CONTENTS

Editorial Foreword

Articles

Kristin Davis, Steven Franzel, Peter Hildebrand, Tracy Irani and Nick Place
Extending Technologies Among Small-Scale Farmers in Meru, Kenya: Ingredients for Success in Farmer Groups

Cees Leeuwis
Fields of Conflict and Castles in the Air. Some Thoughts and Observations on the Role of Communication in Public Sphere Innovation Processes

Richard T. Liles
Core Competencies: A Systems Approach for Training and Organizational Development in Extension

Larry E. Miller
Reconsidering Graduate Programs for Students from Developing Countries

Arjen E.J. Wals, Fabio Caporali, Paul Pace, Bill Slee, Nadarajah Sriskandarajah and Martyn Warren
Education for Integrated Rural Development
Editorial Foreword

text

Harm Biemans
Editor-in-chief JAEE
Extending Technologies Among Small-Scale Farmers in Meru, Kenya: Ingredients for Success in Farmer Groups

Kristin Davis¹, Steven Franzel², Peter Hildebrand³, Tracy Irani⁴, Nick Place⁵

The authors gratefully acknowledge assistance from Wim Buysse, Richard Coe and Christina Gladwin.

Agricultural extension is evolving worldwide, and there is much emphasis today on community-based mechanisms of dissemination in order to bring sustainable change. The goal of this study was to examine the factors that make farmer groups successful in dissemination of information and technologies. A mixed-methods, multiple-stage approach was used to obtain data, using participant observation, documentary analysis, semi-structured interviews, social mapping, and structured questionnaires. Dairy-goat farmer groups (n = 46) and individual farmers (n = 88) were interviewed. Factors that were associated with group success in dissemination included member participation, degree of jealousy within the group, homogeneity of members, group capacity, number of linkages and type of group (project-supported versus non-supported). Some interventions that may increase the success of groups in dissemination include capacity-building, increasing linkages with other extension stakeholders, providing an enabling environment for groups to form, using established groups (as compared to forming new groups), and encouraging groups to form around common interests rather than for other reasons.

KEYWORDS: Africa, Kenya, groups, farmers, extension, dissemination


Introduction

Lack of proper extension services is partially to blame for poverty, according to participatory poverty assessments conducted in 10 districts in Kenya in 2000 (Meru Central District Development Plan 2002; Republic of Kenya 2001). This is due both to reductions in government services in Kenya, and ineffective and inappropriate extension approaches (Eponou 1996; Gautam 2000). These issues have led to gaps in extension of technologies to small-scale farmers, who play a major role in the Kenyan economy.

Technologies to address rural problems have been developed by research, development organizations, and farmers working together in Kenya. A major issue then becomes how to scale up these technologies to benefit more low-resource farmers, despite limited extension resources. The extension system in Kenya today is pluralistic, with the government, private companies, and non-governmental organizations (NGOs) all providing extension. Recently, community-based extension mechanisms have come to the fore, as a means of scaling up these technologies to have a wider impact in rural economies (Franzel, Cooper & Denning 2001; Misiko, 2000; Noordin, Niang, Jama & Nyasimi 2001). Farmer groups are an important vehicle for such community-based extension.

¹ Kristin Davis, Department of Agricultural Education and Communication, University of Florida, 310 Rolfs Hall, Box 110540, Gainesville, FL, 32611-0540, USA. Tel. (352) 392-0502; Fax 352-392-9585; mkulima@ufl.edu
² Steven Franzel, Principal Agricultural Economist, World Agroforestry Centre, United Nations Ave. P.O. Box 30677-00100, Nairobi, Kenya. Tel. (650) 833-6645; Fax: 254-2-524001; s.franzel@cgiar.org
³ Peter Hildebrand, Professor, Department of Food and Resource Economics, University of Florida, Gainesville, FL, 32611, USA. Tel: 352-392-1854, ext. 436; peh@mail.ifas.ufl.edu
⁴ Tracy Irani, Assistant Professor, Department of Agricultural Education and Communication, University of Florida, 219 Rolfs Hall, Box 110540, Gainesville, FL, 32611-0540, USA. Tel: 352-392-0502, ext. 225; Fax 352-392-9585; tai@mail.ifas.ufl.edu
⁵ Nick Place, Assistant Professor, Department of Agricultural Education and Communication, University of Florida, 219 Rolfs Hall, Box 110540, Gainesville, FL, 32611-0540, USA. Tel: 352-392-0502, ext. 227; Fax 352-392-9585; nplace@mail.ifas.ufl.edu
However, there is little research showing what factors, if any, make community-based groups effective in disseminating technologies. If evidence could be found for which factors could or do affect farmer group effectiveness, it would facilitate technology dissemination to small-scale farmers. This information would be useful for organizations working with farmer groups, and to the groups themselves, by providing a means to strengthen and guide the groups. Finally, it would provide valuable information to policymakers and practitioners.

Background

The Kenyan government, NGOs and international research centers have all been using farmer groups in the technology generation and dissemination process. One project that focused heavily on farmer groups was the Meru Dairy-Goat and Animal Healthcare Project in the Meru area of Kenya. Meru Central District is an area on the eastern side of Mount Kenya, ranging in altitude from 300 to 5199 m at the peak of the mountain. Farmers in Meru Central District practice mixed cropping methods with maize (Zea mays) and beans (Phaseolus vulgaris) as the dominant farming system. Livestock such as cattle, goats, pigs, and chickens are also part of the system. Rainfall is bimodal, falling between March and June (short rains) and October through December (long rains). Many of the farmers in the project were living in the coffee and marginal coffee zones of Meru Central District.

The dairy-goat project was collaborative between the Government of Kenya’s Ministry of Livestock Development and Fisheries and the NGO Food and Resource Management (FARM)-Africa. FARM-Africa, a British NGO, aims to help poor African farmers through sustainable projects. In Meru, the poor were targeted for income and nutrition improvement through a dairy-goat project. Dairy goats were deemed appropriate due to the dry climate of the area and the fact that they were more affordable to purchase and care for than improved cattle.

Methods

A mixed-methods, multiple-stage approach was used to obtain data for the study. Research techniques included participant observation, documentary analysis, semi-structured interviews, social mapping, group timelines, and structured questionnaires. Dairy-goat farmer groups (n = 46) and individual farmers (n = 88; half were group members) from Meru Central District were interviewed during the study. Qualitative data provided baseline information and helped in the formation of research questions at the start of the study.

Results

Based upon a literature review and preliminary data collection in Meru, the following factors were considered for their effect upon success of
dairy-goat groups in dissemination: size of the group, amount of member participation, homogeneity of members, jealousy within the group, group capacity, number of linkages, and type of group. For the analysis, the dependent variable, success in dissemination, was measured using various indicators. One such indicator was the number of buck services that took place at each group’s buck station. Buck services refer to the number of female goats brought to the group for breeding with the improved buck. An index of success in dissemination was also created to examine the effects of the various group factors. The “neighbor adoption index” was the dairy-goat groups’ ratings of number of neighbors using dairy-goat technologies averaged together with the three external raters’ scores on the numbers of neighbors using dairy-goat technologies. These scores could range from 1 to 4, where 1 = none, 2 = some, 3 = many, and 4 = all. Cronbach’s alpha for this index was 0.69.

The variables examined are discussed below, together with their binary associations with dependent variables. The variables with high associations with the dependent variable “neighbor adoption index” are then put in a multiple linear regression model to portray the overall effects of group factors on the success of the groups in dissemination. The enter method was used in order to see the effects of all of the variables regardless of significance.

**Group Size**
The size of the group has been shown to be both positively and negatively associated with the success of farmer groups (Agrawal and Goyal, 2001; Place et al., 2002). There was a range of 10 to 50 members per dairy-goat group, with the average being 23. The number of members was substantially and negatively correlated with the number of neighbors planting fodder trees \( r = -.520; p < .00; n = 38 \), showing that smaller groups were associated with greater success. No differences in success appeared between smaller-sized groups and the larger ones, however.

**Member Participation**
Groups with high participation by members were thought by informants to be more successful in dissemination. Member participation in the dairy-goat groups was determined through a five-point Likert-scale question where 1 = strongly disagree and 5 = strongly agree with the statement “Group members regularly participate in most group activities.” Member participation was moderately correlated with the index for adoption \( r = -.447; p < .00; n = 46 \), showing that decreased participation in dairy-goat group activities was associated with an increase in the number of members adopting dairy-goat technologies.

**Homogeneity of Members**
The dairy-goat groups were homogeneous in many ways. Homogeneity within the group was examined in terms of village, ethnic group, clan, gender, age, religion and/or church, occupation and economic level. Almost all group members were from the same ethnic group, called Meru. Nearly 100% of farmers interviewed considered themselves to be Christian. Amount of homogeneity within the dairy-goat groups did not appear to have much effect on the dependent variables “neighbor adoption index” and number of buck services, when factored in with other variables in regression models. However, the groups with higher homogeneity had more neighbors planting fodder than were groups with low heterogeneity \( t = -2.47; p < .02; df = 36 \).

**Jealousy**
Jealousy is a factor that appears to make a difference in technology dissemination. A concurrent farmer-to-farmer extension study taking place in Meru revealed an important role for jealousy in dissemination (Kaberia et al. 2004). Jealousy might affect dissemination of information by farmers and groups, because groups might not want to share information and technology in order to keep ahead of their neighbors. Some informants even mentioned that some groups had by-laws preventing the sharing of information, at least until the group had benefited. Many of the dairy-goat groups thought that jealousy was simply something that is a part of life, especially within groups, making statements such as, “If you put eggs in a bucket, they will knock each other.”

Jealousy was measured through Likert scale questions, where the group was asked if they agreed or disagreed regarding issues of jealousy within the group, group conflict, unity, cooperation, and so forth. Degree of group jealousy was positively and moderately correlated with the neighbor adoption index.
(r = .329; p < .03; n = 46) (possible reasons for this association are discussed in the conclusion section).

**Capacity**
Capacity refers to training, skills and capabilities of farmers and groups. Informants viewed trainings as very important to success for dairy-goat groups in dissemination. Informants said that dairy-goat group members who received training were expected by the project to train other farmers. The established dairy-goat groups trained both newer dairy-goat groups and farmers from outside the district and from other projects. The number of trainings each dairy-goat group received since the start of the project ranged from 0 to 15, with an average of 5.4. FARM-Africa, government extension staff or the Meru Goat Breeders’ Association (an association formed by the dairy-goat project) usually conducted the trainings. Individual members of dairy-goat groups received significantly more training than individuals who were not in the dairy-goat groups ($t = 3.07; p < .00; df = 86$). Basic training for groups was on goat husbandry, animal health care, leadership, and group dynamics. Groups with higher levels of training had higher average scores on the neighbor adoption index.

**Linkages**
Every dairy-goat group had linkages with other players in the area, such as churches, the chief, extension staff, and markets. Linkages were established through Venn or chapati diagrams, where the group illustrated its relationships with outside entities through placing various-sized circles on a piece of flip chart paper, with their group at the center. The most important linkages for the dairy-goat groups were government extension, FARM-Africa, and churches. Other linkages included local chief offices, the Meru Goat Breeders’ Association, other farmers, and farmer groups.

The number of linkages a group had appeared to affect the amount of dissemination that took place within a group, with those having greater linkages disseminating more. Groups with lower amounts of linkages had significantly less buck services. Low capacity groups had an average of 10.30 (SD = 6.56) buck services in a one-month period, and high capacity groups an average of 17.26 (SD = 12.53).

**Type of Group (FARM-Africa-Facilitated versus Extension-Facilitated)**
There were two types of groups within the dairy-goat project. At the start of the project, dairy-goat groups of the poorest community members were formed through the help of local chiefs and community members, based on poverty indicators developed by stakeholders. These groups were given a breeding buck and a training program as part of the project. Afterwards, other self-initiated groups formed, who contacted the dairy-goat project to request a buck, which the newer groups then paid for. The newer groups did not receive the same level of training as the original project groups. Within the project, the original project groups were known as “FARM” groups and the newer groups as “extension” groups. This in part refers to the fact that FARM groups were to be supported by the project, while the extension groups were to be assisted by the government, through the formation of “common interest groups” that were being used as part of the Government of Kenya’s new extension approach. However, it appeared that all groups in the project were working with both FARM-Africa and the government extension personnel; therefore, it is not necessarily an issue of government versus NGO. As with many of these projects, FARM provided support in terms of vehicles, fuel and other expenses, while the government contributed personnel.

According to study informants, the FARM groups tended to be older, had received more trainings and tours, and were comprised of poorer members (Table 1). The FARM groups were helped to form with outside assistance, and were given a buck for community-based breed improvement during the start of the project. The extension groups, on the other hand, were formed on their own initiative and criteria, and had to purchase their buck. The older dairy-goat groups received more training as part of the dairy-goat project. These older groups and extension staff trained many of the new extension dairy-goat groups; however, training was more sporadic than with FARM groups. Furthermore, the level of group formality was significantly different, with the FARM groups having higher levels of formality.

The extension groups were, for the most part, newer than the FARM groups, and therefore less likely to have a buck that was ready for breeding.
The FARM groups had been around longer than most of the extension groups, and this may have been an important factor in the differences of dissemination success between the two groups. Also, some of the extension buck stations were very new so it was unlikely that their neighbors would have had a chance to adopt dairy-goat technologies. Even if neighbors had bred their local goats, they may not have obtained kids or have been able to sell them. Number of buck services in the past month for extension groups was 9.68, while FARM groups provided an average of 19.00 services in the past month ($t = -3.22; \ p < .00; \ df = 40$). Because of these differences in the type of group, it would be useful to conduct a similar study in a few years’ time to see more clearly the differences between FARM and extension groups.

There were also perceived relational or sociological differences between the FARM and extension groups. As seen in Table 1, FARM groups had higher levels of jealousy, less participation by members, and less of a perception that their leadership was good, perhaps because these groups did not form on their own.

There was a significant difference in the two types of group with regard to the number of buck services provided, with FARM groups providing more (Table 2). FARM groups also had a significantly higher neighbor adoption index score (Table 2). Finally, type of group alone accounted for 47% of variation in the dependent variable “neighbor adoption index,” when regressing various group factors on the neighbor adoption index.

### Overall Effects of Factors for Success

In addition to type of group, several of the other variables mentioned in this section have important associations with the dependent variable “neighbor adoption index,” an indicator of group success in dissemination by the groups to their neighbors. However, it is important to look at the combined effect of the variables, and not just examine binary relationships, because group factors do not stand alone, but are influenced by other variables. Because this was an exploratory study, a large number of variables were examined for their relationship to the

### Table 1. Differences in FARM and extension-facilitated dairy-goat groups (n = 46)

<table>
<thead>
<tr>
<th>Response</th>
<th>FARM Groups</th>
<th>Extension Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n M SD</td>
<td>n M SD df t p</td>
</tr>
<tr>
<td>No. of trainings</td>
<td>20 6.75 2.69 26 4.31 2.67 44 3.07 0.00***</td>
<td></td>
</tr>
<tr>
<td>No. of tours</td>
<td>20 3.95 1.91 26 1.31 1.29 44 5.61 0.00***</td>
<td></td>
</tr>
<tr>
<td>Formality indexa</td>
<td>20 3.75 0.44 26 3.35 0.85 44 -1.94 0.06*</td>
<td></td>
</tr>
<tr>
<td>Jealousy in groupb</td>
<td>20 4.30 0.92 26 4.81 0.63 44 -2.11 0.04**</td>
<td></td>
</tr>
<tr>
<td>Leadership is goodb</td>
<td>20 4.10 1.02 26 4.69 0.84 44 -2.16 0.04**</td>
<td></td>
</tr>
</tbody>
</table>

* On a scale of 0 – 4 with 0 = highly informal and 4 = highly formal. More formal groups are registered with the Department of Social Services, have a constitution and by-laws and a bank account

* Approaches significance; **significant; ***highly significant

### Table 2. Effect of type of group on success indicators (n = 46)

<table>
<thead>
<tr>
<th>Success indicator</th>
<th>FARM</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n M SD df t p</td>
<td>n M SD df t p</td>
</tr>
<tr>
<td>No. of buck services</td>
<td>17 19.00 7.53 25 9.68 10.19 40 3.22 0.00***</td>
<td></td>
</tr>
<tr>
<td>Neighbor adoption indexa</td>
<td>20 2.97 0.14 26 2.51 0.31 44 6.82 0.00***</td>
<td></td>
</tr>
</tbody>
</table>

* Mean based on a scale of 1 (low adoption) to 4 (high adoption)  
** Highly significant
dependent variables. Those possessing strong associations with the neighbor adoption index were entered into a multiple linear regression model (using the enter method) to more fully explain high adoption rates among groups’ neighbors by dairy-goat farmers in Meru Central District of Kenya.

This regression model is detailed in Table 3. It includes the variables size of group, degree of member participation in groups, group jealousy, capacity and number of group linkages, and type of group. Although some regression models use stepwise methods to add or remove variables until the best possible explanation is reached, this model included all of the variables discussed above in order to examine their combined effects on the dependent variable.

Table 3 thus shows the most important predictors of dairy-goat group success. The r-squared value of 0.58 means that the combination of these variables explained 58% of the variation in the neighbor adoption index, which was a measure of success of the group. The variables that contributed significantly include member participation, group linkages, and type of group. The size of the group, degree of jealousy, and group capacity (number of tours and trainings) had almost no effect on the neighbor adoption index.

Number of linkages and type of group had positive coefficients, meaning that increases in these variables lead to an increase in success of the group in dissemination. Those groups with greater numbers of linkages were able to both give and receive more information with a greater number of people. Because type of group was binary, it means that the variables that were dummy coded “1” (FARM) were contributing to group success (“extension” was coded 0). Reasons for the differences in success by type of group are discussed above.

A negative coefficient was observed for participation level of group members, indicating that the groups that perceived that participation in group activities was low were the groups that tended to be successful in dissemination. Groups where members were perceived as participating less were providing more buck services and had more neighbors adopting dairy-goat technologies. Perhaps this was because groups that had less participation had more members out visiting others and sharing information and technologies with other farmers rather than hoarding information within the group.

Conclusions

Although this study was exploratory, the results have allowed some of the factors that lead to success in farmer groups in extending information and technology to their neighbors to be teased out. Indicators of success in dissemination included the number of buck (breeding) services that groups provided, and an index of adoption by neighbors called the “neighbor adoption index.” This study has added to other researchers’ findings on effects of group size and capacity on group performance. It has paved the way for possible future studies on the effects of factors such as homogeneity of

Table 3. Linear regression analysis of variables for prediction of success in dissemination (neighbor adoption index)

<table>
<thead>
<tr>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Std. Error</td>
</tr>
<tr>
<td>(Constant)</td>
<td>2.720</td>
</tr>
<tr>
<td>Size</td>
<td>.000</td>
</tr>
<tr>
<td>Member participation</td>
<td>-.119</td>
</tr>
<tr>
<td>Jealousy</td>
<td>-.003</td>
</tr>
<tr>
<td>Capacity</td>
<td>.001</td>
</tr>
<tr>
<td>Linkages</td>
<td>.036</td>
</tr>
<tr>
<td>Type of group</td>
<td>.396</td>
</tr>
</tbody>
</table>
| a 0 = extension-facilitated group; 1 = FARM- facilitated group

**Significant; ***highly significant

Note.  R^2 = .58
members and jealousy on group success. The research has shown an indication that member participation in the group affects group success. Finally, this study has shown the importance of linkages and type of outside support to farmer groups and to extension.

The size of farmer groups is a variable that has been examined over the years for its effects on group success, with varying results (see, for example, Olson 1965, in Agrawal & Goyal 2001; Agrawal & Goyal 2001). Morton et al. (2002) found both negative and positive effects from group size. Stringfellow, Coulter, Lucey, McKone and Hussain (1997) found that small groups were more successful. Place et al. (2002) found that middle-sized groups were the best-performing groups. In the regression model in Table 3, group size has no significant effect on the outcome of the dependent variable “neighbor adoption index.” The only piece of data related to group size and success in this study was the substantial and negative correlation between group size and the perception of number of neighbors planting fodder. Perhaps in the smaller groups members received more training, they were more likely to invite neighbors to trainings, and members worked more effectively. Further studies are necessary to show what, if any, effect size has upon the success of groups.

Group capacity; that is, the number of tours and trainings, was a factor that was expected to positively affect success in dissemination among groups. Morton et al. (2002) found that training led to greater success in self-help groups and dairy cooperatives in Kenya. Although capacity level did not significantly affect the dependent variable in the regression analysis in Table 3, other data from this study give indications that it does have a positive effect on groups’ abilities to extend technologies. More training means more expertise; members will be more self-confident to train others and others will be more likely to come seeking advice. Furthermore, this study shows that capacity can be built. The FARM groups were below the extension groups in terms of capacity at the start of the project, but have outperformed extension groups thus far in terms of dissemination of information and technology.

Homogeneity and jealousy were expected to affect the success of the group, but did not do so significantly. Homogeneity among members was significantly related to just one success indicator, the perceived number of neighbors planting fodder, with more homogeneous groups associated with higher rates of fodder planting. Stakeholders in the research study thought that groups with more homogeneity among their members were better disseminators, because it would increase understanding and unity, and members would have common interests, language, goals, history, culture, and objectives. This was true to a certain extent, in that the more homogeneous groups were more successful in dissemination.

Jealousy in this study was measured within the group itself, not between the group and outside members. It is an important factor to consider in dissemination studies, because people may not want others to get ahead of them materially. They may even be afraid to get ahead of others because of fear of jealousy by others. The degree of jealousy did not significantly affect the success indicator in the regression model. However, moderate, positive correlations were found between the dependent variable “neighbor adoption index” and perceived jealousy among members. Perhaps the reason for this positive correlation is that in groups where people were jealous of each other, the members had more outside connections and thus disseminated more. Within the group, however, there may have been arguments as to whether group members should share their “exclusive” knowledge with others, and thus the groups perceived themselves as having a higher degree of jealousy. The exact way that jealousy affects dissemination is not known, and should be a consideration for further research.

Degree of member participation, amount of linkages that groups had, and type of group were the three variables that significantly affected the neighbor adoption index, based on the results of the regression model shown in Table 3. The measurement of the variable for member participation in groups is described in the results section. Informants in the study thought that groups with high participation would be more successful in dissemination. However, this did not happen, as decreased participation in dairy-goat group activities was associated with an increase in the neighbor adoption index. This may be due to the fact that groups with high participation were inwardly focused, and
did not reach out to or spend much time with non-members and thus disseminate information. Perceptions on group member participation were skewed (4.43 on a scale of 1 to 5, where 1 = strongly disagree and 5 = strongly agree that members participate). Therefore, further studies are needed to more adequately determine the role of group participation on success in dissemination.

Linkages were also an important factor for group success (Table 3). Groups with more linkages had higher rates of success in dissemination. Groups with many linkages are able to both give and receive more information and technologies.

Finally, type of group was a variable that was extremely significant in the study. Once again, the two types of groups were known in the project as “FARM” groups and “extension” groups. The FARM groups were formally supported by the dairy-goat project, while the extension groups formed on their own and purchased a buck. The differences through type of group points to the importance of outside support when using groups to disseminate information and technologies.

The key issue here may not be whether groups were NGO- or government-facilitated, but that the FARM groups were formally part of the project and thus received higher levels of training, more tours, and other assistance. One could say that the FARM groups had greater outside assistance. However, it should be emphasized here that the project assistance was focused on sustainability, and with a view that the groups would not continually receive assistance, but would be trained and helped to the point where they could “go it on their own” eventually. Having such organized outside assistance may be the key to building capacity among groups, to enable them to effectively disseminate information and technologies.

Overall, this study does seem to indicate that groups are important players in dissemination of information and technologies to small-scale farmers. Farmers in the dairy-goat groups would tell people in their other groups (for instance, church or women’s groups) about the things they had learned through the project. Groups were also an important source of information for individual farmers interviewed during the study.

Implications and Recommendations

In summary, the variables that appeared to affect the success of dairy-goat groups in disseminating information and technologies included member participation, linkages, and type of group. The size of the group, member homogeneity, degree of jealousy, and group capacity seemed to have little or no effect on group success, at least when factored in with other variables in the regression model. Further empirical studies with a larger sample size may help to determine the role that these factors may play in farmer groups in their success in dissemination.

These results provide some useful implications for policy-makers and development practitioners, and those who are involved in extension of technologies and information to small-scale farmers. Recommendations can also be made to strengthen groups for their role in technology dissemination.

One important issue that this study shows is that once groups receive adequate training, they are effective at extending information and technologies to other farmers. Capacity building and increasing linkages are thus important factors for increasing the success of farmer groups in dissemination. Although capacity did not show up in the regression model as an important contributor to group success, it was shown through other evidence to be an important factor in dissemination by farmer groups. This is an important finding for policy-makers, for it emphasizes the importance of building capacity for rural development. Training farmers not only increases their own capacities, but increases the likelihood that they will transmit the information to others.

Farmers in remote, rural areas are often cut off from the outside world in terms of roads, communications, marketing, and inputs. This makes farmer group linkages very important; they are often a connection to the rest of the world, or at least to markets, information or inputs. It is often easier for projects, churches, and governments to connect with farmers through organized groups such as the dairy-goat groups in this project. It is, therefore, important to promote grass-roots organizations at the community level not only in order to increase the capacity of farmers and help with marketing, but
also to facilitate the dissemination of information and technologies.

Groups do play an important role in extension and should, therefore, be used to help disseminate information and technologies. Most farmers in the Meru area were involved in some type of group or other. In addition to the various types of farmer groups, there were also church groups, women’s groups, water groups, and savings and loan groups. Groups are an efficient way to target rural people in areas where such social capital is high.

One recommendation therefore is to use farmer groups for dissemination within the context of a pluralistic extension model. Groups are not a silver bullet for extension; they are one actor that can play an important role. To do this, however, groups need to have linkages with other players as well as training and support from governments and/or projects. The important linkages in this study were the government extension, the NGO FARM-Africa, and the farmer association Meru Goat Breeders’ Association. Mechanisms must be put in place to link such extension players with local community groups.

Not all parts of the world have such high social capital in the form of farmer groups as Kenya does. Even parts of Kenya do not traditionally have the rich variety of community associations such as those in Meru. In such areas, it is important to provide an enabling environment for groups to form. This can be done through working with other actors. For instance, in Kenya, the Ministry of Gender, Culture and Social Services (which works with social groups), the local chiefs, and churches could be used to assist groups to form or to contact established groups.

Policy-makers should facilitate non-threatening ways for farmers to register groups through these various institutions in areas where illiteracy, physical distance and fear of government may keep farmers from registering groups. Also, the establishment of a clearinghouse and/or standard operating procedure whereby groups can obtain development assistance, and development players can identify established groups to take part in projects. Finally, mechanisms should be put in place for coordination between development players and farmer groups that will prevent duplication of efforts and alienation of marginalized farmers.

Based upon the results of this study, the authors therefore make the following recommendations to practitioners and policy makers:

1. Use farmer groups for dissemination purposes, within the context of a pluralistic extension environment.
2. Provide capacity building in the form of training, cross-visits, agricultural shows and other mechanisms to build the capacity of farmers and groups. At the same time, build in sustainability and empower groups to “go it on their own” eventually.
3. Focus on key individuals within groups for training; in the case of the dairy-goat groups, the buck keepers, breeders, and community animal health workers.
4. Increase linkages of groups with outside entities from whom they can learn and to whom they can disseminate information and technologies.
5. If established groups are not available, focus on common interests of group members when forming groups.
6. Provide an enabling environment for groups to form by working with the various government departments, local officials, projects and churches, to facilitate non-threatening ways for farmers to register groups through these institutions.
7. Establish a clearinghouse and/or standard operating procedure whereby groups can obtain development assistance, and development players can identify established groups to take part in projects.

Acknowledgement
Kristin Davis would like to thank the United States Agency for International Development (USAID) Scientific Liaison Office for funding her research.
References


Franzel, S., Cooper, P. & Denning, G. L. 2001, ‘Scaling up the benefits of agroforestry research: Lessons learned and research challenges,’ *Development in Practice*, vol.11, no. 4, pp. 524-534.


Notes

i In this study, jealousy (*roritho* in *Kimeru*) refers to the feelings of rivalry and envy between people or groups, and the state of being desirous of another's advantages.

ii In the project, there were groups that were formally part of the project, called “FARM” groups, and those that formed later on their own, called “extension” groups. Both FARM-Africa and government extension were involved with both groups; the terms were simply used to distinguish the two.
1. Introduction.

The chairgroup Communication and Innovation Studies is successor to the department of Extension Education set up in 1964 by professor Anne Van den Ban. The change of title indicates a shift of focus from ‘advisory communication’ to the role of communication in more general terms during processes of change. At the root of this are all kinds of changes in conceptual thinking, some of which are linked to huge changes in context. Starting with the latter, it is clear that -in the Netherlands and elsewhere- the role of agriculture in rural society has become an increasingly controversial issue (Marsden, 1995). More and more interest groups have entered the debates about the use of land and rural space. Where increasing productivity and income in agriculture were once the central concerns, we now increasingly discuss matters like multifunctional land use, ecological services, food safety and the management of production chains. Difficult balances need to be struck constantly between competing goals and values in society. Against this background -and also due to developments within the discipline itself- our thinking about the two main concepts alluded to in the title of the present group -communication and innovation- has changed significantly.

Evolving thinking about communication

During the early years of Extension Education we had a rather mechanical and isolated idea of communication processes. At the time we thought in terms of individual senders and receivers who exchanged messages (i.e. transferred knowledge) through channels and media. If a message did not get across or was not understood, then ‘interference’ or ‘static’ was taken to be the cause. It soon became clear, however, that things were more complicated than this. Especially the idea that a message had a fixed meaning was found to be debatable. The receivers’ interpretation of a message was usually quite different from that of the sender. This was caused not so much by ‘noise’ as by the fact that the sender and the receivers had very different frames of reference and prior knowledge. If a sender wanted to get a certain message across, it was concluded, they had to enter into the lifeworld of the receiver and had to be prepared to listen as well as send (Van den Ban, 1974; Dervin, 1981; Röling & Engel, 1990). Although this way of thinking was a big improvement, there were still some shortcomings. It frequently occurred that senders were doing their very best to anticipate the receivers’ lifeworld, only to see them almost refuse to understand the message.
Despite all kinds of communicative efforts by government and industry, for example, Dutch farmers still have a rather negative perception about policies aimed at, for example, reducing mineral application or stimulating nature development, while consumers are not very willing to adapt their views regarding biotechnology. In these cases, it is not so much a question of incomprehension or lack of effective communication, but rather of an active and more or less purposeful maintaining of a difference in perception. In light of these kinds of experiences we now regard communication as a phenomenon in which those involved construct meanings (Leeuwis, 1993; Te Molder, 1995). Differences in interpretation have to do not only with different prior knowledge but also with other contextual issues such as the historically grown relationship between the communicating parties, configurations of interests, and also the influence of other actors not directly involved in the interaction. In short, meanings come about -are actively constructed- in a complex context, and are not neutral. And communication is not something that necessarily brings people closer together or aids in problem-solving, but it can also add to incomprehension and the creation and up-keep of problems and conflicts (Aarts, 1998). So far some of the changes in thinking about communication.

**Evolving thinking about innovation and change.**

Over the years, ideas about innovation and change have also evolved considerably. The original hypothesis that innovations are developed by scientists, disseminated through extension and education and then put into practice by farmers and the public is called the linear innovation model, and has been refuted by many (Kline & Rosenberg, 1986; Röling, 1994; Rip, 1995). When one analyses successful innovation processes in retrospect, it is apparent that many ideas originate from practical experience and that the role of science is often limited.

Not only have the ideas about the origin of innovation changed, but also the ideas about what an innovation actually *is* are susceptible to transformation. During the early years of Extension Education, an innovation was regarded as something simple: a new type of plough or a new food product, for example. Moreover, the idea was that an innovation was either adopted or rejected by an individual, depending on all kinds of social conditions, among other things (Rogers, 1962; Van den Ban, 1974). It was thought that a new crop variety, for instance, could only be successful on the condition that certain input and output markets were adequately organised. Nowadays, we look at innovation differently. In the first place we recognise that innovations - even when considered solely from a technical perspective- are not one-dimensional, but must be viewed as large collections of partial innovations. Secondly, we no longer regard the social and organisational conditions as external and static, but rather as integral parts of any innovation. Innovations do not just consist of new technical arrangements, but also of new social and organisational arrangements, such as new rules, perceptions, procedures, agreements and social relationships (see e.g Van Schoubroeck, 1999). Thus, innovation depends almost always on multiple stakeholders, which implies that it is not very useful to look at ‘adoption’ as something that happens at an individual level (as we thought in the past). What is important are the co-ordination and interdependencies between people. In line with Dirk Roep’s (2000) dissertation, therefore, I would like to define innovation as ‘a new pattern of co-ordination between people, technical devices and natural phenomena’ (see also Smits, 2000 for a similar definition).

Finally, the thinking about innovation as a *process* has also changed dramatically over the past decades. In former days there was a strong belief in the possibility of planning and predicting change and innovation. In contrast, we now see that change is affected by complex interdependencies, fundamental uncertainties, chaos, unintended consequences, conflicts and unpredictable interactions that cannot be understood from a reductionistic perspective (Prigogine & Stengers, 1990, Holling, 1995). In connection with this, innovation processes are looked at nowadays from an evolutionary perspective. The idea is essentially that a variety of innovations and innovation processes compete in a dynamic selection environment in which the ‘best fitting’ survives (Bijker et al., 1987; Rotmans et al., 2001).
transformations there have, naturally, also been radical changes in our ideas about the links between communication and innovation. The work of my predecessors Niels Röling and Cees Van Woerkum speaks volumes in this regard. The focus has shifted from using communication as a means to transfer and effectuate knowledge, innovations and policies developed from the top down, to the study and organisation of communication and interaction in order to arrive at common starting-points, fitting and acceptable innovations and cogent policies. Thus, our ideas about the role of communication have undergone a 180-degree change in direction. Participation thus became an ever more important subject in research and in practice (Röling, 1996; Röling & Wagemakers, 1998; Van Woerkum, 1997).

2. A closer look at processes of communication and innovation.

If we understand innovation as ‘a new pattern of co-ordination between people, technical devices and natural phenomena’, how should we understand innovation processes and what role does communication therein? Broadly speaking, there are two ways of dealing with this question. The first is descriptive/analytical: what is the actual role of communication? The second is a more normative approach: what could or should the role of communication be? Both starting points are of great interest to our discipline. One can only arrive at useful practical insights on the basis of a solid analytical understanding. Starting from a more normative viewpoint, I would like to suggest -building on the work of many members of the chairgroup- that three (simultaneous) processes deserve particular attention and communicative support.

Network building
The first process is that of the building of networks. Innovation requires co-ordinated action within a network of people. Such a network does not just spring into existence; it needs to be ‘constructed’. And because renewal and innovation are at issue here, it will be evident that there is often a need for the forging of new relationships, both in terms of the parties involved and in terms of content (Engel, 1995), and for using these to expand windows of opportunity. This may sound simple, but it often proves rather difficult.

Social learning
At the same time that the building of a network is taking place, something that can be described as a social learning process must also occur. This means that the parties involved slowly develop overlapping -or at least complementary - goals, insights, interests and starting-points (Röling, 2002), and also build mutual trust and feelings of dependence and responsibility. This is not ‘learning’ in the sense of ‘knowledge transfer’ or ‘teaching’; rather it is about the development of different perspectives on reality through interaction with others. It is not just a question of cognitions about the natural and physical world but also of perceptions regarding one’s own aspirations, abilities, responsibilities and space for manoeuvre, and of other people’s views of reality (see Figure 1). Exploration of different perspectives is vital in such a learning process because it is a very important route to ‘reframing’ (Gray, 1997): learning to look at a situation and one’s role in it in a different way.

Negotiation
A third process is that of negotiation and conflict management. Innovation implies changes in the status quo, which is always accompanied by friction and tension, especially in the case of innovations that go further than just optimisation within established frameworks and goals. Such innovations, which are characterised by the letting-go of existing starting points, goals and assumptions are also known as ‘system innovations’ or ‘transitions’ (Rotmans et al., 2001; Geels, 2002). This kind of innovation and change brings with it, by definition, conflicts of interest between the parties involved and also...
with the established social and technological system or ‘regime’ that in many ways needs to be ‘conquered’ (Rip, 1995). In order to deal with such tensions, and in order to make new agreements and social arrangements, negotiation is essential. Preferably integrative negotiation based on a social learning process (Aarts, 1998).

In view of the above, these three processes should guide and direct communicative intervention aimed at supporting innovation. This means that communications experts must lend their support to a large number of tasks that can be derived from theories about network building, social learning and negotiation. Tasks that are of great importance from the point of view of social learning might be: making the invisible visible, organising comparisons between different contexts, setting up experiments and facilitating exploration. A variety of communicative methods exist to support all this, ranging from dialogue and discussion techniques to model-based explorations (see Leeuwis with Van den Ban, 2004). In addition, negotiation literature emphasises tasks such as the making and keeping procedural agreements, joint research and uncertainty reduction, guiding the give-and-take process, communication with constituencies and monitoring the observance of any agreements reached (Van Meegeren & Leeuwis, 1999).

It is interesting to note that, based on theories about networks building, social learning and negotiation, one can deduce a number of conditions and circumstances which affect the probability of achieving a productive innovation process. Learning, for example, costs time and energy and often fosters uncertainty (Aarts & Van Woerkum, 2002). It is, therefore, something that people only tend to do under certain circumstances. In order to engage in learning, people need to experience a serious problem, for example, preferably one that is urgent and visible. It is also important that people are confident that their learning will bear fruit, and that their social environment welcomes and gives space to a different perspective (Martijn & Koelen, 1999; Leeuwis, 2002). Negotiation literature also provides important pre-conditions, such as the insight that productive negotiation is only possible between parties who feel dependent on one another for solving a problematic situation (Aarts, 1998), which implies that, among other things, a certain balance of power exists. In other words, it is not possible to simply start or create an interactive innovation process from any situation.

3. Some observations regarding current practice

When we look at the day-to-day practice of innovation and communication from the above formulated perspective, what do we see? What is most striking? The following observations are limited mainly to communication and innovation in so far as they concern publicly formulated goals, such as sustainability, development, management of natural resources, health promotion, etcetera.

The need to reflect on pre-conditions

As has been touched upon in the preceding section, the stimulation of interactive innovation processes is not always useful or likely to be successful, as certain pre-conditions may not be met. In practice we see that there is not much heed being paid to this, however. At times one gets the impression that everything nowadays must happen in as participatory and interactive a fashion as possible. Regardless of any pre-conditions, we see that every effort is made to bring all the different stakeholders together around the table or ‘under the tree’ in order for them to undergo a learning process together. In some cases participative trajectories have even become a fixed part of a bureaucratic formula. In Africa, for example, almost every rural project must begin with a standard selection of procedures, such as doing a ‘transect walk’, drawing up a ‘seasonal calendar’, and engaging in various ‘ranking’ exercises. Project workers do it because it has to be done and the communities have become used to it, often having results ready more or less off the shelf. In short, all kinds of rituals lacking any real content, influence or critical dialogue are frequently adhered to (Eyben & Ladbury, 1995; Graig & Porter, 1997; Pijnenburg, 2004). But even when the intentions of the intervening parties are more carefully considered, we can see that the quality of social learning and negotiation processes often leaves much to be desired. We frequently witness, for example, that in-depth exploration is often a non-starter, that conflicts and issues of power are not brought to light, that results end up in the metaphorical ‘bottom drawer’, or that
unattractive pseudo-compromises are reached which are then ignored by those involved (Leeuwis, 2000). All this is caused not only by a lack of ability on the part of the process facilitators but also by the fact that vital preconditions have not been met. There is often a lack of real institutional and political manoeuvring space, certain crucial stakeholders do not experience a problem, or the different stakeholders do not feel dependent on one another (Aarts, 1998). Under such conditions, the time is not (yet) ripe for an interactive innovation process and it would be much more useful -from the point of view of intervention- to try to create better conditions for such a process with the aid of more traditional (policy) instruments (Van Woerkum, 1990). With the aid of rule-making, political pressure, financial incentives and persuasive campaigns, for example, a feeling of interdependence can be fostered among the stakeholders in a river-basin, creating thereby a basis for a serious discussion about water distribution and utilisation. All this implies that it is time to move on from the idea that ‘top-down’ intervention and an interactive approach are mutually exclusive routes towards change and innovation; a concept which has become dominant in professional practice. Before, during and after an interactive innovation trajectories, strategic interventions can be extremely useful, while leadership and the taking on of responsibility are indispensable.

**Knowledge policy or innovation policy?**

Even though the ideas about innovation and the role of knowledge therein have changed dramatically, many researchers and advisors all over the world are still working according to an outdated task model. Attention is mostly focused on the technical side of the equation, that is, the developing and transferring of technical knowledge and devices. Issues such as process management and the creation of coherence between social and technological arrangements receive relatively little attention. In many countries, the emphasis is still on knowledge transfer and knowledge policy rather than on innovation policy. In the Netherlands we witness a rather remarkable situation in this respect. The Ministry of Agriculture, Nature Conservation and Fisheries produced a document on innovation policy in 2001, containing many valuable ideas about innovation and change (Ministerie van LNV, 2001), but everyday policy practice within important policy domains seems to have little relation with this. On the subject of mineral management policy, for example, we can see that policy and project documents are full to bursting with ‘knowledge development’, ‘knowledge transfer’ and ‘knowledge dissemination’, while lack of technical expertise is actually of secondary importance in the case of this particular issue. It is much more a question of troubled relations, lack of agreement and a lack of coherence and co-ordination in the social network of which farmers are a part. These matters, however, do not really receive any explicit attention, partly because it does not fit into the mandate or role conception of the extension organisations and research institutes involved in the policy implementation. In all, there seems to be a lack of congruence between innovation policy and knowledge policy.

**Paradoxes of the ‘knowledge market’**

Despite the fact that role conceptions have not changed very much, there is visible movement in other areas of the knowledge infrastructure. All over the globe there are experiments being carried out with the privatisation of agricultural advisory services and with making research organisations independent from the state (Rivera & Zijp, 2002). One could say that a ‘knowledge market’ is being created. Its exact features differ from country to country. In most cases government agencies remain an important player on the market; thankfully governments still fund research and extension services on behalf of public issues. But an important change from the past is that research and extension organisations now have to compete in order to get access to these funds. The main intention in all this is that a ‘knowledge market’ will lead to a better balance between the ‘supply’ of and ‘demand’ for knowledge (Rivera & Gustafson, 1991; Umali & Schwarz, 1994). The term ‘demand-driven service provision’ has become a magic phrase. Looking at the effects of this situation, it is evident that there is a shift towards the servicing of well-funded customers and questions, especially in areas regarded by government as ‘private’ (Kidd et al., 2000; Hanson & Just, 2001; Katz, 2002). When it comes to public issues, the role of governments -as financiers- in defining relevant questions is often quite large, which is
somewhat strange in light of all the rhetoric about demand-orientation.

What interests me most in view of the issue of innovation is the question of how new forms of funding influence the dynamics of innovation processes in the public interest. That is, processes of network building, learning and negotiation in precisely those situations where accepted solutions and ready-made knowledge products do not yet exist. If, for example, we examine the Dutch ‘knowledge market’ in the area of agriculture and rural resource management from this perspective, a number of remarkable features come to the fore:

**Restrictions in knowledge exchange**

Despite the fact that innovation processes benefit in theory from openness and the exchange of knowledge between the different parties, we have seen that co-operation between those involved in the knowledge network has become less self-evident. In the agricultural sector, the applied research and extension organisations have grown apart because of competition between them. There are also clear signs that farmers and horticulturists have become less open when taking part in study groups, partly because they have to pay more and more for knowledge (Oerlemans et al., 1997). Lastly, the co-operation and exchange between the various publicly-funded projects – which are carried out by competing agencies – are often far from optimal. It should also be noted that these projects often have a limited life-span and have different starting and completion dates, making it difficult to link one to another. There is not much left of the famous -though by no means perfect- Dutch triptych of agricultural research, extension and education.

**A lack of space for innovation**

A second paradox is that -in order to be able to use a tendering system- the government must define (or have others define) fairly precisely what it wants in return for the money it provides for extension and research in the public interest. Concrete ‘outputs’ must be put down on paper. This provides a lot of clarity to project implementers with regard to the number of working days available and the activities to be carried out, but can be very limiting in innovation processes. One essential characteristic of learning and negotiation processes in multiple-stakeholder situations is that it is impossible to predict beforehand what the results will be and which directions for searching for solutions will be agreed upon. Room to manoeuvre and flexibility are needed -not least in terms of the application of funds- but it has become apparent that this is not so easy to realise in the case of output-oriented financing. Defining outputs beforehand can also lead easily to a certain level of inertia in areas for which outputs have not yet been defined. To put it bluntly, activities that are commonly understood as being relevant are left undone because nobody can justify and allocate the necessary man-hours in terms of the contracts available.

Some nuances and reservations need to be expressed here. In their classic article ‘Demythologising planned intervention’, Long & Van der Ploeg (1989) already pointed out that huge differences often exist between project documents and everyday practice. Should we conclude, then, that there is no real problem since everyday practice is less controllable than is portrayed, and/or because more degrees of freedom exist than is suggested by formal documents, contracts, and the like? I think that this would be an erroneous conclusion. The fact that things happen differently in practice to what is planned beforehand does not necessarily mean that what is put down on paper has no influence on what happens. This is especially apparent when one studies the communicative interactions between people in the context of projects and activities with output-oriented funding. In such interactions people refer constantly to what is on paper, especially when arguments for or against the taking of certain courses of action are sought. Substantive issues and challenges to innovation are not taken up, for example, under the pretext that they fall outside the mandate or the time specifications of the contract, or that they do not fit with the previously agreed budget divisions. In project communications to outsiders we see that – in view of efforts to secure future funding – mostly positive experiences are described and expanded on, while problems and failures are not mentioned, even though many valuable lessons can be learned from these (Argyris & Schön, 1996; Dörner, 1996). We also see that monitoring and evaluation systems are often aimed at gathering information on formal goals and results, while a treasure trove of experience and information about processes and informal goals remain untapped.
In all we see that, with reference to what has been put down on paper, all sorts of selections are made and legitimised that lead to the reduction of the capacity to learn, and that also contribute to a situation where commissioners develop and retain a completely skewed image of what occurs in actual practice (Wagemans, 1998). Apart from this, managing all kinds of discrepancies requires enormous energy, not least from the people who find themselves between those who supply the funding and those carrying out the work (including, for example, process facilitators and university professors).

Transaction costs
In line with the above, a third interesting fact is that the stimulation of innovation processes through a ‘knowledge market’ and ‘output-oriented funding’ is often accompanied by large - sometimes vast - transaction costs. It is certainly not an easy task, and especially so for farmers and citizens, to get funding for a good innovative idea. One must ensure that the idea is defined somewhere as an output and then do everything in one’s power in order to get an opportunity to tender for one’s own idea. Millions of euros worth of man-hours are committed to presenting so-called ‘business plans’ to the Dutch government’s innovation programmes and to those of the European Union. Project offices and consultants - referred to by farmers as the ‘suit-and-tie culture’ (Aarnink, pers. comm.) - are doing well out of it, but it has proven to be extremely difficult to link the course of these kinds of programmes (characterised by a long slow preamble, a few years in which everything must be completed, and then a return to inactivity) to the dynamics of already existing innovation initiatives in society. The realisation that innovation processes are really all about new forms of co-ordination between different societal agents must lead us to conclude that innovation takes place primarily within society itself and not within the artificial boundaries of a project or programme. These boundaries can be very useful but must not be given a central role, though this is all too often what happens.

Conclusion
The preceding observations lead to the question of whether innovation in the public arena should really be supported in the form of a ‘market’. The current arrangements are, in any case, attended by risks in the areas of co-operation, coherence, learning ability and pro-activeness. In my view, the problem starts already with the very idea of a ‘supply’ of and ‘demand’ for knowledge. These terms suggest immediately that there is somebody seeking knowledge and somebody supplying it, with the former having to pay the latter. This may perhaps work in the case of already tested and available advice and innovations, but not in a situation where new socio-technical innovations have to be developed. In the latter contexts important questions tend to be unclear at the outset, while much of the relevant knowledge is still implicit, even if it is certain that many stakeholders have relevant knowledge to contribute. In other words, it is impossible to say who should pay whom and for what. In short, the idea of a ‘knowledge market’ is based on an overly simplistic and explicit conceptualisation of knowledge and also on a much too one-dimensional view: the ‘market’ is mainly oriented to substantive knowledge and not to other forms of perception and cognition that are important in an innovation context.

In the following section, I will set aside the practical obstacles signalled above and focus attention on the possible roles of scientists in innovation processes.

4. Knowledge and the role of the scientist in innovation

In innovation processes we are essentially faced with the challenge of linking all kinds of forms, domains, sources, and bearers of both knowledge and ignorance to one another. In connection with this it would be overly simplistic to consider ‘knowledge’ as being only a mental capacity. Knowledge and action are two sides of the same coin; a lot of knowledge seems to be ‘stored’ in our bodies and in the things around us, and is expressed through our actions, without our even consciously or actively reflecting on it (Giddens, 1984; Nonaka & Takeuchi, 1995; Scott, 1998). Knowledge is therefore often implicit; a large part of what we think, know, feel and are able to do is difficult to put into words. And even when we are able to articulate in communication with others - we are usually more or less strategically selective in the words we use. Knowledge is, in short, an extremely elusive phenomenon. In light of this, how should we define the possible role of science? And what
about the relationship between the natural and the social sciences?

Before addressing these questions, it is perhaps important to establish what we understand by the term ‘science’. I would characterise scientific research as a subculture in which much importance is given to the development of original, valid and credible conclusions about reality. Within the scientific community all kinds of epistemological subdivisions exist, because large differences also exist between various groups of scientists regarding the way in which they arrive at their conclusions and the kinds of pronouncements that they make (Knorr-Cetina, 1992). For this reason I prefer to use the phrase ‘scientists’ knowledge’ rather than ‘scientific knowledge’.

Role perception from an innovation perspective

Scientists in the domain of agriculture and natural-resource management often have to deal with complex connections between technical, ecological, economic and social systems. There is much unpredictability and uncertainty and there are divergent values and interests at issue. This is precisely the kind of situation in which the philosophers Funtowicz & Ravetz (1993) argue for a post-normal approach to science, instead of a strategy in which science is only applied for the ‘solving of puzzles’ or the giving of situation-specific advice. With post-normal science, the scientists themselves are intensely involved in societal processes, discussions and innovation. In other words, in processes of network building, social learning and negotiation.

In such contexts, the reaching of an agreement between the parties is often hampered by a lack of insight into certain issues or because there is a high level of uncertainty in technical and/or social areas. It is also possible that the available insights are not sufficiently explicit. All kinds of implicit claims to knowledge, assumptions and knowledge gaps are concealed in any communication between the parties. It can be important to make these explicit and open to discussion in order to assist the advance of an innovation process. This is not at all an easy task and will never be completely successful. Not only process facilitators but also scientists from various disciplines can play an important role in this respect. One may expect scientists to have a certain sensitivity regarding implicit assumptions, claims and knowledge gaps in their own areas of expertise. A serious dialogue between scientists and societal stakeholders, in which the different parties have the opportunity to ask each other difficult questions, can contribute to making explicit previously implicit issues. If knowledge gaps also arise during this dialogue then the presence of researchers will naturally be helpful in developing answers with the aid of research. From the point of view of negotiation, conducting joint research is most relevant. That is; research in which various stakeholders are involved closely in the refinement of research questions, the choice of methods and the fixing of the research location (a laboratory, an experimental station, a computer model or a field situation). It is important not only to generate answers, but also to assure that the parties involved have confidence in the results. In addition, collaboration in carrying out research can contribute to an improvement in the relationship between the stakeholders involved (Van Meegeren & Leeuwis, 1999).

This does not imply, however, that nothing remains of the individual responsibility and autonomy of the researcher. Here it is relevant to note that a crucial trigger for social learning is feedback (Kolb, 1984; Heymann, 1999). In innovation processes, therefore, both natural and social scientists can stimulate learning processes by providing –more or less confrontational- feedback at their own discretion. They can provide not only insights based on research with reference to a specific situation but also those gleaned elsewhere, or they can make projections about the future or point to radically different technological or social solutions.

The status of knowledge contributed by scientists

Some natural (and also social) scientists may have winced when reading the above. Not so much because I attribute a somewhat modest role to scientific researchers in innovation processes - many natural scientists are far more modest about their role than at times portrayed by social scientists- but because I have given very little attention to the role of scientists as ‘referees’ in situations where conflicting views on reality are
at issue. Is it not the task of science to bring the truth to light? In my experience, many natural scientists feel threatened by the idea that reality is something that is constructed. It could, after all, lead to a situation where the scientist’s perspective is pushed aside as being just one of the many equally valid views on reality! This is not what I am advocating. It seems to me that it remains possible and important to differentiate between sense and nonsense, and between more and less well-founded views on reality. In my opinion, the essence of constructivism is not so much that every truth is relative but rather that every truth has its limits and also that in everyday life neutral truths do not exist.

When, for example, a laboratory experiment shows a link between the presence of the nitrogen fixating bacteria Rhizobium and crop growth, this can lead to a conclusion that is valid within the context of the experiment. That is to say: given a particular type of soil, particular climatological conditions, a particular labour input, a particular form of crop protection, a particular planting date, etc. In other words, the conclusions drawn from the experiment are only valid within the limits of its context. Many of the conditions outside the laboratory and/or experimental station will most probably be quite different. When knowledge that is valid within a certain local context (the laboratory or experimental station in this example) is transplanted directly into a different local context (an agricultural region, for example) there are bound to be problems. Scientific knowledge too is a form of local knowledge.

One important aspect of such local specificity is connected with my second point; namely, the fact that neutral truths do not exist. This has to do with the fact that a particular research initiative is usually brought about by a particular issue. The question of whether there is a link between the presence of Rhizobium and crop growth is not at all a neutral one, but arises from a certain problem perception and is therefore linked to social aims. It is not a question that is likely to be brought up by the fertilizer industry but it is likely to be asked by organic farmers and development organisations. And if questions are not neutral, then the answers will not be either. Answers are used by people as ‘weapons’ in a ‘struggle’ with other interests; so it matters which questions scientists try to formulate answers to, and for which ones they do not.

In a nutshell, scientists have to realise that their knowledge has a local character and is not neutral. In connection with this Alroe & Kristensen (2002) argue for a ‘reflexively objective science’ in which scientists not only realise this but make it explicit and transparent. In other words, scientists should be expected to open up the hidden dimensions of their own research questions and knowledge to discussion. Such transparency does not mean that scientists will become politicians. The opposite is true, in fact. When scientists are clear about underlying social values and goals it can only become more obvious that conflicts of interest cannot be settled by scientists and that it is up to societal stakeholders, authorities and politicians to judge the value of the different viewpoints and to make decisions.

**Working across disciplinary boundaries**

The foregoing is also connected with the manner in which co-operation between social and natural scientists can take shape. The essential point here in my opinion, is that natural and social scientists influence and refine one another’s assumptions, research questions and action plans. In other words, it is about putting the most relevant non-neutral questions on the agenda. These can also be very ‘fundamental’ questions. One example of such mutual influencing can be taken from the ‘Convergence of Sciences’ project in which nine doctoral students are being guided by both natural and social scientists from Wageningen University and universities in Ghana and Benin.

In an initial investigative stage of this project, the researchers in Ghana came across a complex crop-rotation system in which farmers attributed soil-fertility enhancing properties to a certain variety of cassava. This was interesting, because it ran directly counter to the accepted theory that cassava actually exhausts the soil. Doctoral student Samuel Adjei Nsiah set out to examine this system in greater depth and, where possible, improve it. Spurred on by his interest in the social aspects of this innovation, he eventually discovered that the rotation system is mainly applied by the native population of the area and not by the migrants who come from the north of
Ghana. The latter are aware of the system but usually cannot apply it because they own no land and the locals will only agree to short-term leasing contracts. The latter, then, is associated with specific attitudes to money, inflation, the land tenure system, mutual distrust and with the role played by the local authorities (Adjei Nsiah et al., forthcoming). This example illustrates once again that diversity within communities is an important subject (Van der Ploeg, 1994; Hebinck & Ruben, 1998). We can also see that - from the point of view of the migrants- there is little advantage to be gained if the natural scientists concentrate solely on the further development of the multi-year rotation system, at least as long as nothing changes regarding the issue of contracts between landowners and tenants. It would, perhaps, be more useful to search together with the migrants for single-year intercropping systems that would have an immediate effect on soil fertility. Furthermore, based on the insights gained, social scientific research could be directed towards bringing about a better understanding of the dilemmas faced by the native population and the migrants with reference to land use and leasing contracts, and towards identifying and mobilising, bringing together actors and institutions that could help break the deadlock.

Such fine-tuning of natural and social science research questions is far from standard practice. For a broader application, new organisational forms, methods and tools for ‘beta/gamma science’ (Röling, 2000) are essential. There is still scope for immense progress in this area.

5. By means of conclusion: issues for research and education

What is the significance of the foregoing to future research and education in Communication and Innovation Studies?

Research themes

Over the coming years, socio-technical innovation processes and the role of communication therein will be a prominent theme in our research group. It is a research orientation that is useful not only in the area of rural development and sustainability but also in that of, for example, health promotion and agricultural chain management. Five interconnected research topics stand out:

1) The construction of (in)coherence: We have seen that innovation is about the achieving of effective co-ordination in a network of people, technical devices and natural phenomena. All this in the form of a coherent whole of new technical and social-organisational arrangements. In order to arrive at this kind of co-ordination and coherence, it is essential that different forms, kinds and sources of cognition be connected together in a social learning and negotiation process. It is important for our field that we begin to better understand how such connections come into existence, or do not, and what the role of communication is in all this. One approach to researching this is to zoom in on the moments in innovation processes at which certain breakthroughs, changes in direction and selections occur, respectively on the moments at which the process stagnates. Looking back on episodes in which 'in retrospect' things ‘went awry’ is also of interest. On the basis of a better understanding of these kinds of situations, new focus points for process facilitation can be formulated as well.

Within this theme the value and influence of different communicative tools can be studied in connection with the ways in which they are used. Interesting tools here include, for example, methods for explicating knowledge, methods for demand articulation, and explorative techniques, including also model-based explorations (Rossing et al., 1999).

2) Beta/gamma interaction: A second theme, which can be viewed as a special subject within the first, is the interaction between natural and social scientists, and also the relationship between beta and gamma knowledge. We must not only practise beta/gamma co-operation but, as a university department, we must also study it! How do processes of beta/gamma interaction and communication evolve in an innovation context, and why do things happen in this way? To what effect? What is the value of specific communicative techniques? This dual interest can be somewhat of a dilemma. On the one hand, we are often expected to contribute to the shaping of beta/gamma interaction and interactive processes, and even to play an active facilitating role. On the other hand, our desire to engage in critical reflection, analysis and theory formulation regarding such processes, necessitates not only active involvement but also a certain amount of critical distance. In my
opinion, we should certainly contribute to design of processes, but should leave the actual facilitation to others, for example, the department's graduates.

(3) The influence of the ‘knowledge market’ and other institutions. One of the main themes of this article has been that communication on behalf of innovation is influenced not only by the backgrounds of the societal stakeholders involved but also by the manner in which intervention is integrated into organisational, administrative and/or financial structures. Such institutional influences, therefore, form a third research theme, within which I would like to emphasise the manner in which the rise of a ‘knowledge market’ influences the course of innovation processes in the public domain. Comparisons with similar innovation processes in different institutional contexts could be an interesting research approach in this area.

(4) Alternation between ‘top-down’ and ‘bottom-up’. A fourth research theme concerns the alternation between ‘top-down’ and ‘bottom-up’ moments and interventions in socio-technical transformation processes. How do these two kinds of strategies affect one another in practice? How does this influence different kinds of innovation processes in a positive or negative way? And what patterns of alternation are more and less useful? This theme is also closely linked to the question of the ways in which the processes of network building, social learning and negotiation are (or can be) interwoven. Here too the issue of more and less productive forms of interaction is of interest.

(5) A methodology for process monitoring. Within the framework of methodology development, I would like to propose process monitoring as the fifth research topic. When we assume that processes are impossible to pre-plan in any useful manner, then this implies, among other things, that participants and process facilitators need to keep a constant eye on how processes evolve, and need to be able to respond to emergent developments. But because much of what is happening occurs, by definition, behind the scenes, the question of how process facilitators and participants can get a clearer insight into it is important. The development of a feasible approach and methodology for monitoring the course of learning and negotiation processes is, therefore, of interest.

For the study of the subjects mentioned above, it is important to develop approaches to research through which innovation processes - that is to say, processes of network building, social learning and negotiation - can be followed and documented over time and compared with one another.

Developing a new kind of professional

In view of the developments in our thinking about communication, innovation and the relations between these phenomena, it is clear that we need to move beyond the classical ‘extension professional’, whose work was mainly in the area of knowledge transfer, persuasion, providing individual advice and supporting horizontal knowledge exchange. Although such areas of activity can still be relevant for purposes of stimulating innovation, they need to be complemented by the provision of other key communicative services which are not traditionally associated with ‘extension’. Such services include the facilitation of network building, multi-stakeholder learning and conflict management which constitute key processes for arriving at new (and coherent) technical and social-organisational arrangements. Thus, we need to train people to build bridges, people who can mobilise and link the expertise of natural scientists, social scientists and societal stakeholders, and who can communicatively support complex multi-actor processes in order to enhance opportunities for arriving at new patterns of coordinated action. Clearly, this requires analytical and practical competencies that deviate considerably from those with whom classical ‘extensionists’ were equipped. At Wageningen University, the MSc programme ‘Management of Agro-ecological Knowledge and Social Change’ (MAKS) is especially tailored to develop such competencies.
References


Alroe, H & E.S. Kristensen (2002), Towards a Systemic Research Methodology in Agriculture: Rethinking the Role of Values in Science. Agriculture and Human Values, 19, 3-23.


Note

* This article is a slightly modified and shortened version of the inaugural lecture given by the author on the 24th of April 2003 on the occasion of his accession to the post of professor of Communication and Innovation Studies at Wageningen University. The author wishes to thank Dr. Noelle Aarts for her invaluable comments on earlier versions of this speech.

1 Neither does it work in the case of advice given in connection with restrictive policies, which are quite common in the public arena. For example, with regard to the mineral management policy, there is a lack of active demand for knowledge on the part of farmers, which forms a serious obstacle to the achievement of a ‘demand-oriented’ market (Katz, 2002; De Grip et al., 2003).
Core Competencies: A Systems Approach for Training and Organizational Development in Extension

Richard T. Liles

The authors present a rationale for developing core competencies for training and organizational development in extension. Core competencies are defined as “the basic knowledge, attitudes, skills, and observable behaviors that lead to excellence in the workplace.” Competency-based models can be used to create an infrastructure that promotes innovation and continuous learning in every dimension of an extension organization. Competency models are designed around the skills individuals and groups need to be effective now and in the future. Competencies must be tied directly to the mission and strategic issues of the organization. A ten-step model is offered for identifying, validating and developing core competencies for an extension training and organizational development system. The seven core competencies developed by North Carolina Cooperative Extension using this process are defined. These competencies are being used or adapted by several states in the Southern Extension Region of the United States, and extension organizations throughout the United States are beginning to develop competency-based models for training and development. Illustrations of the application of the core competencies in North Carolina are provided along with preliminary qualitative evidence of the impact of this approach.

*J Agr Educ Ext (2004, 10, 2, pp 77-82)*

Introduction

In order to function successfully in the context of a multi-functional agriculture, extension educators must be technically competent in the various disciplines related to agriculture and highly competent as educational practitioners. A strong system for training and organizational development is essential to ensure that extension educators develop programs that are technically sound, conveniently delivered, economically valuable and customer focused. By developing a set of core competencies for extension educators and incorporating those competencies into a training and organizational development system, the capacity of an extension organization to better serve its customers can be enhanced and sustained. The process for developing core competencies must be highly participatory. It must enable extension employees and volunteers to continuously identify and validate the knowledge, skills, and observable behaviors that are needed to achieve professional excellence. Competency-based models and the process used to continuously update and validate such models must foster an organizational environment of continuous growth and improvement. Extension employees can assume responsibility for their own professional development and become lifelong, self-directed learners. In such a system the organization must provide support for learning and offer incentives and rewards for excellence in the workplace.

Purpose and Objectives

In this paper the authors present a rationale for developing core competencies and a systems approach for training and organizational development in extension. They propose a ten-step model for identifying, validating and developing core competencies for an extension training and organizational development system. They define the seven core competencies developed by North Carolina Cooperative Extension using the ten-step model. In addition, they provide case examples of how the model has been used in North Carolina along with qualitative examples of positive impact.
Theoretical Base

Malcolm S. Knowles (1980), long recognized as a leading authority in adult education in the United States, offers a rationale for using a competency-based approach in designing learning experiences. Dr. Knowles argues that the learner and the teacher should collaborate in determining what should be taught. Research conducted by Knowles within a span of over 40 years concludes that when learners are actively involved in identifying the competencies to be taught, the learners feel a strong ownership for the content; and consequently, the learners are motivated to participate actively in the learning process. Such learning tends to be self-directed with the learners taking responsibility for their own learning and ultimately becoming lifelong learners. After the competencies have been identified, Knowles indicates that the learners should be involved actively in diagnosing their skill or knowledge level for each competency. The idea here is that learners need individualized learning plans especially designed for their unique situations; in other words, “one size does not fit all.” If a learner is determined to be at a satisfactory level of competence on a core competency, no immediate training or learning experience is required. After learners assess their level of competency on each core competency, they develop learning plans to achieve the desired level of expertise. In summary, Knowles concludes that the involvement of the learner in the identification of the learning content or competencies and the immersion of the learner in the teaching and learning process results in a highly motivated and self-directed learner.

Renowned educator, author and researcher Ralph Tyler (1971) suggested three sources of content for educational programs. The first source of content is the felt needs of the learner. The assumption here is that learners have knowledge of what they need to know or be able to do in order to be successful. The second source of content is derived from studies of the current situation. This may include studies of contemporary society, the culture, the organization, or the social system in which the learner must operate. The third source of content is from research and experts in the field of practice. In summary, the three questions to be asked in determining what is to be learned or the core competencies are (1) what competencies do learners think are critical?, (2) what competencies do research studies indicate are critical?, and (3) what competencies do experts think are critical? All of these sources are legitimate and should be used in the determination of core competencies. Klemp (1999) urges educators to be selective in a number of competencies that compose an educational training curriculum. He indicates that the number of core competencies should be ten or fewer. This author suggests that competencies should be revised and reviewed periodically to reflect changes in organizational priorities, changes in the environment, and changes in the expertise needed for success in the future.

Based on her studies of a variety of organizations, including three Fortune 500 companies, Hodge (1999) reports that core competencies must be strategically derived and strategically aligned with the mission and goals of the organization in order to yield positive results in the workplace. Silvera (1999) defines competencies as “the skills, knowledge, and behaviors that describe successful performance.” He reports that competencies provide a mechanism for concentrating on developing in employees the skills, knowledge, and behaviors that will have the greatest positive impact on achieving individual and organizational success. A review of the literature indicates that the corporate sector has used competency-based approaches for training and development for over two generations. With a proven record of success in the corporate sector, it is logical that core competency approaches will be equally successful in nonprofit and governmental organizations.
Methods/Procedures and Data Sources

A training and organizational system including the core competencies determined to be critical to success in North Carolina Cooperative Extension was developed in 1999 by the Blue Ribbon Commission (BRC) for training and development. The North Carolina system is called the Personal and Organizational Development System (PODS). It is being developed and implemented in spite of severe budget constraints since January 2000. The BRC consisted of 21 members representing all job groups in North Carolina Cooperative Extension (NCCE). Over 800 employees of NCCE provided relevant input data and feedback. Members of the State Advisory Council (SAC) representing thousands of volunteers, customers, and other NCCE stakeholders were also involved in the process.

The BRC used a variety of quantitative and qualitative methods to analyze data; these included surveys, interviews, and focus groups. Peer institutions selected for study and collaboration were Iowa State University, Texas A&M University and Ohio State University. Experts from the two latter universities served as consultants to the BRC.

Training and development systems in the corporate sector were also examined. These included the Westinghouse Savannah River Company; AT&T; How Medica, Inc.; First Heritage of Canada; TransAmerica Life Company; Toyota Sales; Xerox Limited; Amoco Corporation; Scherring-Plough Corporation; and Partners Healthcare System, Inc.

Planning Process Steps

A ten-step visionary planning process was used for identifying, validating, and developing core competencies for extension educators; and for building a training and organizational development system based on those competencies. The model for identifying the competencies includes the following steps:

1. Conducting an environmental scan and examining internal and external forces impacting extension. The questions asked were: “What is working well within your extension organization?”; “What is working less well within your extension organization?”; and “What are current forces, both positive and negative, impacting your extension organization; and what are trends and forces, both positive and negative, that you think will impact your extension organization in the future?”

2. Collecting data on stakeholder/customer expectations and identifying the expertise (competencies) needed by extension educators for excellence in conducting extension programs. The questions asked at this step were: “What do you need and expect from extension workers?”; and “What knowledge, skills, or areas of expertise are essential for extension educators to provide for you the educational programs that you need?”

3. Establishing benchmarks for excellence and training and development systems by analyzing state-of-the-art training and development systems in exemplary governmental organizations and the corporate sector. At this stage members of the BRC selected a variety of universities, government organizations, and corporations, mentioned above, and studied and analyzed their training and development systems. In addition, several members of the BRC attended an international conference on competency-based learning and attended presentations delivered by experts on competency-based learning systems from around the world.

4. Identifying (with extension educators) core competencies which are the broad areas of knowledge, attitudes, and demonstrable skills for achieving excellence in planning, delivering, evaluating, and accounting for extension education programs. In this step the BRC used data collected from six job groups in extension. The question asked was, “What do you need to know or be able to do in order to achieve excellence in your job?” An analysis of these data revealed seven core competencies. An unexpected result was that all job groups identified the same seven competencies as essential core competencies.

5. Validating and refining core competencies by the six groups within extension by using external consultants and by studying the core competencies of peer institutions. At this
stage approximately 50 adjunct members of the BRC were identified, again representing six job groups. These adjunct members validated the core competencies and refined the definitions for each of the core competencies. It was found that many of the peer institutions, specifically Texas A&M University, had similar core competencies as North Carolina Cooperative Extension.

6. Developing subcompetencies with three levels of proficiency for each job group within the organization. At this stage the BRC adjunct members identified approximately three to seven subcompetencies, which more clearly defined the competencies for each of the seven identified. In addition, three levels of proficiency for each subcompetency were developed for each job group within the organization. This process continues with solicitation of input from over 800 members of the organization. Professional organizations within NCCE have also played a key role in developing the subcompetencies for the various job groups. At this time the subcompetencies and proficiencies for county extension directors is the most thoroughly developed framework.

7. Setting goals and developing action plans for integrating the core competencies into a sustainable training and development system. The BRC developed a long-range plan for introducing and implementing the core competency system into North Carolina Cooperative Extension. Although budget constraints have made it necessary to alter the timeline, the process continues.

8. Using a systems approach to implement organizational structures and a process for sustaining a competency-based training and development system. A special unit was established within NCCE for giving leadership to the implementation of the system. This unit, Personal and Organizational Development (POD), consists of four full-time training and organizational development professionals and two part-time professionals who are charged to give leadership to the system.

9. Developing and delivering a curriculum for training employees and volunteers in the core competencies, subcompetencies and proficiencies. At this time, diagnostic assessment tools for determining the level of proficiency in each competency have been developed for county extension directors. In addition a curriculum for training new and aspiring county extension directors has been developed and tested within a variety of delivery systems. The 2003 State Extension Conference was organized around the competency-based approach. Work is currently being done on developing a curriculum for extension agents, program assistants, specialists, secretaries, and volunteers.

10. Obtaining feedback on the effectiveness of a competency-based system, adjusting and refining the system as needed. Members of POD continue to collect data, both quantitative and qualitative, on the effectiveness of the system. Data from the six job groups on the success of the competency-based systems approach to training and development are continually being collected, analyzed, and used as a basis for adjusting the system.

Goals of the system are as follows:

1. To enable the recruiting, hiring, training, evaluating, and supporting of creative, motivated, and innovative cadre of faculty, staff and volunteers.

2. To provide learning opportunities that are responsive, accessible, applicable, and competency-based.

3. To encourage collaborative learning.

4. To empower individuals to pursue their own career goals and professional growth.

5. To enhance customer focus and organizational effectiveness.

6. To build individual and group accountability.

7. To build organizational commitment for a sustained learning system.

8. To continuously assess, monitor, validate, and refine competencies needed for individual and organizational excellence.
Results/Findings

The seven core competencies were identified by the BRC, validated by the adjunct members of the BRC, and are being continuously validated and refined throughout the organization. These were identified as critical to successful performance of all NCCE employees and volunteers:

1. Knowledge of the organization—an understanding of the history, philosophy, and contemporary nature of NCCE.

2. Technical subject-matter expertise—the mastery of a scientific discipline, a research body of knowledge or a technical proficiency that enhances individual and organizational effectiveness.

3. Programming—the ability to plan, design, implement, evaluate, and account for significant extension education programs that improve the quality of life for NCCE customers.

4. Professionalism—the demonstration of behaviors that reflect high levels of performance, a strong work ethic, a commitment to continuing education and to the mission and goals of NCCE.

5. Communications—the ability to effectively transfer and receive information.

6. Human Relations—the ability to successfully interact with diverse individuals and groups creating effective partnerships, networks, and dynamic human systems.

7. Leadership—the ability to positively influence a wide range of diverse individuals and groups.

Core Competencies

These seven core competencies were determined to be applicable to all job groups in NCCE. These job groups were: agents, specialists, administrators, support staff, program assistants/associates/technicians, and volunteers. The seven core competencies are consistent for each of the six job groups. However, subcompetencies and proficiencies vary; and it has been necessary to develop three levels of performance or proficiency for each subcompetency, which may be unique in some cases to a job group. Part of this work was presented as the initial phase of a continuing developmental process resulting in a set of core competencies, subcompetencies, and proficiencies for each of the major job groups within NCCE. Input from county extension faculty, state-level faculty, support staff, and volunteers throughout the organization has been ongoing. The content of the competency-based model is always presented as evolving; however, the current content represents the best available information on the knowledge, skills, and demonstrable behaviors essential to excellent performance on the job within extension organizations.

Conclusions/Implications

Recommendations/Educational Importance

The ten-step model for developing core competencies does not force change, but rather involves extension employees in the process of continuous and focused professional improvement. Employees are involved in every stage of the process and remain involved in an organizational system that fosters an atmosphere of individual growth and renewal.

Individual “buy-in” or ownership for competencies, subcompetencies and proficiencies is a product of continuous involvement. This involvement results in ownership of the content, the training program, and its outcomes. The basic premise of this participatory process can be summarized by what the authors call the “Principle of IOU.” The Principle of IOU is that Involvement Results in Ownership and Understanding. When the IOU Principle is applied, the results are a commitment to the outcomes and products of the process. This is proving to be true as the competency-based system is being introduced within NCCE. Some typical quotations from a recent training program for new and aspiring extension directors include the following:

“This was one of the most beneficial training experiences that I have ever attended. The course was well designed to meet the needs of anyone interested in learning the specific tasks and competencies necessary for an individual
considering this job. I highly recommend it as a prerequisite for anyone wishing to become a county extension director.” Another participant wrote, “This course should be a prerequisite for anyone wishing to become a county extension director. It will help them be more successful and avoid problems for them and for the organization.” Finally, a third participant wrote, “The time I spent with you and the rest of the participants in the past twelve months has been some of the most valuable experience that I have had in my twenty-year career with extension…the knowledge that I have gained from this program will serve me well in all aspects of my professional life.”

Competencies developed using this model are being used or adapted by states throughout the Southern Extension Region. A recent leadership program developed by Arkansas Cooperative Extension is a good example of the practical use of a competency-based system. There are clear implications for the application of this competency-based and systems approach to international extension organizations. Toward that end the authors recommend that research be conducted to answer a number of critical questions. Among these are: (1) Are competency-based systems approaches already in place in other international extension organizations? (2) Are core competencies universal for extension workers around the world? (3) Can technology allow web-based training systems to be used and shared by extension organizations on a global basis?

References


Reconsidering Graduate Programs for Students from Developing Countries

Larry E. Miller

This article examines issues related to graduate programs in agricultural and extension education for students from developing nations who are studying in developed countries. Implications are drawn for developing graduate programs that prepare individuals for their most likely career paths. Such programs may not be congruent given the current graduate programs in universities particularly with the present financial and political pressures on departments and faculty. How can professional associations enter into dialogue to assist in creating more relevant programs of study? *J Agr Educ Ext* (2004, 10, 2, pp 83-88)

**Introduction**

How well are universities in developed nations providing graduate education for students from developing nations? Some of the issues to be addressed in this article include examining the appropriateness of the graduate preparation model for the student from a developing country, the match between degree program content and the career expectations of graduates, the appropriateness of the research methods and statistical analysis preparation, the selection of research topics, and the time-to-degree expectations. The content of the paper is driven by issues which the discipline needs to address.

**Purpose**

The purpose of this article will be to present viewpoints on these issues and challenge institutions with graduate degree programs to consider the unique needs of the student from developing countries by addressing some pertinent questions. What will be the likely career path of graduates upon their return to their home country? How can a student best be prepared for these likely career paths and still assure the “high quality” program desired by the higher education institution? How can institutions best prepare flexible, well-rounded, learned individuals who are ready to adapt to the unique demands of their universities or agencies in developing countries? Many writers would note that future graduates must be lifelong learners, and be capable of higher order cognitive processes, decision-making, critical-thinking, and/or problem-solving. How relevant for the students’ dissertation/thesis research are the research problems adapted from adviser’s programmatic research programs? Are the concepts and methods learned from the research applicable in assisting the graduate to undertake a programmatic research agenda of their own at their home institutions/agencies? To what extent is the pressure applied to professors to procure grants and contracts forming the basis of research problems investigated by students? Should advisers encourage students to pursue their own research problems or expect students to pursue problems related to the professor’s research program? Do different levels of quality exist for the programs for domestic versus international students? Do international students have the same opportunities as domestic students to benefit from the informal learning and professional socialization that ought to be occurring in developing teaching experience and expertise though mentoring and reflection, doing outreach, writing grant proposals, establishing networks, attending professional meetings, supervising interns, or gaining practical experience — in the public schools, Extension offices, or related agencies? To what extent does the research problems investigated contribute to
the knowledge base for the country/region of student origin? To what extent should they? What are reasonable expectations for time-to-degree?

**Theoretical Base**

These issues and questions form the basis for attempting to stimulate professional discussion of how to best design relevant and rigorous graduate programs of high quality. The “data source” is over 30 years of experience in directing graduate study and interacting with those that do, and serving on numerous department, university and professional committees related to graduate education. Particular concerns exist about the quality of the research studies and the nature of the research questions investigated by international graduate students as observed in professional conferences and journals. Experience as editor of two journals in the profession, serving as a paper/article referee, and/or paper discussant at professional meetings has provided the author with insights into research that has and has not been published.

**Conclusions and Implications**

The agricultural and Extension education professorate need to address how relevant, appropriate, rigorous and transferable are the skills and abilities taught in graduate programs to the situations in which graduating students will find themselves in developing countries. Universities/agencies where graduates may find employment after graduation often have a different focus than those of the US Land-grant or European models. For those graduates who take jobs in universities, teaching is often the primary focus. Research, while expected of the persons in these positions, finds few resources available and limited financial support internal or external to the universities/agencies. Service activities, likewise, are often defined differently. Internal (department, college or university) service is expected but service as outreach to audiences external to the university/agency often has limited emphasis.

One approach to improving graduate programs for international students from developing countries might be to assure a broadened set of courses or learning experiences in the graduate programs to help prepare graduates for future roles. Such a strategy may necessitate taking courses outside the home department, beyond the typical minors or cognate areas, but this is often in conflict with the way departments now receive their funding for instruction because it is beneficial to the department if students take courses from their home department. Therefore, departments often try to keep their course sections full, enrollments high, and benefit from higher instructional subsidies rather than advise students to take courses from other departments that might be particularly beneficial to their future careers. Such funding strategies in universities do not encourage innovation in student program planning to broaden the learning experiences.

International students who wish to pursue advanced degrees in technical agriculture disciplines often find similar dilemmas. Their adviser may be involved in basic research, such as creating GMO’s, using a laboratory costing millions of dollars and a high daily operating budget. The adviser desires that all graduate students contribute to his/her programmatic research program, after all, they are under pressure to publish and many “milk” the graduate students for as many papers and articles as they can. Graduate students from developing countries may find that the expertise learned in the aforementioned laboratory, during the completion of a dissertation, has little applicability to the research program they can conduct in their home country where such costly laboratories or research programs are not feasible to develop or maintain. The student finds little support in suggesting that a research problem that is more nearly applicable to his or her home country would be suitable for a thesis/dissertation. Advisers argue that anything less than “cutting-edge-inquiry” constitutes a “watered-down” degree program for the student. Is there a common ground that can accommodate the needs of the graduate student (Miller & Ng, 1994)? A similar analogy might also be drawn for some research in agricultural and Extension education.

Several universities have conducted internal follow-up (tracking) studies of graduates to examine their professional career paths following graduation. They have often found that many of them are in administrative and supervisory roles...
soon after they graduate. However, course work in administration, supervision and leadership are seldom a part of their degree programs. Would further investigations, across graduate institutions, accumulate evidence that might permit all in the profession to develop more appropriate degree programs to prepare future leaders in administration and supervision?

Similarly, most graduates who enter positions in higher education upon graduation will find themselves in teaching roles. How many of these graduates have had the experience of teaching in higher education during their degree programs? How many are given mentoring experiences to learn now to teach with “master teachers” at university level so that they are exceptionally effective teachers when they return to their home countries? As newly employed instructors/professors, they are often laden with the heaviest teaching loads in a department. Often, the courses assigned to them to teach may be the courses no other professor desires to teach. Further, the enrollment in these courses may be very large. How many graduates have had preparation in “teaching difficult courses” or in “effectively teaching large enrollment courses?” How many have actually been taught how to teach?

Graduate Teaching Associate (GTA) support has typically been limited for the international graduate students who do not have Extension or experience in teaching agricultural education at secondary level in the U.S. Some are fortunate enough to obtain a Graduate Research Associateship (GRA). However, with increases in student stipends and tuition fee waivers, faculty with funded projects can now hire a full-time research scientist cheaper than a GRA in many U.S. universities. At my institution rising costs of tuition waivers and escalating health care costs are expected to elevate GTA/GRA costs another 15% for the next academic year. Eventually, this will mean that few GRA positions will be available to either domestic or international students. Further, in the U.S., many universities offering agriculture are publicly state supported universities and the tax-payers are often vocal about providing support to students from their own state and not those from other countries or even other states. The GTA/GRA member who is an international student and who returns to his or her home country after receiving thousands of dollars of support provided by the tax-payers of the state is viewed as not contributing to the state economy to the same extent as someone remaining in the state would.

The content of what is taught in agriculture colleges in developing countries is also changing. One report from, Africa, for example, indicated that BS graduates should have characteristics including initiative, creativity, integrity, adaptability, flexibility, commitment, teamwork, good listeners, self-confidence, self-motivation, independence, be effective communicators, the ability to make decisions and the ability to be socially and environmentally aware. To what extent are graduate programs preparing professionals capable of instilling these characteristics in their students?

The issues about how to prepare graduates to do research is not merely a paradigm debate (paradigm war), as some might purport. Quantitative and qualitative research both have contributions to make. What drives good research are important questions and not method! The most important question in assessing research may be “So what?” Or, does the research ask important questions that provide useful answers. Preparing graduates capable of conducting more applied, pragmatic research, as contrasted with theoretical research, may be important. Using Habermas’ Interest Constitution Theory (1972), researchers investigate interactions of (1) man-nature: positivism, empiricism, functionalists, (2) man-man: communicative interaction, practical understanding, interpretive science, hermeneutics, or (3) man-self: emancipatory, authority, power, freedom, radical/critical science [sic]. Agricultural and Extension educators conduct few studies to try to understand nature but are almost evangelistic about research in communicative interaction or the emancipation of people (Miller, 2003). How well are we preparing our graduates for inquiry in the latter two areas? Most of the professorate, including myself, were prepared in quantitative methods and have had little preparation in interpretive or critical science. I advocate, for current and future graduate students, a balanced preparation program in research with each graduate well-versed in quantitative method and possessing familiarity with other ways of knowing; that is, competence in interpretive or critical science. If
breadth and depth cannot be achieved within each individual, then using departments as the unit of analysis might be appropriate; that is, assuring that a balance of research expertise exists within the faculty of a department. However, this may be particularly difficult to achieve by departments in developing countries where the hiring decisions are often driven by subject-matter teaching needs, more than research-expertise-needs, and even politics or nepotism often comes into play — not what you know, but who you know can determine who is employed.

Further, preparing graduates capable of interdisciplinary research will be essential in the decades ahead. Practical, field-based problems do not nicely fit disciplines or university academic departments. Successful researchers of the future will need to be able to navigate the competitive waters of procuring funding where the agencies desire investigation of complex problems requiring interdisciplinary/multi-disciplinary/inter-institutional/inter-agency and/or multiple-method lenses (Miller, 1991).

The extent to which the love of conducting and sharing research can be developed in graduates will, to a large extent, define their future pursuit of research, often under difficult conditions, by our graduates from developing countries. If graduates see research as laborious and despise doing it, then they are not likely to conduct research or add to the knowledge of the discipline. The experience of thirty years in this profession has often led to frustrations with the faculty who teach research methods and statistics and who seem to purposefully want to make their content appear confusing so they can maintain the illusion that they have the corner on some body of knowledge that is inaccessible to the rest of us, that only they can really understand the content, and that there is some magical perspectives they possess that the students cannot grasp. Too many students see the study of research methods (no matter what the paradigm) as the most onerous part of their degree program. Exit interviews with graduate students have often indicated that “research” was just something they “suffered through” in order to obtain their degree and is highly despised. Research is creating new knowledge. Creating new knowledge to improve the quality of individuals’ lives can be an exciting, invigorating and satisfying dimension of one’s lifelong professional contribution.

While I have never had problems spelling “higher education” as “hire education”, that is to say, there is a vocational dimension to doctoral study; many rewards await those who can walk the profession “down the road to knowing.” Let us purposefully make the conduct of research fun and encourage students to love the creation of new knowledge. Research is not conducted just to have papers to present at research conferences or to generate journal articles for promotion and tenure, but for a deeper motive. At the end of their career, will they be able to say “I made a difference?”

I suggest that institutions, that have graduate programs, have an ethical responsibility to prepare individuals who are capable of succeeding in universities or agencies in developing countries where the political, economic and social milieu may be greatly at variance with the model in which they studied. Current graduate programs do not necessarily fulfill this expectation. I call for the profession to conduct further research on the needs of these students and develop strategies to better prepare graduates. Professional associations can charge special task forces or committees to investigate these issues or conduct national or international seminars on these topics. The time is right to examine the existing paradigm of graduate education. The profession must prepare future scholars (Miller & Sandmann, 1998) and not just researchers.

What is the average time-to-degree for a Ph D student in your program who enters with an MS in the discipline? While degree expectations vary, I was shocked to learn the data for my institution. Ethical questions may emerge about whether or not students are being delayed so they can add to the list of publications of the adviser and/or whether students are being delayed to generate credit hours.

Contributions to knowledge resulting from thesis/dissertations might best serve the students if the studies were conducted about problems from their home country. For example, if an adviser has a doctoral student from Malaysia, studying for a Ph D with support from Malaysia; would it not seem to be ethically appropriate for the problem identified for research to have relevance for Malaysia, perhaps with data...
collected in Malaysia, and have practical implications for adding to knowledge or improving practice in Malaysia? When that student returns home to Malaysia, takes a job in a university or other agency, and begins a research program, the dissertation can be the beginning of making a professional programmatic research program and reputation for the student and provide a basis for further funding or research.

Implications

The implications of an improved graduate education program are many. While the examples have explicitly been drawn from the U.S., colleagues in universities in other graduate institutions from Europe or Asia and other nations should also take heed. With improved programs of study, graduates could be better teachers and scholars. Graduates could be better researchers, asking more important questions, ready to address questions with new lenses, and ready to work with interdisciplinary teams. Graduates will be better able to be of service to their agency, or department, college, university, profession, country and the world. They can be scholars and not just researchers, and they can be contributors to the professional knowledge base … they can “make a difference.”

References Cited

Introduction

As land-use claims increase in not only Europe but elsewhere in the world as well, whilst at the same time the amount of rural space available is on the decline, the need for a more integrated approach to agricultural production and the development of rural areas becomes more apparent than ever. Integrated Rural Development (IRD), is an emerging concept or theme in agricultural reform in theory, policy and practice. The objective of IRD is to raise the level of economic performance in all sectors of the rural economy, to promote the shaping of viable rural communities, to maintain indigenous cultures, to protect the environment and to conserve the natural features and appearance of the landscape (Wals, et. al, 2004). The EU has been developing its policy for rural development laying stress on an integrated approach, simplification and sustainability. These developments present exciting challenges and obligations for agricultural and forestry education sectors which have a mission to help rural society grow and develop, and to provide the new skills, competencies and knowledge conducive to such development. A key question addressed in this article is: How does the increased pressure for expertise in IRD translate itself into the demand for educational services and the design of appropriate curricula on a European-wide basis? This article examines these issues and generates a number of stepping stones for the development of Education and Training for Integrated Rural Development (ETIRD) in tertiary education, based on a two-year inter-institutional curriculum development project carried out under the umbrella of the AFANet.

Research objectives

The overall aim of the ETIRD research project was to explore, outline and develop communication, education & training strategies which are sensitive to and build upon both universal (i.e. European) and contextual (i.e. local or regional) conceptions of IRD. The project team was composed of six experts in either rural development or curriculum development or both and represented higher education institutions in four European countries (Denmark, Italy, Malta, the Netherlands, and the United Kingdom). The objectives of the project, as identified by these experts, were:

1. to make an inventory of current curriculum responses to changes in rural land use within European Institutions for Higher Agricultural Education,
2. to investigate Communication, Education and Training (CE&T) programmes that are suitable for developing notions of IRD among students,
that is, problem-based learning, (soft) systems thinking, interdisciplinary learning, social learning,

3. to describe four case studies of CE&T programmes for IRD in Europe (focusing on learning goals, learning and instruction methods, contents and learning outcomes),

4. to share and reflect on the experiences participants in the network have had so far with alternative learning and instruction methods for teaching and learning for IRD, and

5. to generate general guidelines for the development of CE&T programmes for IRD in Europe, complemented with examples of the contextual application of these guidelines.

In this article we will briefly touch upon the first four objectives and will then elaborate on the results related to objective five.

Research method

In order to realise the objectives listed above, a research cycle was designed that contained five key elements, which will be discussed briefly (Figure 1).

The first phase of the research consisted of an open exploration of different conceptualisations of IRD and curricular responses to IRD in Europe by the members of the AFANet Team, followed by an inventory of existing ETIRD courses and programmes. This inventory was conducted using an on-line survey and the AFANet database of institutions active in higher agricultural education. The second and third phases consisted of the development and comparison of four case studies of institutions that were selected as being of potential interest to others due to their innovative approach to ETIRD. The cases were selected on the basis of the outcomes of phase one. Phase four consisted of the generation of, so-called, stepping-stones for conceptualising IRD and appropriate curricular responses. In phase five the original conceptualisations of ETIRD were revisited in order to understand how they changed as a result of the research. The research itself can be viewed as a learning cycle.

Inventory of current practice

In the first phase (inventory phase) of the research a link to an on-line survey of rural development education and training programs was sent to just over 200 people working at agricultural universities or colleges in areas related to rural development. The main purpose of the survey was to explore, outline and develop communication, education and training strategies which are sensitive to and build upon universal (i.e. European) and contextual (i.e. local or regional) conceptions of rural development. The complete survey can be found on www.afanet.info

In the end eighty-two people participated in the survey of which 78 represented institutions based in Europe, two institutions based in Africa and two institutions based in North America. Here is a summary of the main results of the survey:

– All respondents considered rural development education as an interdisciplinary field;
– More than 2/3 of the institutions represented by the respondents created web-sites providing more information about their institution and the specific programmes taught;
– Most participants in the survey were highly ranked within their institutions;
– About 1/3 of the institutions involved taught rural development as a separate course or module;
– Many (2/3) respondents expressed their willingness to participate actively in the development of case studies of exemplary ETIRD in the next phases of the research.

The sometimes elaborate answers to the open-ended questions, formed the basis for discussion about the goals, content and process of ETIRD and the basis for selecting the four cases that would be developed in the second phase (in-depth investigation phase) of the research. Based on the respondents’ input to each question, institutions represented by those who answered most or all questions were identified as potential case-study institutions. In order to narrow down the total number of potential case studies selection criteria were used. Inputs were chosen if they provided:

– a clear and detailed description of their learning goals,
– a clear and detailed description of their teaching approach,
– an in-depth description of their perspective on
Based on these criteria, 28 short institutional profiles were generated. These profiles helped the team decide what institutions to select for more in-depth investigation. Box 1 contains an example of such a short institutional profile. More short profiles can be found in Wals et al., 2004.

Box 1: Sample institutional profile based on the on-line survey

**Institution:** Agriculture University of Athens  
**Country:** Greece  
**Course name:** Agricultural and Rural Development

**Learning Goals**
Students have to acquire a broad spectrum of issues related to rural development. Therefore after the first three years (6 semesters) of subjects relating to various disciplinary aspects of agriculture (including: Political Economy, Microeconomics, Introduction to Agricultural Economics, Rural Sociology, Macroeconomics, Applied Economic Statistics, Agricultural Production Economics, and Mathematics of Finance), a wide range of more interdisciplinary courses is provided, such as: Agricultural Policy, Farm Management, Comparative Agriculture, Quantitative Methods in Economic Analysis, Agricultural Marketing, Analysis of the Pricing of Agricultural Products, Agricultural Credit and Finance, Agricultural Education, Agricultural Extension, Agricultural and Rural Development: Theory and Policy, Methods in Agricultural Economics and Social Research, Cooperative Economics, Agro-environmental Policies, Economics of European Integration, Assessment of Agricultural Investments etc. Furthermore, students have to submit a thesis (10th semester). Therefore, students are provided with knowledge relating to the economic, social and environmental dimensions of rural development along with solid knowledge concerning technical aspects of agronomic education and training. The overall aim of the Department concerns the provision of knowledge which, in turn, will allow the students to become capable professionals in the field of sustainable development in rural areas while taking into account the broader framework, i.e. European Integration as well as the world-wide developments concerning the agro-industrial and market conditions.

**Teaching approach**
In brief, a process-oriented curriculum is needed. The approach has to be systemic/ holistic globally-oriented, and interdisciplinary, involving elements such as learning through action, team work in small groups, learning for an open mind and careful facilitation. Thus, education has to involve elements of creative education like inquiry, discussion, planning, co-operation and appropriate action. Group-work is necessary as it advances communication skills, reinforces the importance of citizen participation, creates meaningful learning situations for students, utilises the interests, creativity, and curiosity of students as it does with controversy which is thus turned to a source of conceptual change. This way, learning is the continuous process of conceptual change and central to this is helping students to advance their learning strategies. Within such a context teachers are to be viewed as facilitators and co-learners. They facilitate learning by providing learning experiences that induce change through debate and dialogue. Teachers have to have the qualities of ‘transformative intellectuals’.

**Understanding of Rural Development**
It means a new paradigm for rural development taking into account the socio-cultural, economic and environmental aspects. The overall aim has to be the close examination of the dynamic balance among many factors such as political, technological, economic, ethical, cultural and environmental. Nowadays, rural development represents a ‘way out’ of the limitations and lack of prospects intrinsic to the modernisation paradigm and the accelerated scale-enlargement and industrialisation it entails. This new paradigm is of a multi-level, multi-actor and multi-facetted nature. In this context the farming/rural systems approaches have to be utilised in order to understand the multiple dimensions and possible synergies (as well as the negative feedback). Within the framework of rural development new forms and mechanisms for co-ordination and conflict management must be developed; methodologies have to be of a participatory nature.
The results of the inventory show a number of common patterns. In terms of the descriptions of the learning goals, most respondents emphasise the promotion of a systemic or broad view, and the ability to act and think out of ‘the disciplinary box’ in a more holistic or integrated way. Furthermore, many stress the importance of communication skills and the ability to put oneself in the position of others in an understanding and empathic way. Another learning goal that runs through many of the responses, is that of critical thinking and the ability to critically follow trends in policy-making, society (shifting consumer needs) and farming. Finally, a number of additional competencies are mentioned, including, project management, creative thinking and working in (interdisciplinary) teams.

When looking at the teaching approaches that are favoured by the respondents we again see more similarities than differences. Most stress interactive forms of teaching and learning such as: action learning, workshop-based learning, process-based learning, and hands-on, experiential learning, all referring to learning that supports the creation of a meaningful synthesis between theory and practice and the relevant disciplines.

As far as the respondents’ understanding of IRD a common pattern of triple P (Planet, People, Profit) and triple E (Equity, Environment, Efficiency) oriented views of rural development emerges. All seem to call for a more systemic view of rural development involving multiple time scales, multiple stakeholders and sectors and multiple values.

All respondents are involved in very concrete teaching and learning activities – some by means of a special course or module, some by means of a special degree and some by means of regular courses that seek to include some of the aspects listed above. The case-study component of this research was designed to explore good practice in-depth and, in a way, to worthwhile to check how these lofty intentions manifest themselves in practice. In the next section we will highlight the four cases that were selected for further in-depth analysis.

In-depth case studies

According to Yin (1988, p82) case studies allow a researcher to ‘reveal the multiplicity of factors [which] have interacted to produce the unique character of the entity that is the subject of study’. It is a method of learning about a complex instance through description and contextual analysis. The result is a description and theorizing about why the instance occurred as it did, and what may be important to explore in similar situations. A case study:

*investigates a contemporary phenomenon within its real-life context; when the boundaries between the phenomenon and context are not clearly evident; and in which multiple sources of evidence are used.* (Yin, 1989, p 23)

Case-study methodology, therefore, is an appropriate research tool to the incorporation of IRD in agricultural education. The case-study approach allows the researcher to experience phenomena in their context, to learn what works and what does not. An important feature of case-study research is its flexible and adaptive nature.

The members of the ETIRD research group took a closer look at the 28 institutions which not only provided sufficient information for generating an institutional profile (box 1), but also expressed willingness to participate in the in-depth investigation phase of the research. They did so by studying submitted documents and the web-links they provided. Each of the core-group members got an opportunity to express his preference for certain institutes for further exploration and analysis. It was decided that a good geographical distribution was important to allow for possible regional differences to emerge. As a result, the team looked for one institution from the South of Europe, one from the North of Europe, one from Eastern-central Europe and one from Western Europe. Using the criteria from the on-line survey results, in combination with the personal knowledge of the individual core-group members of the various institutions, the following cases were selected:

- University College Dublin (Ireland),
- University della Tuscia-Viterbo (Italy),
- University of Córdoba (Spain), and
- the Czech University of Agriculture Prague (Czech Republic).
These four institutions were visited by one of the working-group members for a two-day period during which a number of people were interviewed about the program (instructors, students and administrators). The site visits resulted in four cases, which were validated by those who were interviewed.

A list of guiding questions for case-study development was generated that were divided in six categories based on work carried out on sustainability in higher education (Corcoran et al. 2004): ideology, programme drivers, responsiveness, institutional linkages, access and pedagogy. The categories and their questions have been listed in Table 1. ‘Programme’ here refers to a combination of courses and or modules that, depending on the situation, may or may not constitute a degree.

### A. Ideology (values/ethics)
- Is the programme’s ideology explicit or not?
- Is the programme needs based?
- What is the balance between cognitive and affective objectives?
- Are sustainability issues coupled with issues about responsibility?

### B. Programme drivers
- What is the programme’s ideology?
- Who/what are the programme’s drivers (market, client, beneficiaries)?
- From where do funds for the programme come from?
- What is the policy of the programme?
- How does the programme address the needs of the individual/people?
- What RD needs are addressed by the programme?

### C. Responsiveness
- Does the programme respond to learners’ needs?
- Does the programme respond to employers’ needs?
- Does the programme respond to the needs of those interacting with the learners?
- Is peer opinion about the programme sought and valued?
- Does the programme give space for critical reflection?
- How is quality assurance carried out?
- Is programme evaluation formative or summative?

### D. Institutional linkages
- Is the programme linked to other learning initiatives?
- Is learning driven by links to networks and/or NGOs?
- Did curriculum development involve any partners?
- Is there evidence of any networking activity on an academic level? on a local level? on a global level?
- How does the programme fit in within the overall institution’s educational framework?

### E. Access
- Is the programme flexible to respond to different learning styles?
- Does the programme have flexible entry/exit points?
- Does the programme offer distance-learning opportunities?
- Does the programme offer opportunities for part-time learning?
- Does the programme cater prepare learners for lifelong learning?

### F. Pedagogy
- Does the programme promote active learning?
- Does the programme address equity/ethical issues?
- Are the learning experiences presented problem based/experiential?
- Is the approach adopted systemic/holistic, hence promoting system thinking and system practice?
The research team decided that the case studies did not need to be structured identically and that it would be unlikely that all of the questions raised above would be tackled but that, to allow for some kind of analysis and comparison, they should at least touch upon the following:

- Personal history of the programme co-ordinator/developer;
- History of the development of the programme (how it evolved, barriers encountered, how the barriers were resolved, any partnerships);
- The ethos of the programme (what is special about the programme, is there any competition with other programmes);
- The target audience (a brief bio of a typical learner) and the number of learners attending the programme;
- Level of education and entry requirements;
- Aims and objectives of course, module and/or degree (depending on the situation);
- Curriculum plan: main areas addressed, assessment methods adopted, interface with outside organisations/institutions);
- Learner evaluation of the programme;
- Programme evaluation by the programme co-ordinator;
- Plans for future development of the programme.

For the purpose of this article we have distilled the main conclusions of the analysis of the four case studies (for full-fledged descriptions of the four case studies see: Wals et al., 2004). What is presented here can be viewed as a meta-analysis of the four case studies.

### Results

One of the key observations the four cases seem to share is that highly motivated and dedicated people are the main driving force in curriculum change. They are engaged in such change for a number of reasons, but a key one is the desire to educate graduates who can work in the new, more sustainable, post-productivist rural economies. There are important differences of a personal nature (epistemological vantage point, personal values, personal experiences and social networks), and of more contextual nature (rural history of the region, rural policy, local economic outlook and trends, links or lack thereof between tertiary education and the rural communities), that lead to different institutional responses to the challenge of designing education for IRD.

There are also differences in the way ‘change’ is conceptualised by the various actors involved in curriculum response to a changing world. Some lean towards a radical transformation of ideology of teaching and learning and equate ‘integration’ with the inclusion of systemic thinking, holism and transformative learning. Others, perhaps more pragmatically, opt for a more adaptive and conservative approach and prefer to renew existing course, improve links with the community and integrate emerging concepts, while discarding old ones that have become fruitless. In the four cases, but also in the responses to the on-line survey, a whole range of approaches to teaching and learning can be found, often closely related to a particular view.
of what constitutes ‘knowledge’, ‘research’ and ‘curriculum’. Some stress the importance of preparing students to be competent and skilful workers with a healthy work ethic (tendency towards a vocational/neo-classic orientation). Again, others stress the importance of equipping students with the competences and skills that help them succeed in a competitive, globalising market-oriented world (tendency towards a liberal/progressive orientation of curriculum development). There are also those who stress the importance of engaging students in critical thinking, action taking and helping them cope with uncertain futures and ever changing realities (a tendency towards a socially critical orientation of curriculum development). Table 2 shows three different perspectives on teaching, learning and research that in reality might not be as clear cut as presented here.

The epistemological paradigm shift towards a systems perspective is a strong influence in some cases, but certainly not in all cases. Many involved in curriculum development have simply sought vocational sensitivity which has required new courses, without advocating a paradigm shift. The courses and degree programmes that we examined are a manifestation of this practical response as well as of new thinking. In practice we see a mixture of giant leaps and small steps. Such changes, big and small, are often a function of changing values, interests, perceptions and experiences of people active in further and higher education.

A number of the barriers of adopting an integrated approach to curriculum development were identified. These barriers include the deeply entrenched patterns of reductionist and disciplinary thinking that characterise so many institutions of ‘higher’ education. A systems framework is offered by some of the institutions as a way out of these, what they see as, unproductive, ultimately, irreversible and destructive processes.

A systems perspective on curriculum change as a means for accommodating more integrative approaches to teaching and learning (process) and rural development (content), perhaps does not fully reflect the gradual, messy, stuttering process that more accurately reflects how, in most cases, progress in curriculum design in IRD moves forward. In some cases there are significant key events that may trigger curriculum change, for instance, when new powerful or inspiring (or both) personalities engage in curriculum development, or when a new European Policy on Higher Education becomes effective (for instance the introduction of a European Bachelor-Master structure and the European wide introduction of the ECTS-system), or when a decline in student numbers require a major overhaul of existing programmes. Hence, the turn to a systems approach and the need for an alternative ontology/epistemology that emerges out of the four case studies should not be seen as a prescription but rather as a critical consideration that might be considered

<table>
<thead>
<tr>
<th>Focus</th>
<th>Scientia</th>
<th>Technē</th>
<th>Praxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning for knowing</td>
<td>Learning for doing</td>
<td>Learning for being</td>
<td></td>
</tr>
<tr>
<td>Propositional</td>
<td>Practical</td>
<td>Experiential</td>
<td></td>
</tr>
<tr>
<td>Subject disciplines</td>
<td>Crafts/Skills</td>
<td>Issues/Competences</td>
<td></td>
</tr>
<tr>
<td>Expert</td>
<td>Master</td>
<td>Facilitator</td>
<td></td>
</tr>
<tr>
<td>Lectures on theory</td>
<td>Practical instruction</td>
<td>Real-world Projects</td>
<td></td>
</tr>
<tr>
<td>Demonstrations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic (Experimental)</td>
<td>Applied (Developmental)</td>
<td>Action (Participative)</td>
<td></td>
</tr>
<tr>
<td>Abstract-universal knowledge</td>
<td>Workplace Solutions</td>
<td>Contextual knowledge / Action for change</td>
<td></td>
</tr>
<tr>
<td>Positivism</td>
<td>Utilitarianism</td>
<td>Constructivism</td>
<td></td>
</tr>
<tr>
<td>What do I now know?</td>
<td>What can I now do?</td>
<td>Who am I becoming?</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Some distinctions between different traditions of knowledge and knowing (Adapted from: Bawden and Macadam, 1991, p. 4)
along with others. One of those, present in all four cases covered, is a very pragmatic one driven by the current socio-cultural and economic reality that many rural area’s in Europe are currently facing. It can be argued that in economic, social and cultural terms the ‘old rural,’ made up by the occupational community of those working the land, has been supplanted by a ‘new rural’ with businesses not necessarily connected directly to the land (i.e. tourism and other services, which are part of rural development and need to be integrated into a new consumption-oriented approach to RD). In some areas, this trend is enhanced by a growing new rural population alongside a declining farm population. It should be no surprise that many higher agricultural education institutions respond to these trends by creating new courses and programmes that address these changes without necessarily re-thinking their educational philosophy. It is with this in mind that we introduce a systems perspective as one of the stepping stones for curriculum development.

A systems perspective for IRD curricula.

Rethinking the curriculum means discussing the changes in teaching, learning and instruction that are needed to better link the academic world to today’s global realities. According to a survey of the agriculture teaching programmes of related universities in Europe (Phillips, 1999), most graduates felt that their exposure to relevant practical experience was lacking, as was their training experiences in the environmental aspects of agriculture. To overcome the growing mismatch between the requirements of the curriculum and the realities of life, it is necessary to develop new epistemological, ontological and methodological tools in order to give a more coherent view of knowledge and more authentic and meaningful view of life. These new intellectual and organisational tools will help in the challenge to better understand reality.

One of the most powerful examples of an integrative approach is the systems paradigm, which calls for a change from a discipline to a systems focus. To explain the structure of reality, the processes involved, and the role of humankind in these structures and processes, the use of a holistic type of instrument called “systems thinking” has been suggested (Boulding, 1956; Checkland, 1981). The systems field is predicated upon the belief that reality is a unified whole. Historically, the term and the philosophy of holism was originally developed by Smut (1927) and scientifically elaborated by Tansley (1935) who used the concept of ecosystem of which people and their activities are fully part. Dating back to the first formulations of this concept (Tansley, 1935), human activity finds its space in ecology as an extremely powerful biotic factor which tends to increasingly disturb the balance of pre-existing ecosystems and in the end destroy them. The systems paradigm spotlights the deeper patterns that connect all phenomena and proposes that diverse aspects of reality – physical, biological, social and technological- can be better understood and handled when treated as systems of interdependent parts that interact with their environments.

Curricula based on a systems paradigm offer an educational process more appropriate for an era of limits. The interpretation of our planet as the ultimate global ecosystem requires an acceptance of natural limits to human activities and serves to instil a context culture, where a sense of belonging and responsibility for sustainable development are promoted. Curricula designed to foster social and environmental interdependence have more chances to offer students multiple opportunities to experience learning within the context of their neighbourhoods so that the acquisition of important skills and knowledge is not de-contextualised but embedded in a process of shared existence. Knowledge of local cultural traditions and sense of affinity with the regional environment help prepare students to take an active role in the care and governance of their communities once they have graduated (Smith, 1993).

Global problems are systemic (Malone, 1990). Education for global problems demands an understanding of the underlying ethical attitude of our activities. One of the most critical challenges in restructuring natural science dominated curricula is incorporating ethical and aesthetical dimensions of learning. The centrality of values (like sustainability) emerges in a curriculum based on a systems approach. Values are not a separate category of the mind, but arise out of a comprehensive understanding of reality, our worldview (Clark and Wawrytko, 1990). The sense of good and the sense of beauty are part of our human dimension. The ontological assumptions derived from the ecosystem concept
that all life forms are inextricably connected (religion of connectedness) in a finite and beautiful planet calls for the urgent need to protect the ecosystem of which we are part, by assuring sustainability of our human activity systems. Universities and schools have a responsibility in re-examining current perceptions of nature, of the world and of human society in the light of the reality of resource depletion (see also Corcoran & Wals, 2004). They have a responsibility to (re)develop curricula and structures to help students deal with a world of limits rather than a world of expansion and growth (Smith, 1993).

**Methodological tools**

Traditional methodologies inspired by a monodisciplinary curriculum structure tend to foster in learners a fragmented view of reality because their main focus is success (e.g. passing an exam or getting a proficiency certificate) in separate fields of learning. Learners find it very difficult to integrate uncontextualised and unrelated knowledge and skills to resolve real-life issues. Methodological tools inspired by the systems paradigm can be helpful in improving connections between a curriculum as a whole, its external context, and within the curriculum components themselves (internal tools). External methodological tools help to introduce a broad concept of teaching and action-based learning. Integrating the expertise of farmers, business owners, government specialists, and non-profit groups can enrich the educational process by offering different perspectives and ways of knowing (Francis et al., 2001). Moving students into the discovery made through case studies engages their multiple senses when they become immersed in the real-world context in which learning takes place. Case studies, interview and survey techniques, time-series measurements, and activity calendars can be taught and applied to answer questions about integration within the whole agro-ecosystem hierarchy (cropping systems – farming systems – regional systems – global systems). These approaches require several changes in attitude and organisation. New sources of funding and revised systems of administering research funds will be required to promote this approach successfully (Stark, 1995).

Tools are also needed in order to give more internal coherence to a curriculum. This requires more integration of the disciplines. Thus, all levels of approaches to integration (multidisciplinarity, interdisciplinarity and transdisciplinarity) are probably needed. Multidisciplinarity generally means bringing separate theories, skills, data and idea to bear on a common problem, while interdisciplinarity involves bringing together people and ideas from different disciplines, to jointly frame a problem, agree on a methodological approach, and analyse the data (Golde and Gallagher, 1999; Hammer and Soderqvist, 2001) Finally, transdisciplinarity implies full interaction between disciplines from an issue-based perspective. According to Hammer and Soderqvist (2001), integrative approaches could be addressed in course programmes in several ways, including:

1. inviting external lecturers from other disciplines;
2. having seminar exercises and discussions with invited lectures from other disciplines;
3. mixing students from ongoing disciplinary courses for joint exercises;
4. offering full transdisciplinary courses and programmes.

The efforts in this list range from the most basic (1) to the most completely integrative (4). Although the latter type of effort is desirable in many respects, it is likely to require relatively well-developed and integration-oriented organisational structures, such as interfaculty degree courses or courses/modules.

More internal coherence also requires more integration between teachers and students, who are the basic components of a curriculum-based learning system such as a curriculum. Creating a truly integrated curriculum entails that the two groups become reciprocal members of a shared, self-critical learning community. This can be achieved through:

– creating a community (amongst learners and/or teacher - learners) that generates conversation (i.e. including such techniques as having members talk in turn to create knowledge through a process of continual negotiation and transformation);
– creating a team-teaching context. Team-teaching is an excellent way to move away from the individualistic and disciplinary mode of scholarship and research. Members of teams composed of faculty from different disciplines, often find their intellectual life more enriched (Manley and Ware, 1990). A team-taught
course can be a vastly rewarding experience for both students and instructors; and

– implementing intensive programmes or courses that are not longer than two weeks (6 ECTS) in order to create more flexible didactic arrangements for approaching different contextual experiences.

Conclusions

The past disciplinary “successes” in production agriculture involved high levels of abstraction resulting in deductive conclusions, which were generalised to the real world with little awareness of the dangerous consequences of doing so. This kind of organisation of knowledge and its implications were anticipated early in the past century by Alfred North Whitehead who labelled the outcome of the whole process: “the fallacy of misplaced concreteness”. Signs of this fallacy are shown in the economic paradigm which dominates our current unsustainable development. For instance, the strongly cultivated appeal of “material externalities” occurs at the expense of other more internally driven experiences. This points at the problem of misplaced concreteness in economic theory. The fallacy of misplaced concreteness culminates in “money fetishism,” which consists in taking the characteristics of the abstract symbol or measure of exchange value, money, and applying them to the concrete use value, the commodity itself.

With the advent of a money economy, the most tragic human paradox has been accomplished: virtual wealth can be indefinitely accumulated in the form of money, whereas real wealth in the form of bio-physical, non-material, richness and earth habitability can be increasingly destroyed. The characteristics of the abstract symbol (non-spoilage) comes to dominate the characteristics (spoilage) of the concrete reality being symbolised (Daly and Cobb, 1994).

A resilient barrier to integration in curriculum development is provided by the university research structures, which contribute to re-enforce disciplinary-oriented learning. Departments are designed to foster knowledge within their discipline, and their reputation and resources flow from recognition within their field. Most research is conducted within the established boundaries of a given discipline. Traditional doctoral programmes, which open access to academic careers, have evolved in a way that strongly encourage specialisation (Golde and Gallagher, 1999) and are at times openly hostile to interdisciplinary initiatives that are regarded as attempts to ‘water down’ the rigour of the discipline’s research track. As a consequence, the classical organisation of university research into discrete and specialised departments provides neither the perspectives nor the tools to deal with reality, let alone to (re)design and improve it (Francis et al., 2001).

Among the human activity systems, agriculture and forestry are perhaps the most integrated ones, since they combine in organised systems or farms bio-physical and socio-economic components from both natural and anthropogenic sources. A sustainable integration is demanded in today’s rural land using activities at any hierarchical level, from the local to the regional and global level. The concept of IRD has been created to revitalise the rural environment and economy without compromising the Earth’s life support systems. University has an important role to play in society by educating professionals in agriculture to help them meet the current expectations and demands. New epistemological, ontological and methodological tools based on a systems paradigm could help universities address the challenge of establishing new curricula for sustainable rural development. At the same time, society as a whole must find the right way of supporting universities in this task so that it can play its role in a learning society.

In our cases we found diversity in innovation. In addition to the epistemological “Gestalt switch” towards a systems orientation, we also found a kind of Darwinian adaptation process as institutions, and more importantly individuals, sought to survive and adapt what they had done to attune it more closely to contemporary demands. The resistance of the old guard is widespread. It was evident in many of the cases, as is the tendency for mono-disciplinary scientists to look down their noses at the efforts to build interdisciplinarity.

There are some profound and unresolved paradoxes, not least the growing tension between institutional research excellence and relevance to the wider needs of rural society. This pushes interdisciplinarity and new courses to the margins and makes their establishment and financing difficult in many cases. However, new
universities tend to be more closely connected to their client base and less ivory-towered than the old Ivy League type establishments. It might help to have a systems perspective – as has been outlined here - but it is still possible to develop an IRD-oriented curriculum without it. Nonetheless, the cases and the on-line survey results do show a strong drift towards a systems-type approach as programmes are evolving. Sometimes this systems perspective is explicit and sometimes it is not.

Generally speaking, introducing IRD in the curriculum has been a struggle and will remain so as long as universities are judged on their traditional outputs in terms of narrow disciplinary research excellence. It is also paradoxical that agricultural institutions designed to be vocationally sensitive have been so critical and resistant to what is clearly led by the demands for change on the ground and the actual changes that have swept through rural Europe, albeit in different ways and at different paces in different places. This can be explained by the attempts of those with power and resources, in both industry and education, not wishing to give these up to new activities and to deny the legitimacy of softer process-oriented approaches to education and change management. A general attitude of 'better a subsidy in the bank than a learning process to help manage change and complexity' seems to have prevailed!

Despite all this, progress has been made and will continue to be made by the actions of a few individuals motivated by their subject and capable of sparking that interest not only in their students, but also in their teaching colleagues and administrators. Their efforts greatly benefit from the vocational relevance-demands of practitioners who face the need and urgency of a more integrated approach to rural development on a daily basis in everyday practice.

Finally, reflection on the relationship and level of congruency between one’s outlook on IRD and one’s view on teaching, learning and curriculum development is crucial. What we see emerging from the cases is a need to understand better the connection between biophysical and human systems. This is becoming a central task for higher education propelled, in part, by the multiple market failures and externalities that are found in the rural arena. Even though education for IRD can go down a number of routes, from soft-systems based learning to a modified or a more pragmatic positivism to a socio-critical transformative learning, it appears crucial to reflect on the relationships between one’s conceptualisation of IRD and one’s conceptualisation of teaching and learning. When such reflection and reflexivity becomes an integral part of curriculum development, ETIRD will provide for a stronger, more meaningful and transformative learning experience that is likely to sustain itself beyond the time students spend in college.

References


**About the authors**

*Arjen Wals* is an Associate Professor within the Education & Competence Studies Group of the Department of Social Sciences of the Wageningen University in the Netherlands (http://www.wur.nl). He specialises in the areas of environmental education and participation, and social learning in the context of sustainable living. Email: arjen.wals@wur.nl

*Fabio Caporali* is a Professor of Agricultural Ecology at the University of Tuscia, Viterbo, Italy, within the Department of Crop Production. He has more than twenty years of experience in teaching both Ecology and Agroecology and has published extensively in this area. His current main scientific interest is in designing, performing and evaluating sustainable cropping systems using a participatory research strategy. Email: caporali@unitus.it

*Paul Pace* works for the Department of Mathematics, Science & Technical Education of the University of Malta. Dr. Paul Pace lectures and conducts research in Environmental Education and Science Education. He works actively with teachers in the implementation of environmental education school policies. Email: ppace1@educ.um.edu.mt

*Bill Slee* is Professor of Rural Economy at the Countryside and Community Research Unit of the University of Gloucestershire. His principal research interest is the restructuring of the rural economy, both in relation to the primary sector and its diversification and the aggregate shift towards more consumption-based demands on rural space. Throughout his career he has been engaged in curriculum development in relation to countryside management and rural development. Email: bslee@glos.ac.uk

*Nadarajah (Sri) Sriskandarajah* is Associate Professor at the Unit for Learning and Interdisciplinary Methods, Royal Veterinary and Agricultural University, Copenhagen, Denmark. Formerly, he was with the University of Western Sydney, Hawkesbury in Australia, as an active member of the group which led many innovations in agricultural education. His main interests have been in systemic and learning approaches to education and research within agriculture and rural development. Email: sri@kvl.dk