careers available in agricultural science
- whether students wished to pursue the same listed careers available in agricultural science
- perceived importance of environmental issues and perceived affect of agriculture on these same environmental issues

The multiple categories used for questions throughout the survey were developed from related studies (Mallory & Sommer, 1986; Reis & Kahler, 1995; UWA, 1995). Careers in agricultural science were selected from the 1996 Australian Institute of Agricultural Science careers guide to agri-industry supplemented with suggestions from persons engaged in relevant fields. The word ›agricultural‹ was not included when listing careers such as an agricultural consultant, agricultural economist, or agricultural engineer to reduce bias. Current environmental issues were selected from Connolly and Keohane (1996), and supplemented by opinions of peers.

A five point, Likert scale was used for questions concerning factors influencing career choices, and issues relating to careers and the environment. Respondents were asked to circle their preferred response with 1 being ›not important‹ and 5 ›extremely important‹ or 1 being ›does not apply‹ and 5 ›definitely applies.‹ For the question regarding the effect of agriculture on the environment, 1 equaled ›negative effect‹ and 5 equaled ›positive effect.‹ For the purposes of analysis responses 1 and 2 were combined into one category, 3 in a separate category (being ›neutral‹ or ›undecided‹) and 4 and 5 were also combined into another category.

Frequencies, percentages, medians and chi-square tests were calculated by the programs. Differences between metropolitan and non-metropolitan student responses were considered significant at $p < 0.05$.

Results

Consideration of a Career in Agriculture:
A significantly ($p = 0.000$) greater percentage (33.2%) of Year 10 students from non-metropolitan schools had considered a career in agriculture compared with their metropolitan counterparts (16.1%).

Factors Influencing Knowledge of Careers in Agriculture:

Of the students surveyed, 57.3% stated that their knowledge of agriculture came from teachers (Table 1), followed by parents/relatives (52%), media (46.4%), and friends (27.1%). The Internet (3.6%) was found to be the least contributing factor. Significantly ($p < 0.01$) more students in non-metropolitan regions gained their knowledge from parents (64.6%) rather than schools (51.3%). In comparison, students in metropolitan regions gained their knowledge of careers in agriculture from school (61.4%), media (47.2%) and lastly from parents (43.2%), this difference was again found to be significant. Percentages of respondents from metropolitan and non-metropolitan regions did not vary significantly.

Table 1

Factors Influencing Students Knowledge of Careers in Agriculture by Region.

Option	Metro (%) n = 324	Non-Metro (%)	Total (%) n = 550	
Parents/Relatives	43.2	64.6	52.0	**
Television/Radio/Newspapers	47.2	45.1	46.4	**
School/Teachers	61.4	51.3	57.3	**
Internet	4.0	3.1	3.6	**
Friends	27.4	26.6	27.1	**

**, $p < 0.01$

Factors Involved in Choosing a Career:
Factors regarded by a majority of students as being important in choosing a career were: interesting work; good income; opportunities for advancement; work location; job prospects; social responsibility and the prospective growth of the industry, respectively. Table 2 provides a summary of chi-square analyses indicating the significance of differences between metropolitan and non-metropolitan students. Students from metropolitan areas differed from non-metropolitan students with significantly more ($p = 0.000$) ranking good income as important, above interesting work. Non-metropolitan students placed job prospects equally with opportunities for advancement and above work location.

Factors Applying to a Career in Agriculture:
Factors seen as applying to a career in agriculture were (in decreasing order of frequency): conservation/environmental concerns; interesting work; work location; prospective growth of industry; opportunities for advancement; job prospects; good income; social responsibility, and helping those in less developed countries. A greater number of students in both metropolitan and non-metropolitan regions thought that family approval did not apply or were uncertain about whether it applied to a career in agriculture. More students from non-metropolitan regions ranked family approval as applying to a career in agriculture, compared with metropolitan students, however this was not considered significant (Table 3). Significantly ($p < 0.05$) less metropolitan students ranked job prospects as applying to a career in agriculture compared with non metropolitan students. When placing the factors in order of relevance to a career in agriculture, metropolitan students differed from non-metropolitan students in rating social responsibility above job prospects and a good income.

Knowledge of Agricultural Careers:
For eight out of the 17 careers listed, between 75-90% of respondents in each case thought that these careers would be available to someone with a degree in agricultural science (Table 4). Those careers with a mid-range response (40-60%) were, Ateacher,@ Amicrobiologist@ and Ascientist.@ Careers which most respondents thought unavailable to someone with a degree in agricultural science were; Abusiness advisor,@ Aconsultant,@ Aengineer@ and Aeconomist.@ ›Land and environment manager@ received the highest percentage of responses followed by, Aenvironmental scientist@ and Afarmer@ (differing by 0.4%). Chi-square analysis (Table 4) showed that these differences were significant ($p < 0.01$). Significantly ($p < 0.05$) more students from non-metropolitan areas thought it possible to become a property manager by completing an agricultural science degree.

Table 2

Factors in Choosing a Career (Metropolitan Students n = 324, Non-Metropolitan Students n = 226).

Factor		Not Important	Uncertain	Important
Interesting Work	Metro (%)	3.5	8.0	47.5
	Non-Metro (%)	1.5	5.3	34.4
Good Income	Metro (%)	2.9	8.4	47.6 ***
	Non-Metro (%)	1.8	9.6	29.6
Opportunities for Advancement	Metro (%)	3.5	13.8	41.6
	Non-Metro (%)	3.3	12.0	25.8
Work Location	Metro (%)	7.8	11.3	39.8
	Non-Metro (%)	5.6	10.0	25.5
Job Prospects	Metro (%)	4.2	18.2	36.5
	Non-Metro (%)	4.2	11.1	25.8
Social Responsibility	Metro (%)	11.6	16.0	31.3
	Non-Metro (%)	9.1	12.5	19.5
Prospective Growth of Industry	Metro (%)	8.7	20.4	29.8
	Non-Metro (%)	5.8	14.9	20.4
Family Approval	Metro (%)	18.5	20.5	19.8
	Non-Metro (%)	13.6	13.8	13.6
Conservation/ Environmental Concerns	Metro (%)	20.5	19.3	19.1
	Non-Metro (%)	12.5	15.5	13.1
Helping Those in Less Developed Countries	Metro (%)	22.7	19.8	16.4
	Non-Metro (%)	17.5	14.5	9.1

***, $p < 0.0001$

Pursuit of Agricultural Careers:

Table 5 indicates low numbers of students wishing to pursue the listed careers (between 4-33%). Differences between metropolitan and non-metropolitan students' responses were not significant. However, when noting the percentage differences between metropolitan and non-metropolitan students, 12.4% more non-metropolitan students were interested in pursuing a farming career and approximately nine percent more wanted to become a national park ranger (not significant).

Table 3

Factors Applying to a Career in Agriculture (Metropolitan Students n = 324, Non-Metropolitan Students n = 226).

Factor		Does not apply	Uncertain	Applies
Conservation/ Environmental Concerns	Metro (%)	6.2	10.2	42.5
	Non-Metro (%)	3.23	9.6	28.2
Interesting Work	Metro (%)	6.4	14.0	38.5
	Non-Metro (%)	2.9	10.0	28.2
Work Location	Metro (%)	8.9	11.5	38.5
	Non-Metro (%)	4.9	9.8	26.4
Prospective Growth of Industry	Metro (%)	8.6	17.5	32.9
	Non-Metro (%)	4.2	12.9	24.0
Opportunities for Advancement	Metro (%)	8.4	17.3	33.3
	Non-Metro (%)	5.5	12.4	23.3
Job Prospects	Metro (%)	10.7	21.1	27.1 *
	Non-Metro (%)	4.2	14.5	22.4
Good Income	Metro (%)	12.5	19.5	26.9
	Non-Metro (%)	6.4	14.2	20.5
Social Responsibility	Metro (%)	12.7	18.2	28.0
	Non-Metro (%)	9.1	16.0	16.0
Helping Those in Less Developed Countries	Metro (%)	19.1	15.8	24.0
	Non-Metro (%)	12.9	11.3	16.9
Family Approval	Metro (%)	28.5	16.5	13.8
	Non-Metro (%)	16.5	11.6	12.9

*, $p < 0.05$

Table 4

Careers Respondents Considered Available to Someone With a Degree in Agricultural Science by Region (Includes Percentages and Chi-Square Results).

	Metro(%) n = 324	Non-Metro (%) n = 226	Total(%) n = 550
Land & Environment Manager	90.1	89.4	89.8
Environmental Scientist	87.4	89.4	88.2
Farmer	87.4	88.5	87.8
Environmental Science Teacher	85.5	84.1	84.9
Soil Scientist	86.1	83.2	84.9
National Park Ranger	83.0	81.9	82.6
Botanist	80.9	74.3	78.2 **
Horticulturalist	74.4	83.2	78.0
Environmental Engineer	76.2	72.1	74.6
Property Manager	55.9	69.9 *	61.6
Scientist	54.3	59.7	56.6
Microbiologist	45.4	49.6	47.1
Teacher	43.5	40.3	42.2
Economist	38.3	36.7	37.6
Engineer	21.3	25.2	22.9
Consultant	17.6	19.0	18.2
Business Advisor	15.1	19.9	17.1

**, $p < 0.01$; *, $p < 0.05$

Table 5

Careers Respondents Wished to Pursue, by Region (Includes Percentages and Chi-Square Results).

	Metro(%) n = 324	Non-Metro (%) n = 226	Total(%) n = 550
National Park Ranger	23.8	32.3	27.3
Engineer	26.2	25.7	26.0
Farmer	16.4	28.8	21.5
Business Advisor	19.1	18.6	18.9
Teacher	16.4	19.0	17.5
Scientist	17.0	14.6	16.0
Consultant	14.2	14.2	14.2
Environmental Scientist	14.5	12.4	13.6
Property Manager	10.2	17.7	13.3
Land & Environment Manager	10.8	15.9	12.9
Horticulturalist	10.5	15.5	12.6
Environmental Engineer	11.1	13.7	12.2
Microbiologist	13.6	10.2	12.2
Economist	9.6	15.0	11.8
Botanist	7.7	10.2	8.7
Environmental Science Teacher	8.0	6.2	7.3
Soil Scientist	4.6	8.9	6.4

Importance of Environmental Issues (Part A): When asked whether or not environmental issues were of major concern today, approximately 80% of respondents answered in the positive while less than 5% said that environmental issues were not of major concern. Responses between regions did not vary significantly. Upon listing several environmental issues all were considered important (Table 6). The environmental issues selected most frequently were; pollution of rivers and streams (84.9%), air pollution (81.8%) and reduction of the ozone layer (81.6%). Increasing soil salinity (52.9%) was considered to be less important in comparison to the other issues. In all cases except for the increase in soil salinity, pollution of rivers and streams and soil erosion, significantly ($p < 0.05$) less non-metropolitan students saw environmental issues as being important.

Table 6

Level of Importance of Environmental Issues (Metropolitan Students n = 324, Non-Metropolitan Students n = 226).

Factor		Not Important	Uncertain	Important
Pollution of Rivers and Streams	Metro (%)	2.0	6.2	50.7
	Non-Metro (%)	1.3	5.6	34.2
Air Pollution	Metro (%)	1.8	6.6	50.5 **
	Non-Metro (%)	3.3	6.6	31.3 **
Reduction of Ozone Layer	Metro (%)	2.0	6.2	50.7 **
	Non-Metro (%)	3.1	7.1	30.9 **
Clearing of Tropical Rainforests	Metro (%)	3.8	7.6	47.5 *
	Non-Metro (%)	5.3	6.6	29.3 **
Decrease in the Number of Species Present in the Environment	Metro (%)	3.6	8.7	46.5 **
	Non-Metro (%)	4.6	10.0	26.5 **
Global Food Shortage	Metro (%)	5.3	10.2	43.5 **
	Non-Metro (%)	3.6	12.2	25.3 **
Global Warming/ Climate Change	Metro (%)	5.1	11.1	42.7 **
	Non-Metro (%)	4.6	12.7	23.8 **
Soil Erosion	Metro (%)	7.8	14.5	36.5
	Non-Metro (%)	5.1	12.2	23.8
Increase in Soil Salinity	Metro (%)	10.0	18.4	30.5
	Non-Metro (%)	6.0	12.7	22.4

**, $p < 0.01$; *, $p < 0.05$

Perceived Effect of Agriculture on the Environment (Part B):

When students were asked to rate the effect of agriculture on the same listed areas, responses were evenly distributed (Table 7). A significantly ($p < 0.05$) greater number of non-metropolitan than metropolitan students responded that agriculture had a negative effect through clearing of tropical rainforests and reducing biodiversity.

Table 7

Perceived Effect of Agriculture on the Environment (Metropolitan Students n = 324, Non-Metropolitan Students n = 226).

Factor		Negative Effect	No Effect	Positive Effect
Global Food Shortage	Metro (%)	15.5	16.5	26.9
	Non-Metro (%)	9.3	14.9	16.9
Pollution of Rivers and Streams	Metro (%)	16.2	16.9	25.8
	Non-Metro (%)	11.5	12.2	17.5
Increase in Soil Salinity	Metro (%)	15.1	18.4	25.5
	Non-Metro (%)	12.0	13.8	15.3
Soil Erosion	Metro (%)	18.0	15.6	25.3
	Non-Metro (%)	14.4	12.2	14.5
Clearing of Tropical Rainforests	Metro (%)	18.2	14.7	26.0 **
	Non-Metro (%)	17.1	12.4	11.6 **
Reduction of Ozone Layer	Metro (%)	16.7	19.8	22.4
	Non-Metro (%)	11.3	15.8	14.0
Decrease in the Number of Species Present in the Environment	Metro (%)	16.7	17.8	24.4 **
	Non-Metro (%)	14.5	14.9	11.6 **
Air Pollution	Metro (%)	17.6	19.6	21.6
	Non-Metro (%)	12.0	15.1	14.0
Global Warming/ Climate Change	Metro (%)	17.8	21.1	20.0
	Non-Metro (%)	10.7	18.5	11.8

**, $p < 0.01$

Conclusions

According to the minimum sample for a population of this size suggested by Krejcie and Morgan (1970), the sample population size of n = 550 Year 10 students was sufficient to apply to the entire population of Victorian Year 10 students. While the numbers of students considering to undertake a career in agriculture were very low, at just over 100 (17.1%), significantly ($p < 0.0001$), more non-metropolitan students said that they had considered a career in agriculture. Low overall numbers could be attributed to students not having sufficient understanding of the breadth of careers available to people trained in agriculture, with the majority of students choosing 'land and environment manager,- 'environmental scientist' and 'farmer' as careers they thought available to a graduate in agricultural science.

The high response rate to careers prefixed by the adjectival descriptor ›environmental- may indicate a lack of knowledge about careers in general. The relatively small number of students considering a career in agriculture may also be due to the negative public image of Australian agriculture. Future studies are recommended to determine whether a relationship exists between knowledge of agricultural careers and the intention to pursue agricultural careers.

The sources from which Year 10 students learned about careers requiring tertiary study were largely consistent with findings in the United States (Lam, 1982; Martin, 1985; Kotrlik, 1987). If students do possess a negative image of agriculture, this may also be associated with the sources of information about careers in agriculture. This suggests that parents, school and the media could be viewed as potential foci for agricultural educators and industry in improving the image of agriculture. The potential value of presenting a different balance of negative and positive media images of agriculture is reflected in the high numbers of students influenced by this source.

Income was seen as one of the most important ($p < 0.05$) more non-metropolitan students factors in choosing a career. Importantly, income was also one of the lowest ranked factors in relating to a career in agriculture. On the other hand conservation and environmental issues were the highest ranked considerations relevant to a career in agriculture, but these issues were not seen to be as important to students when choosing a career. It may be concluded that students are not looking for the type of career that places an emphasis on these issues.

The importance of interesting work in choosing a career was 10% greater than that which was seen to apply to a career in agriculture, suggesting students did not see agriculture as offering particularly interesting careers. This also suggests a need to portray agriculture as interesting, particularly to metropolitan students. The view that agriculture is not interesting may be related to negative student views of agriculture as suggested by Monteith and Field (1995) and Wilkins, (1995). However, whether the image students possess of agriculture was strongly positive or negative was not able to be fully determined from this study.

Students seemed to be unaware of the variety of careers available to them from a degree in agricultural science. This is seen by the low percentage of students responding to 'scientist' as a potential career and the greater percentage choosing 'environmental scientist' and 'soil scientist.- The greater number of non-metropolitan students choosing 'property manager' as a potential career could be due to a greater knowledge of the activities of property managers.

Greater numbers of students, particularly from metropolitan backgrounds, wanted to pursue at least one of the listed careers than wanted a career in agriculture. This may suggest that some students did not realize that they could pursue such careers from an agricultural training. While the issues of clearing of tropical rainforests and decreasing biodiversity showed significantly

viewing agriculture as having a negative impact,

overall metropolitan students did not have a significantly more negative view of the effects of agricultural practices on the environment than non-metropolitan students.

Attracting high achievers to agricultural and related courses appears constrained by students= knowledge of careers in agriculture. Students in a closer proximity to agriculture were more likely to consider a career in agriculture, although both metropolitan and non-metropolitan students related the study of agriculture mainly to farming. The reduced contact of city dwellers with rural areas probably means that opinions are oriented to past practices in farming. Attracting greater numbers of high achievers to agriculture is related, among other things, to improvement of the knowledge about and image of agriculture in the media and through other sources. There was seen to be a need to portray agriculture as a developing industry which plays a role in everyday life and offers exciting and rewarding careers.

Ignorance about agriculture influences the number of students considering a career in agriculture. As teachers, parents/relatives and the media were the most frequent sources of knowledge of careers in agriculture, they form potential target areas for programs to increase community knowledge about agriculture. Increasing agricultural awareness about all aspects of agriculture and agricultural careers in education at primary and secondary level may influence the perceptions of students towards agriculture in the long term.

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PARTICIPATORY RESEARCH AND EXTENSION FOR SUSTAINABLE DEVELOPMENT IN MOUNTAIN AREAS OF MAINLAND SOUTHEAST ASIA: THE CMU EXPERIENCES

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Abstract

This paper describes the 30 year experience of the Faculty of Agriculture of Chiang Mai university in the development of a participatory extension approach to promote sustainable development of agriculture in Northern Thailand and the extension of the approach to neighboring countries in the Mainland Southeast Asia. It begins with the historical development of system approach to lowland agriculture in Chiang Mai valley when the Faculty had put its emphasis on agricultural intensification in a government irrigation project begun in early 1970s. Conventional extension method was adopted to introduce the improved rice-based, multiple cropping systems for the local people. Many Aimproved@ technologies had been packaged to replace traditional technologies which were assumed to be inferior in agronomic as well as economic criteria. Later, these assumptions were found to be inadequate to explain problems and constrains to technological adoption and diffusion. Furthermore, farmers= perception, knowledge and local capability have helped them to intensify and diversify traditional rice-based multiple cropping systems in the Chiang Mai valley on a large scale without any impact of Agreen revolution@ technological pack. A system approach was introduced in early 1980s to review the overall research and extension activities. A set of criteria was used to assess the performance of alternative (improved) cropping technology including productivity, stability, sustainability and equitability. These criteria ›helped research and extension workers 10 modify the extension approach toward farmer-focussed, participatory approaches. With experiences in rural extension and highland development in Northern Thailand, the Faculty of Agriculture has developed programs for the region, especially the mountain areas of the mainland Southeast Asia. This program is expected to introduce a participatory approach for the development of sustainable land use and community forest management as the key to rehabilitating degraded hill areas.

Introduction

Mainland Southeast Asia is undergoing dramatic economic growth. The mountain area is isolated approximately one-half of the land area of the six countries in this region harbour an immense wealth of natural resources including globally important stocks of biological diversity and a rich heritage of indigenous cultures. Many areas recently opened to outside influences are experiencing profound and widespread changes. The remaining natural forests are under threat as timber is being out forest lands converted to alternative uses traditional swidden fields are transformed into plantations of cash crops and commercial timber tree species. Massive infrastructure projects are started and may alter not only the physical but also the social and economic aspects of the landscape.

Collaborative research and training are urgently needed to build institutional capacity in those critical areas of the region participatory collaboration for sustainable environment is critical to promote the development and exchange of ideas and approaches on a regional scale in a shorter period of time. With over 30 years of experience in Northern Thailand, the faculty of agriculture is currently working collaboratively with various institutes in

Vietnam, Laos and Yunnan of Southwestern China.

Purpose

The purpose of this study aimed to present the concepts and approaches on participatory collaboration on sustainable environment future in the mountain areas of the mainland Southeast Asia. The specific objectives of study were to:

1. Review past experiences on system research and extension in agriculture and natural resource management in Northern Thailand;
2. Discuss the extension of the concepts and approaches to neighboring countries in Southeast Asia;
3. Present specific case where training on participatory approach in sustainable land use and community forestry have been recently carried out, and
4. Discuss the shift in agricultural extension teaching towards sustainable environment issues in the region.

Methodology

Various methods were used in this study. Secondary data provided results of the Faculty of Agriculture during the past 30 years. Technical papers from members of the Faculty and other sources were examined and included in the study. Key informant interviews were carried out where appropriate.

Evolution of Participatory Extension Approaches

The evolution of participatory extension approaches for sustainable development in the Faculty of Agriculture may be broken into two phases:

1. The beginning phase during late 1 960s to early 80s when the Faculty started multiple cropping system research and village programs in the lowland valleys and agronomic research for ethnic minorities on the highlands;

2. The developing phase (1980s to early 90s) when participatory extension approach was extended locally and regionally.

The beginning phase (late 1960s-early 1980s)

In the beginning phase, newly introduced crops and alternative (improved) multiple cropping patterns were screened, assembled and field tested under research station environments before they were packaged for village extension programs in both lowland and highland areas. Figure 1a illustrates the extension model that has been adopted. In this model, the interface between research and extension activities are linearly linked from technology development on the top and connected to the extension plot by means of large scale or pilot programs at the bottom (e.g. MCP 1980a,b and CMU 1979).

When this approach reached the village testing stage, evidence accumulated which suggested that the systems developed did not fit farmers= real needs (Rerkasem et al. 1983). Many were accepted and incorporated into farming systems. However, none of the cropping systems were successful enough under farm conditions to warrant the projects proceeding towards the extension stage. After intensive interviews it was concluded that a reorientation of research and a revision of the functional objectives would be required if the projects were to make any real contribution to the development of cropping systems in the valleys or on the mountains.

The developing phase (1980s-early 1990s)

After intensive review at the later stages of the project cycle, the linear extension model has been revised and replaced by a complex Close-knit Model in which feedback between theory and practice dominates the research and extension program (Figure 1b). In this model farmer practices have been readily incorporated right at the beginning of the research stage, i.e., Problem identification, and these are also subjected to evaluation and analysis prior to actual agronomic field trails and/or socio-economic research. The importance of Afarmers@ is being= recognized at all stages of the Model, the Ahuman@ component of agricultural systems

provides a focus for research and extension in the Close-knit Model.

In order to identify research and development problems, an ecosystem-based human ecology model (Rambo, 1983), the agroecosystem analysis (Conway, 1987) and rapid rural appraisal (Grandstaff and Grandstaff. 1987 and Chambers, 1992) can be easily adopted by interdisciplinary teams to evaluate field results in a very short time, i.e., maximization of available human, financial and time resources. These conceptual frameworks and analytical procedures are summarized below.

1. Ecosystem-based human ecology model

In human ecology the analytical framework is built around the basic questions which can be very helpful in examining the rural agroecosystems and identifying specific topics for research, development and extension (Rambo 1983). Three questions are:

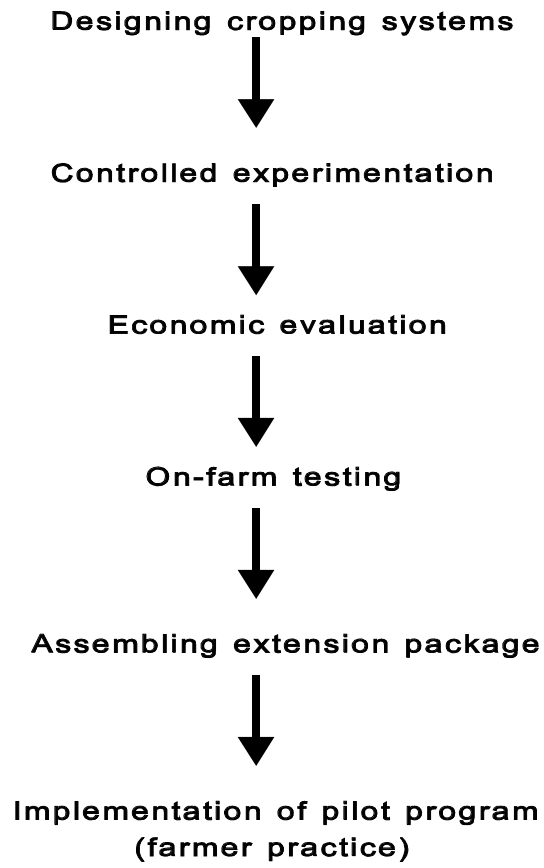
1. What is the flow of energy materials and information from the ecosystem to the social system and from the social system to the ecosystem?

2. How does the social system respond to changes in the ecosystem? (a question of adaptation), and

3. What impacts do human activities have on the ecosystem?

Interactions occur in the form of flows as is materials and information between the social and the ecosystems. The flows influence the structure and functioning of each system. For example, social system, requires a steady flow of energy from the ecosystem in the form of food and fiber for the people and fuel for cooking and manufacturing activities. The magnitude of these flows influences the size and settlement pattern of the human population. The social system, in turn, releases materials into the ecosystem in the form of wastes and pollutants. These inputs influence the biotic composition of the ecosystem, which in turn affects the availability of energy and materials to the social system. The relationship between social system and ecosystem, therefore, is a dialectical change in each system continuously affects the structure and functioning of the other system.

(a) The Linear Model (1960-1980s)



(b) The Close-Knit Model (1980-1990s)

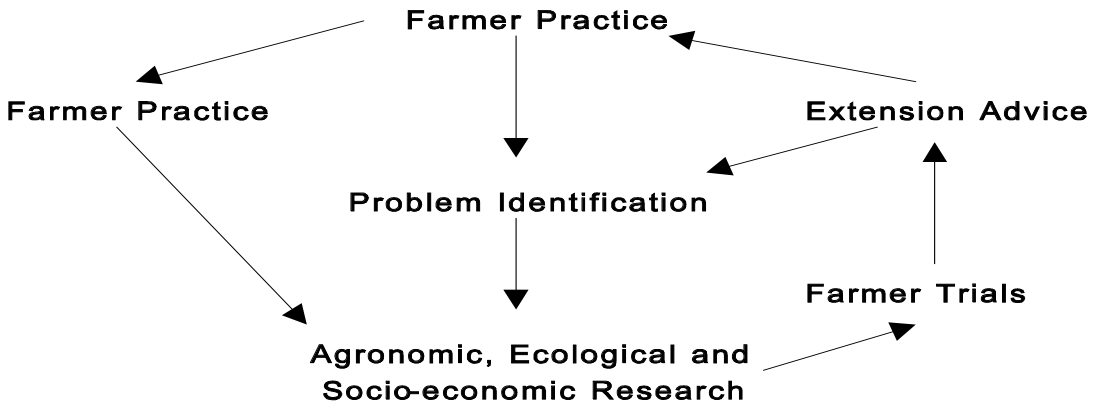


Figure 1. Extension models for crop and cropping systems research and development in lowlands and highlands of Northern Thailand. Sources: MCP 1980a, b, and Rerkasem et al. 1983.

Population size and composition are extremely important in ascertaining the impact of the social system on the ecosystem. Large, very dense population have greater impact on the environment than do small, dispersed populations. In the valley where the holding size of paddy land is very small, extending growing season for double and triple cropping could provide adequate food and supplementary cash income. Spared space for forests and wildlife however, is not feasible. On the other hand, populations are considerably less dense on the highlands, only part of the area is being used for food production. Hill tops and other less fertile areas may be used for forestry or agroforesty purposes.

2. Agroecosystem Analysis (AEA)

Agroecosystem analysis (AEA) (Conway, 1987) provides an important tool for focusing on key relationships. It rests on four basic assumptions.

1. Knowing everything about an agroecosystem is not necessary to produce a realistic and useful analysis.
2. Understanding the behavior and important properties of an agroecosystem requires knowledge of only a few key functional relationships.
3. Producing significant improvements in the performance of an agroecosystem usually requires changes in only a few key management decisions.
4. Identifying and understanding these key relationships and decisions requires that a limited number of appropriate key questions be defined and answered.

A full agroecosystem analysis (AEA), involves three basic steps:

1. Systems definitionCdelineation of the agroecosystem and its key components and description of important interactions and flows among these components as they affect the overall properties of the systems;
2. Pattern analysisCidentification of constraints and opportunities for management of the system;
3. Research design and implementationCidentification of key questions about the functioning of the system, especially with regard to possible ways to overcome constraints to enhance productivity and sustainability.

These key questions are intended to suggest promising direction for future in depth research and development plans of the systems under investigation. The elaboration of this ABA procedure may be found in more detail elsewhere (e.g., MCP 1980 a and b, Conway 1985, 1987 and 1993).

3. Participatory, Rapid Rural Appraisal (PRRA)

Rapid rural appraisal (RRA) is one method that allows researchers, government officials and development workers to gather qualitative data in a timely and cost-efficient way the method seeks to find a middle way between short-term and long-term research. It is a process of learning about rural conditions in an intensive manner. This method relies on small interdisciplinary teams using a variety of data collecting techniques to enhance understanding of rural conditions. Particular emphasis is placed on tapping the knowledge of local people and combining that knowledge with scientific expertise. Rapid rural appraisal (RRA) allows a direct learning experience for senior level researchers and officials to learn from and with local people. Reliance on small, intensively engaged interdisciplinary teams allows the exploration of subjects and relation ships the do not fit neatly within disciplinary boundaries.

Participatory Extension in Northern Thailand

Our experience with participatory extension shows that the human ecology framework (HE), agroecosystem analysis (ABA) and participatory and rapid rural appraisal (PRRA) are often used in conjunction. While the human ecology provides researchers and extension workers with a variety on conceptual frameworks to link their research and extension tasks in natural and social system interactions, agroecosystem analysis offers a powerful tool for assessing an ecosystem (within the complex nature of hierarchical arrangement). Sustainability is a criterion to assess the performance of an ecosystem in connection with other criteria such as productivity, stability and equitability. The trade-off between these properties helps to bring up issues and problems for research, development and extension.

A case study in Muser Paktang village in Chiang Mai may be given as an example of the trade-off between these properties (Table 1). In this village, Arabica coffee was introduced as an alternative cash crop to replace opium in early 1970s. At that time, coffee price on the international market was very high with low and variable annual production global. This made Arabica so attractive to the opium growers and the replacement rate to opium was very successful the crop was grown more or less as pure culture on production scale (Angkasith et al. 1988). In the late 1980s, coffee price markedly dropped and impacted growers, many of them have begun to diversify with some annual crops and fruit tree species such as lychi. In many cases, the)- also left local tree species, bamboo and medicinal herbs to regenerate naturally in these plots. The growers now return to harvest these plots including the remaining coffee trees when the price is favorable.

Cabbage was also introduced recently in this village and the crop offers very high income to the growers with highly fluctuation price but the impact on the environments and the health of the growers remains questionable, because of heavy use of pesticides and chemical fertilizers. The dosage of pesticide application for the cabbage also increases considerably over time because of building up of insect pests and disease. This PRRA case study in Table 1 suggests alternative agroforestry systems that may help to alleviate problems. This agroecosystem analysis (AEA) has been extended to the diverse agroecosystems of Southeast Asia.

Table 1

A Comparison of Coffee-Based Agroforestry System and Cabbage Fields in Ban Muser Paktang of Omkoi District, Chiang Mai.

Criteria	Coffee-based Agroforestry	Cabbage Fields
Productivity	Higher standing biomass Higher net income on longer term basis (lower inputs) Greater variety of production	Higher gross income
Stability	Year round production (Aliving granary@) Higher year-to-year stability	Seasonal production Vulnerable to climate, pest and disease variation
Sustainability	Maintenance of social fertility (e.g., fruits for children and neighbors) Protection from soil erosion	Increasing debts and risks from pesticide applications
Equitability	Easy to establish in most Households Barter of products	Product to landowners and/or outside traders Incised Discrepancy between the rich and the poor

Source: HCRDC 1992.

Regional Training and Special Services

With the above experiences in Northern Thailand, the Faculty of Agriculture has short term regional training on participatory approaches and sustainable highland development for policy makers, government officials, project personnel as well as local leaders. Priority is given to the mountain area of mainland Southeast Asia. The main reason is because of the faculty-s regional relevance in terms of both ecological similarity and ethnicity. Experiences or lessons learned from Northern Thailand could readily be shared regional for example crop replacement strategies for highland development programs, infrastructure development in remote areas and the intrusion of trading and commercialization to the highland.

In 1996, the Faculty of Agriculture worked with the Committee for Ethnic Minorities and Mountain Area (CEMMA) of the government of the Socialist Republic of Vietnam with joint funding support from the Department of Technical and Economic Cooperation (DTEC) of the Royal Thai Government and the Highland Peoples Program of the United Nations Development Program (HP P/IJN DP). The HPP/UNDP and DEMMA selected the pilot areas and assessed needs in pilot villages of Thua Thien Hue and Bac Thai provinces (HDTC, 1996). PRRA has been introduced to provincial and local officials as well as local leaders in the pilot areas. Specific actions, e.g., food security and nutrition, require technical and analytical skills and project management skill. ~n addition to the specific tasks for PRRA training, CEMMA would also like to establish are organizational structure where different

levels of existing organizations from national provincial, district, and community can be can linked and effectively manage the project. The training workshop was organized with two sessions (1) a study tour to northern Thailand for the Vietnamese delegation to gain technical and management skills from the experiences of the existing development projects and government and non-government agencies, and (2) a PRRA field workshop in pilot areas in Vietnam. The later session increased local capacity to identify development activities in relation to food crop growing, livestock and pasture improvement, development of paddy land, water resource development and conservation farming.

The session in northern Thailand promoted interaction and communication between participants from a wide range of technical backgrounds and development experiences. An interdisciplinary team of eight CMU core staff represented a balance between natural and social sciences. The 20 Vietnamese participants included 11 officials from CEMMA and provincial offices and local universities and nine local leaders and farmers from pilot villages, i.e., A Nag and Ngoc Phai-communes. The group visited most of the offices to discuss and exchange views. The local leaders and farmers went to the fields in Chiang Mai and Mae Hong Son provinces to interview field officers and villagers. At the end of the session, the participants gave a briefing on what they saw and identified some useful knowledge and information which may be extended to the development activity in their pilot areas. Participants also formulated a working plan for Vietnam.

In Vietnam, the CMU team split in to two groups; one group joined the team to that visited A Loui village in Thua Thien Hue province and the other group joined the Cho Don group in Bac Thai province. At the commune and village, more than 30 people joined the workshop and actively participated in field activities. A series of PRRA field meetings took place at province, district and commune levels. Social mapping and maps of existing land use were obtained through key informant interviews and transact walks with local people who are very knowledgeable about shier systems. Household interviews was also undertaken to obtain household information. At the end of the field work in the village, the group outlined specific areas for future improvement.

At the end of the field training workshop in pilot areas, the two teams from A Loui in Thau Thien and Cho Don in Bac Thai rejoined in Hanoi and prepared the policy meeting that I provided field information and encouraged policy dialogue among government officials and representatives from major funding agencies. As a result the Vietnamese government, with assistance from the Highland Peoples Programme of UNDP and other foreign donors, have undertaken further steps to implement development activities for sustainable environments in the pilot areas according to the recommendations from PRA field workshop.

Conclusions

Since 1965 the Faculty of Agriculture at Chiang Mai University has gained considerable experience and academic competence in research, development and extension in the mountain ecosystems in Northern Thailand. In the developing phase of the Faculty when many young staff returned from their graduate studies abroad, they were eager to put their new skills and experiences to the tasks of helping local farmers. Soon they found difficulties in transferring new technology to farmers. This raised questions about then role as university researchers in helping poor farmers in marginal areas of Northern Thailand. Where did their comparative advantage lie? Should they continue to design the new technology or improved practices? If not what kind of research should they undertake? These questions have had a great impact on the development of

research and extension within the Faculty than service the highlands.

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KOREAN NATURAL FARMING ASSOCIATION: A COMPARISON OF SELECTED PERFORMANCE FACTORS WITH NATIONAL FARMING DATA

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Abstract

This formative study was conducted to describe preliminary results of the alternative agricultural practices advanced by the Korean Natural Farming Association (KNFA). A survey questionnaire and personal interviews were used to collect data from KNFA members. Agricultural production and farm income and labor means were compared to national averages. In terms of net income including family labor, the results of this study favored the KNFA alternative agricultural practices in red pepper production, farrow to finish swine production, and poultry layer production. Only slight differences between KNFA practices and national averages in rice production were observed. The subjective results of the interviews showed that KNFA members had not adopted all of the recommend rice production practices.

Introduction

In agricultural and rural development efforts in the Third World, an increase in productivity has been long emphasized. In some regions, a rapid increase of productivity was experienced as a result of the AGreen Revolution@ in the 1960s and the 1970s. However, the production techniques, which realized high yields but also required high inputs of fertilizers and pesticides, are being reconsidered as to whether they are appropriate for sustained agricultural development. Concern has grown that high inputs tend to cause environmental degradation and impose severe cost burdens on small farmers.

The importance of indigenous knowledge systems in rural development has been well documented (Martin & Rajasekaran, 1994; Elliot & Martin, 1995). Han Kyu Cho has received credit for developing the body of knowledge on natural farming in Korea (Cho, 1993-94; Koyama, 1994). Unable to attend junior high school due to the Korean War, Cho joined the Korean 4-H to further his agricultural knowledge. As a teen, he was a three-time recipient of the Korean 4-H Presidential Prize. In his 20s, he began experimenting with natural farming techniques and established an informal study group of interested farmers. Concurrently, the Republic of South Korea promoted agricultural modernization with significant external inputs and perceived Cho and his followers as a threat. Cho-s dissemination efforts were ultimately restricted.

In the 1990s, Cho-s methods began to draw attention due to reported high profitability. He established the Korean Natural Farming Association (KNFA) which was officially registered as a non-profit organization in 1994. In 1995, the KNFA began receiving federal funding and established the Natural Farming Life School. Currently, the KNFA disseminates information using three methods. A one-week basic seminar is offered at the Natural Farming Life School for up to 150 participants. Six four-day courses for basic school graduates are offered. Also, local study meetings are held across South Korea, primarily for individual consultation.

Natural farming has four basic components which are also characteristics of KNFA. The first component was that one-s own view of living organisms affects production. Cho (1994) states,

> A human cannot make what supports his life. He cannot even digest what he [eats]. Natural movement is not influenced by human knowledge. Therefore, all living things have to know their own roles that were assigned by nature as well as to accept and respect the roles of others. A farmer has to produce, following this reason of nature. (p.20)

The second component of natural farming emphasized the role of microorganisms and enzymes in farming. By culturing indigenous microorganisms and applying them to the soil and leaves, the diversification of microbial ecologies in the soil and on the plant surface was promoted. Natural products such as fermented plant juice and lactic acid bacteria serum are manufactured and placed on plants.

A third component of natural farming is an understanding of nutrioperiodism, first advocated by Oinoue (1949) in the 1930s. Nutrioperiodism emphasized differing nutritional requirements of crop plants at differing plant stages. The fourth requirement of natural farming is a crop-livestock mixed farming system. An example of such a system could include a pear orchard (0.82 hectares) as a cash enterprise, a rice paddy (0.43 hectares) for household consumption, a farrow to finish swine operation (22 sows) as a cash enterprise, and cattle production (3 cows) as a cash or reserve enterprise.

The KNFA was facing a number of challenges. First empirical knowledge supporting natural farming recommendations is lacking. Second, the KNFA has a shortage of qualified instructors to deliver extension programs. Finally, KNFA programs have not been evaluated.

Purpose and Objectives

The purpose of this study was to describe early results of KNFA approved agricultural practices. Specific objectives were:

1. Describe KNFA members.
2. Compare crop production records of KNFA members with national data.
3. Compare livestock production records of KNFA members with national data.

Methods and Data Sources

Data were collected from KNFA members in two stages. In February 1995, a questionnaire was developed to collect economic and demographic information on members. A panel of experts representing the University of Florida and the KNFA was used to establish face and content validity. The KNFA administered the questionnaire to farmers with a minimum of 2.5 years experience of KNFA practices (N = 100). Fifty-eight percent of the questionnaires were completed and returned (nonresponse error was not controlled).

In June 1995, face-to-face interviews were conducted with 45 experienced KNFA farmers. These farmers were purposefully selected by KNFA officials based upon their expected willingness to cooperate in providing information, and not on the extent to which they had adopted recommended alternative agricultural practices. An interview schedule

was developed based upon the information collected in the initial survey The interviews lasted from two to eight hours. Interview data were collected for 42 days.

Most information collected was based upon the farmer-s personal memory, rather than written records, when information such as unit selling price could not be recalled, secondary data from the National Agricultural Cooperative Federation (1995) were used. Demographic information was obtained from all 45 members. Fifteen of them provided data on all farm enterprises (greenhouse horticulture, single or mixed crop enterprises, a combination of crop and livestock enterprises, and livestock only enterprises). Comparative national data were obtained from the Ministry of Agriculture, Forestry and Fisheries (MAFF), (1994).

Descriptive statistics were used to compare KNFA data with national data in this formative study. According to Rossi and Freeman (1993), AFormative studies are evaluations that assess the conduct of programs during their early stages@ (p. 135).

Results and Discussion

As revealed in Table 1, KNFA members could be described as being middle-aged (M = 43.70, SD = 9.60), with 4.5 family members per household (SD = 1.50). They reported 5.30 years of natural farming experience (SD = 4.00). Average farm size was 1.94 hectares (SD = 2.31), with an average 3.40 agricultural enterprises (SD = 2.80) and 3.00 natural farming enterprises (SD = 2.90). In terms of education, 53% had completed high school.

Table 2 shows differences in net farm income and total labor hours between KNFA members and national averages. The net farm income for members was 34.46 million Korean won compared with 9.45 million Korean won for all farmers. Members invested an average of 2,639 hours of labor in their farms, compared to the national average of 1,448.

Table 3 presents performance data of KNFA members for red peppers and rice compared with national averages. Red pepper (Capsicum annuum) is one of the most popular upland field crops in South Korea. Approximately 4 kg of dried red pepper per capita is consumed per year.

The personal interviews revealed that KNFA members adopted most of the recommended practices for red pepper production. Member yield was 59% greater than the national average and net income, including family labor costs for red pepper production, was over twice as much as the national average.

Table 1

Demographics of KNFA Members (n = 45).

	M	SD
Age	43.70	9.60
Number of family members in household	4.50	1.50
Years of natural farming experience	5.30	4.00
Average farm size in hectares	1.94	2.31
Number of agricultural enterprises	3.40	2.80
Number of natural farming enterprises	3.00	2.90

Table 2

Farm Income and Labor of KNFA Members (n = 15) Compared with National Averages.

	KNFA Members		National Average[1]
	M	SD	M
Gross farm income[2]	55.99	26.27	14.50
Farm operational cost[2]	21.54	14.09	5.05
Net farm income[2]	34.46	18.18	9.45
Total labor hours	2639.00	1458.00	1448.00

[1] Standard deviations not available for national data, [2] Million Korean won

With regard to rice (Secale cereale), however, the yield and net income, including family labor costs, were only slightly greater than national averages. The researchers attributed this to non-adoption of recommended rice production practices by most KNFA members.

A number of differences were found in the two livestock enterprise production systems examined (Table 4). In farrow to finishing operations in swine, members generated almost twice as much net income, including family labor costs, as the national average. In layer production, members reported over four times the net income, including family labor costs, as the national average.

Table 3

Selected Crop Performance of KNFA Growers (n = 6) Contrasted with National Averages.

	KNFA Farms		National Average[5]
	M	SD	M
Red Pepper			
Yield[1]	330.00	55.00	197.00
Chemical fertilizer[2]	1.80	1.50	3.50
Organic fertilizer[2]	24.70	17.90	1.90
Pesticides[2]	0.04	0.10	2.62
Natural inputs[2]	7.40	2.60	0.00
Gross income[2]	306.50	76.70	129.30
Operation cost[2,3]	48.30	18.80	21.50
Total labor (hours)	227.60	58.90	221.90
Net income w/ family labor[2]	258.20	69.10	107.80
Rice			
Yield[1]	466.00	69.00	509.00
Chemical fertilizer[2]	0.82	0.24	1.09
Pesticides[2]	0.47	0.40	1.43
Gross income[2]	72.15	11.88	67.95
Operation cost[2,4]	8.59	1.31	10.43
Total labor (hours)	23.10	6.20	37.20
Net income w/ family labor[2]	63.57	12.40	57.52

[1]kg/0.1 ha, [2] 0.1 ha/10,000 won, [3] includes seeds, chemical fertilizer, organic fertilizer, pesticides, & natural inputs, [4] includes chemical fertilizer, pesticides, farm machinery, [5] standard deviations not available for national data

Table 4

Performance in Swine (n = 7) and Poultry (n = 8) Production of KNFA Members Contrasted with National Averages.

	KNFA Farms		National Average[5]
	M	SD	M
Swine - Farrow to Finish			
Number of market hogs	462.00	218.00	N/A
Weaning age	37.20	6.50	30.90
Litter Size	10.60	0.80	9.70
Gross Income[1]	16.55	1.68	15.91
Operation Cost[1,2]	9.91	0.59	11.15
Total labor hours/hog	2.32	0.52	4.80
Net income w/ family labor[1]	6.65	1.65	3.26
Poultry - Layer Production			
Number of layers	1663.00	691.00	3505.00
Number of eggs/hen/year	262.00	16.00	272.00
Egg Price (won/egg)	104.00	5.20	57.00
Gross Income[3]	2.87	0.34	1.74
Operation Cost[3,4]	1.47	0.33	1.42
Total labor hours/100 layers	129.00	22.00	72.00
Net income w/ family labor[3]	1.40	0.33	0.29

[1]hog/10,000, [2]includes feed, price of feeder pigs, & labor cost/feeder pig, [3]hen/year/10,000 won, [4]includes total labor hours per 100 layers, egg cleaning, & feed preparation, [5] standard deviations not available for national data

Conclusions and Implications

At the onset, the researchers acknowledge that client recall of economic and production information on which this study is based is less sound than information obtained through actual measurements. This was a preliminary study to determine progress of the KNFA and not a controlled design. Therefore study findings have to be interpreted with caution.

A significant, though not unexpected, conclusion drawn from the study is that natural farming is labor intensive. From a productivity point of view, less labor is desirable if income levels are the same. From a farm labor intensity point of view, more labor per unit of land area indicates greater land utilization. In Korea, one-half of the total household net income of farmers is generated from off-farm labor. One reason might be that predominant monoculture operations make it difficult for small-scale farmers to organize their family labor to farm full-time and efficiently. Free time encourages off-farm employment. For red pepper production, the KNFA member sample averaged 59% higher yield and twice as much net income as the national average. However, labor requirements increased by 54% using the KNFA practices. This finding suggests that the KNFA methods may generally realize higher yield and higher incomes, but they are more labor intensive when compared with conventional methods.

Rice yield and income of the KNFA members were not significantly different from the national average. These KNFA members could be categorized as ›transitional‹ natural rice growers. For example, only 16% adopted no-till farming. Most farmers tended to believe that tillage was indispensable for rice farming.

All farmers, however, used several natural inputs such as indigenous microorganisms and fermented plant juice. Labor was significantly less than the national average. This suggests that the limited natural farming methods adopted by KNFA members reduced labor requirements.

KNFA members experienced a greater net income through lower operating costs in the farrow to finishing swine operations. Feeder pig costs were lower for the KNFA members because labor requirements were less than one-half of the national average. This labor savings can be attributed to KNFA manure handling techniques. The KNFA recommends that 25 feeder pigs be placed in a 30 square meter pen. A foundational bedding material consisting of sawdust, local soil, and sea salt is laid. As manure is added, the bedding ferments. This allows animals to dig freely, and it is hypothesized that this bedding technique reduces stress in growing animals.

In terms of layer production, the overall operational costs between the KNFA members and the national average were about the same. Net income, however, was more than four times the national average due to a higher quality egg. Labor per bird was almost twice that of the national average, and biological productivity was less than the national average. This suggests that the KNFA methods can generally produce higher quality eggs which can be sold at higher prices, though labor becomes more intensive.

This formative study provides evidence that the KNFA is resulting in behavioral change with positive economic consequences for small farmers in Korea. However, the researchers acknowledge that a stronger evaluation design is needed in order to substantiate these findings. If subsequent program evaluations and empirical studies on recommend practices are found to support the natural farming techniques advanced by the KNFA, then there is the potential for the expansion of this educational program throughout Asia.

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