Evaluation of Learning Group Approaches for Fostering Integrated Cropping Systems Management

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ABSTRACT

Cropping systems management requires integration of multiple forms of knowledge, practice, and learning by farmers, extension educators, and researchers. We evaluated the outcomes of participation in collaborative learning groups organized to address cropping systems and, specifically, the challenges of integrated weed management. Groups were constituted to focus on two different cropping systems: fresh-market vegetables and soybean [Glycine max (L.) Merr.] (both in rotation with other crops). Participants in the learning groups included farmers (representing a wide array of production philosophies), extension educators, and university faculty with extension, resident instructor, and research responsibilities. Interviews were conducted to assess the value of the learning groups and how they influenced participants to alter practices in support of integrated crop and weed management. Farmer participants reported an increased capacity to implement integrated approaches to management, resulting in part from changes in self-esteem, enhanced decision-making capabilities, and increased awareness of available resources. Extension educators reported that learning group participation increased their ability to use facilitative education methods. University research and teaching faculty also noted enhanced effectiveness from participation in the learning group project. Evidence was obtained that learning groups foster knowledge creation and transformational learning and that they can be more effective than conventional (lecture-based) approaches for achieving such outcomes.

SERIOUS PROBLEMS involving tightly coupled ecological and social factors are becoming increasingly evident within agriculture (Matson et al., 1997; Uphoff, 2002). A prime example is the challenge faced in implementing integrative approaches to cropping systems management and integrated pest management. Such integrative approaches are seen as necessary for the well-being of today’s cropping systems, such as achieving profitable, resource-efficient, and environmentally sound production (Uphoff, 2002).

Integrated weed management is a priority for many agronomists. Questions have arisen about the profitability, long-term efficacy, and the environmental safety of herbicidal weed control (Cousens and Mortimer, 1995; Sheley et al., 1996; Liebman et al., 2001). Effective implementation of integrated weed management can be achieved by considering the farm operation itself to be the fundamental unit of weed management (Bender, 1993; Jordan, 1996; Sheley et al., 1996; Gallandt et al., 1999). According to this approach, many aspects of farm management can be systematically fine-tuned to disrupt the life cycles of problematic weeds (Liebman et al., 2001). For example, Bender (1993) described the case of an organic field crop production system that demonstrated how tillage, fertility, and planting practices could be adjusted to provide crops with an early growth advantage relative to weeds, thus greatly enhancing weed management. In general, farmer experience has demonstrated many times that effective, low-cost weed management—often with minimal or no herbicide use—can be attained using such approaches (Thompson, 1991; Bender, 1993; Jordan, 1996).

Farmers have the primary role in executing approaches to integrated weed management within cropping systems. Most farmers have detailed knowledge of the interacting and shifting components of their farms, and of the economic, social, and environmental factors that influence and constrain their management options. Given time and support they can use such knowledge to adjust various aspects of cropping systems management, including weeds.

However, we must also recognize that farmers do not act alone in their cropping systems management decisions. They must have the support of many other sectors such as extension workers, farm advisors, input suppliers, research agronomists, equipment manufacturers, and plant variety developers (Svejan, 1996). One example is the innovation that enabled the rapid adoption of synthetic fertilizers (Engel, 1997), which depended on innovation not only in farmer practice but also equipment makers, grain marketers, agronomists, extension educators, etc. Therefore, broad innovation is needed among the diverse professionals that support the social infrastructure behind farmers’ management decisions.

The proposition that such social infrastructures are essential to foster innovative approaches to cropping systems management is a departure from the conventional technology transfer paradigm for extension education (Röling and Jiggins, 1998), which emphasizes one-way transfer of knowledge from specialist or expert (who are often scientists) to farmer (van de Fliert and Braun, 2002). This model has been successful in achieving solutions to straightforward and relatively simple cropping systems problems but has been entirely inadequate for addressing more complex, systems-based dilemmas (Röling and Jiggins, 1998; Ison and Russell, 2000; Pretty and Uphoff, 2002). The technology transfer model has generally been unsuccessful for implementing integrated pest management because such management requires holistic understanding and concepts that cannot be readily transferred from experts to passive learners (Jordan, 1996; Röling and Jiggins, 1998; Röling and van de Fliert, 1998).

Developing the social infrastructures needed to implement more integrative cropping systems and weed management approaches depends, in part, on collaboration among farmers and support professionals. Each must implement innovations in their practices (Steins and Edwards, 1999; Röling and Maarleveld, 1999). Examples of such collaboration and in-
novation do exist (Uphoff, 2002; Röling and Wagemakers, 1998); however, many of these are within the contexts of developing nations. Examples from developed nations are mostly found in Europe and Australia. Within the USA there have been only a very few examples (e.g. Smith, 1998; Hesterman and Fisk, 2000).

One fundamental issue is how to implement and sustain learning and action around more integrative approaches to cropping systems management (Chamala, 1995; Röling and Jiggins, 1998). The idea of learning groups (also termed learning communities) is emerging as an important approach that can effectively address this challenge. Learning groups are intentional, organized structures that assist people regarding complex situations to interact to create knowledge and foster innovation (Engel, 1997; Röling and Jiggins, 1998; Steins and Edwards, 1999; Jiggins and Röling, 2000; Jordan et al., 2003).

The learning group project evolved from discussions with various Minnesota governmental agencies. The parties in-...
(i.e., the why, what, and how of their working lives). In addition, we examined the interview responses for indicators of enhanced self-confidence (Nelson, 1994; Gerschick et al., 1989) and perceived abilities to implement integrated weed management on one’s own, the capacity to influence others, and the ability to secure resources (e.g., economic assets, political influence, information, and relationship building). Because the interviews were conducted within a year of the completion of the learning groups, it appeared to be too soon to evaluate the extent to which learning group participants had altered their production practices in response to their participation in the group.

RESULTS

Farmer Participants

Farmer participants reported that the learning groups helped them to become better practitioners of integrated weed management by increasing their self-confidence as well as their core understanding of weed management. In particular, most farmer participants expressed an enhanced sense of self-reliance in their management skills with an increased emphasis on utilization of on-farm resources. Many reported an increase in the value they placed on their skills as managers; therefore, they felt less dependent on outside expertise. One vegetable farmer said that she felt “more like a manager than I used to. I used to view myself as almost only a person that did the handwork on the hoe and then helped the kids pick [vegetables].” A soybean grower reported that he had developed an “enhanced value” for his own labor. He felt that, as a manager, his “labor becomes critical—something valuable.”

Thus, the farmers’ learning group experiences appear to have enhanced their sense of empowerment. This appears to be counter to a perception that some contemporary farmers may have “forgotten how to think [for themselves]” and to have become overly dependent on the “guy selling us our inputs.” Several farmers indicated that they had gained insights from the group discussions about weed biology and had applied those to their farming practices. An organic farmer reported that he “thought differently” after being a part of the learning group. He reported that he had learned to “think like a weed.” He described this as a perspective that helped him manage weeds more proactively by better predicting weed emergence and growth. He maintained that he “did a much better job handling the situations that the weeds presented” by better coping with variable circumstances such as weather. A vegetable farmer explained that she “thinks differently because I remember the talks on the biology of the weeds. I think differently, and more than that, I feel differently.” Another reported that he “just totally thinks more about weeds. I even look differently at articles and notice things I never did before.” Consequently, he observed that his “entire thought process is different.”

Certain farmers attributed specific changes in their cropping and, specifically, weed management practices to the learning group experience. One couple noted that, as participants, they had focused their on-farm summer experiment project on the effects of delayed soybean planting date on weed numbers. As a result of this experiment and the results they had observed, they formally adopted the practice and planned to continue its use in the future. They further identified the weed biology discussions during the group meetings as being the specific catalyst for this particular modification of their practice. Another group participant reported that his integrated weed management skills had “improved dramatically” through his involvement with the learning group. He commented, “Some of the things I learned from the other farmers I really feel have helped me make some better decisions.” He added, “…the [weeds] that needed some major work for me were the grass problems and I was able to fine tune that with some skills I basically learned from the other farmers and from the group.”

Some farmer participants related their perceptions of how learning within the group context had been instrumental for changing their thoughts and actions regarding cropping systems management. First, several noted that before their experiences with learning groups they had felt disempowered by the competitiveness and lack of communication among farmers. As one vegetable farmer explained, “Farmers are isolated from each other primarily around competition in the marketplace. You don’t want to tilt your hand too much. We hold our cards in tight and we close ourselves in and it’s in that isolation that we cut ourselves off from learning.” This sense of isolation was reported by a large number of the participants in our project. They spoke of “loneliness” and how other people have “walls up.” Farmer participants reported that the groups alleviated such feelings of isolation and competitiveness. One stated, “I prioritized those [learning group] meetings; that’s how important they became for me…I think we built camaraderie.”

Group participants reported gaining self-esteem because they sensed that their knowledge was validated and recognized as integral to the group learning process. One farmer participant spoke emotionally about the groups’ effect on the way he viewed himself and his fellow farmer participants. He stated, “We are starting to honor the collective knowledge that farmers have and to treat that knowledge in a professional way…We are creative people by nature and that was very, very clear to me in this group.” Another farmer explained how such validation created feelings of empowerment for him: “The group was all about acceptance and nonjudgment, support, validation, vulnerability, and humility. It gave me that positive push that I needed to keep being innovative and to keep focused on the fact that there is more to it than just making money.” Still another observed that, “[The participants] establish a trust level, confidence in ourselves to bare our souls, you might say; not only on things that were successful, but failures as well.”

Many participants expressed appreciation for the particular kinds of learning opportunities that the groups created. One farmer observed: “One of the things that I really got a lot from was the farmer-to-farmer exchange we had at each meeting. I learned as much from the other farmers as I did from [the weed scientists and extension educators]. I learned as much from the other farmers and I think everybody there did.” Generally, participants had not experienced this kind of collaborative learning experience before, and especially over such an extended period of time. As one expressed it, “I didn’t expect that farmer-to-farmer correspondence that we had. I thought it would be strictly a school-type education process, [where the focus is solely on the instructor].” Another perceived that the group “multiplied the innovation…and we have all left
with something more creative than would have been possible to have as individuals.”

Many commented on the importance of diversity of perspectives among group participants for attaining the outcomes of the group learning process. Farmers varied greatly with respect to farm sizes and practice. As the groups progressed through the project, it became important to the participants that they had the opportunity to think together and come to “some type of common ground.” One farmer reported that he had anticipated a “defensive posture on both sides,” but found that this was largely absent. An organic farmer reported forming close relationships with others in his group who had different management philosophies than he did. Another organic farmer reflected, “Too many like things, you have a dull group. Too many opposite things and all you have is a big argument. So it takes a mix to make the group work.”

Another farmer noted that the group members “challenged each other time after time to be looking at the big picture.” Still another commented that with such a diverse group there is “sharing about how they are doing seemingly different things, which really aren’t totally different,” and that they may realize that “we have more in common than we have differences.”

In addition to the diverse array of farmers, group participants also included researchers/resident educators and extension educators. The farmer participants believed that inclusion of these groups was essential to their learning. One observed how their participation in the learning groups had contrasted with past experiences where, “Ph.D.’s were the experts and the farmers were the passive recipients of their knowledge.” A farming couple noted their appreciation for the “mix of information and science to back it up and the opportunity for everybody to have dialogue around a particular scientific aspect of the problem.” In their view, it was very important to the learning group process that discussions were not based solely on practitioner knowledge—or entirely on scientific information.

In particular, the inclusion of farmers, researchers/resident educators, and extension educators was perceived to be empowering since it provided access to a wide range of types of knowledge (e.g., that knowledge accrued by inquisitive and innovative farmers as well as through structured agronomic research and extension education methods). One large-scale vegetable farmer referred to the groups as a “continuing education, but they’re together for a couple years. And so you can repeatedly over several years. She noted, “I love the cohort concept, because you’re working in a community of learners. It’s not just people who come together for a week or a semester, but they’re together for a couple years. And so you can build the trust and the safety so that people can be more vulnerable and can really reflect on this. We really need that. I don’t think we can do it without it.”

Another outcome reported by the extension educators was a new understanding of the role of expertise—be it their own or that of others. In their previous extension work, each educator had viewed knowledge of scientific or technical experts as largely sufficient to guide adoption of new agricultural practices. Through their experience with the learning groups, the educators came to more fully recognize that scientific or technical expertise functioned as only one ingredient in an interactive, interdependent process of knowledge construction. As one educator put it, “I think the best adult learning is where there’s enough of a common base of knowledge and a recognition that people can learn a little bit in a half hour to get them learning more through a conversation.”

One educator had previously made extensive use of technical expertise in his extension programs, which often consisted of large meetings intended to give a broad audience...

Extension Educators

Two of these extension educators, both of whom worked in county-level positions, noted that one outcome of their participation in the learning groups was that it helped them to recognize the importance of using diverse approaches to creating learning opportunities, as well as the value of changing their roles from lecturers to facilitators. The learning groups were seen as effective vehicles for bringing diverse viewpoints together. One educator emphasized that the groups had enabled him to make progress toward his goal of creating programming that helped farmers gain skills for managing complex farm challenges. He perceived from his learning group experience that progress had been made toward his goal of bringing together people who viewed these challenges quite differently because “they need each other.” For another educator, the diversity of the groups helped him balance development of practical knowledge with reflective inquiry into how practice “play[s] out in the rest of life, in community, and in the broader world.” In his view, such practical knowledge was best created when principles and practices are “shaken through more screens,” by which he meant contrasting viewpoints.

The third extension educator, who worked at the state level, emphasized her conviction that learning through diversity within groups depends strongly on constructing a space for critical reflection on the interrelation of values and actions—and that such reflection depends in turn on trust, dialogue, and willingness to express vulnerability among the participants. For her, a challenge was how to create environments that foster this kind of learning, given barriers of time and social, professional, and geographic distance. She expressed satisfaction with the value of forming cohorts of learners who interact repeatedly over several years. She noted, “I love the cohort concept, because you’re working in a community of learners. It’s not just people who come together for a week or a semester, but they’re together for a couple years. And so you can build the trust and the safety so that people can be more vulnerable and can really reflect on this. We really need that. I don’t think we can do it without it.”

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timely updates on technical matters. However, this educator reported that the audience for such programming was declining and that he struggled to produce such programs because he felt dependent on a limited and declining supply of technical experts. From his experiences in the learning group, he reported that he had learned to use his own expertise differently, explaining how he had gained “…confidence that [learning groups] can work, as a viable teaching method…where you’re not the person standing up and teaching in front of a group—you’re sitting there in this circle. And once in a while you may need to speak up and give a little new direction, or throw out your expertise, something you think the group should be aware of.”

Another extension educator described his dissatisfaction with the use of experts to alter agricultural practice: “If I think that I had 500 people in a room and I taught them some particular concept about dairy nutrition or weed control and that they all went home and made great strides with it, then I’m kidding myself in most cases.” This educator was also quite conscious of the role of farmer knowledge and how to elicit this expertise in extension settings. He was particularly concerned to encourage contributions by farmers who held minority (less popular) viewpoints.

Several extension workers acknowledged uncertainties in working in such new ways. As one observed “…when I was recruiting the farmers [for the project], and I was just cold-calling people, trying to explain an idea that was maybe confusing…that was very difficult for me…was this going to be a good thing? Are they going to like it? Are they going to learn something? I tried to be really ‘up front’ with the farmers by saying we need to understand that we [university people] don’t know exactly what the groups are going to do or how they are going to function…”

Research/Resident Education Faculty

The faculty research and resident education participants reported that their learning group experiences helped them to better stimulate and support change in how students or farmers thought and acted regarding crop and weed management. Moreover, they reported that the learning group experiences had important effects on the objectives and methodologies used in their research programs. Two of these faculty members focused on extension educational programming around weed management. Over their careers, both had experienced major problems with technology-transfer approaches to extension education and each reported that the learning groups provided a setting where they could develop and refine alternatives to these. One weed scientist reported that he had shifted his educational approach in recent years from updating farmers on herbicide developments to a much broader focus on integration of multiple methods of weed control. He had moved more toward helping his extension clientele gain insights that could be applied to the ongoing design and management of their farm operations. He had found that an emphasis on features of weed growth and other aspects of weed ecology was effective and well-received by his clientele. He valued the learning groups as a safe environment to develop and refine his approach to extension education, a place where he could hone skills and test ideas and suspicions about what his clientele might need, as well as define new possibilities for programming that heightens awareness of the interrelationships of weed biology and management.

Another extension faculty member noted that he was expected to provide weed management recommendations for an increasingly broad range of vegetation systems, ranging from horticultural to wetlands to pastures to roadsides. He found such expectations to be impossible to fulfill since little research had been done, few herbicides were available, and relatively few effective weed control options existed for some of these situations. Given this deficiency of knowledge, this person was quite uncomfortable in the role of expert. Furthermore, when he accepted that role he anticipated that his clientele would not develop—or even see a need for—the capacity to “think differently about problems” and access other resources that would contribute to improving their problem situations. Working in a learning group context led to “giving farmers tools so that they can approach problems in different ways and are able to deal with the next problems on their own.”

Two researchers involved in the project had primary responsibility for classroom instruction and research in their university appointment rather than extension. Each had become convinced that their research needed to broaden if they were to address the knowledge needed to pursue sustainable agriculture practices. For both, this represented a significant shift in their research; both had previously emphasized reductionist crop physiology and ecology research. One researcher had redirected his research toward assessing the role of learning theory for understanding and enhancing farmer learning. He had been particularly motivated by a perception that a significant amount of agronomic research was not accepted or heeded by farmers, possibly because the researchers did not adequately account for the learning contexts of farmers. He further had focused on developing research collaborations with colleagues from nonagricultural academic disciplines; particularly, those that utilize qualitative research methodologies such as interviews in order to bring these techniques to bear on better understanding farmer decision making and learning. In this work, he had noticed that he, an agronomist, “heard things” in the interviews with farmers that his nonagricultural, social science colleagues did not and vice versa. From his experience he had gained a strong appreciation and confidence that agronomists have “a place at the table” when conducting and interpreting qualitative research.

The second researcher reported that he had shifted his scholarship in direct response to his participation in the learning group experiences. He reported that his involvement with the groups had him working with a different set of colleagues within several disciplines to develop a working model of agricultural science that more directly engaged problems, such as the implementation of integrated weed management. This required bringing together the work of multiple professions (Jordan et al., 2002, 2003).

DISCUSSION

Clearly, development and widespread adoption of integrated crop and weed management options that utilize multiple forms of knowledge, practice, and learning require a better understanding of how to organize, implement, and sustain such integration (Chamala, 1995; Röling and Jiggins, 1998). Our results support the contention that diverse learning groups
are an effective means fostering such integration within the context of two cropping systems of Minnesota. Consistently, the farmers, extension workers, and researchers interviewed in conjunction with our project expressed strong enthusiasm for the collaborative learning process fostered by learning groups. Many participants explained that learning groups enabled them to address highly compelling issues in their lives and to utilize practices that were more consistent with their core values and commitments. Collaborative learning in diverse learning groups exposes participants to views that contrast with their own (Burch and Lacy, 1984) and, in this context, critical examination of basic premises and values underlying practice will be fostered. Such disorienting dilemmas (Merriam and Caffarella, 1999) can serve as the basis for significant transformational learning in professional attitudes and practices. We found that such interplay of divergent views was possible despite initial apprehensions on the part of the learning group participants about possible antagonisms or isolation among various farmers, researchers, and educators.

We found that our results support the perspective that learning groups can support coordinated innovation among interacting professionals (Engel, 1997; Jordan et al., 2003). Such innovation can produce new professional approaches and attitudes (Senge et al., 1994) that manifest increased interdependence in thought and action among interrelated professions. We found that participants consistently expressed insights that suggested they had acquired enhanced capacity for intentional and conscious interdependence in thought and action. For example, both research and extension education faculty noted that they were interested in addressing complex crop and weed management problems for which general problem-solving prescriptions do not exist—and in their opinion cannot exist. Therefore, it is necessary for them to approach such situations by fostering the capacity for farmers to create their own site-specific knowledge regarding such situations. In our interviews, these categories of participants described how their learning group experiences had increased their ability to more effectively foster such capacity among their clientele. Of course, more definitive evidence is still needed, presumably from longer-term studies that more comprehensively evaluate actual changes in practice by farmers and others in response to learning group participation. However, we believe that strong expressions of values and intentions engendered by participation in the learning groups, as observed during our interviews, are important indicators of a willingness to initiate change and an important prerequisite to action.

Practices for Learning Group Facilitation

Given the evident potential of learning groups, it is important to draw attention to effective practices for extension educators, researchers, and others to use if they wish to implement and facilitate learning groups. From the perspectives and experiences of the participants in our project, we offer these points in this regard:

- Differences are essential. We learn less from those who think like us and who may have the same blinders as we do. Different perspectives in a group can engender transformational learning that leads to substantive changes in actions. However, in organizing groups it is also important to consider personality attributes of the participants to avoid polarizing views and behaviors. It is important to facilitate the groups in ways that encourage open communication (Daniels and Walker, 2001).
- Even relatively small amounts of experiential learning (e.g., the experiences gained through the on-farm experiments in our project) can enable extensive collaborative learning among the participants. Therefore, facilitators of learning groups should strive to assure that such experiential learning elements are present. However, there is nothing about experiential or collaborative learning itself that will overcome poor facilitation. Technical experts (e.g., researchers) can support collaborative learning groups by creating simple technical modules that convey important concepts.
- For successful collaborative learning, it is important to do more than just bring people together to share experiences or problems. Part of the learning process is accumulation of shared experiences, thus the need for learning groups to remain together for a significant period of time. Having farmers conduct on-farm projects, and then visiting some of those projects as a group, was one effective way to approach this goal within our project. The learning group concept is based upon learners creating and interpreting knowledge together—quite possibly knowledge that could not be created or accessed in any other ways.
- Adequate organizing capacity is essential. Learning groups often require forming new working relationships among educators, researchers, farmers, and other professionals. Initial creation and maintenance of such relationships is very time consuming. It takes time for creation of ground rules for respectful and productive discussion, to define common goals and vision, and to build the capacity for collective action on shared concerns. Patience and trust in the learning group process is critical to its effective use. Therefore, groups should plan to meet regularly over a period of weeks or months. Some farmer participants—and educators/researchers as well—may expect results (i.e., transformed attitudes and actions) too quickly.
- Learning group participants must develop a sense of safety and trust in order to share some kinds of important knowledge (e.g., experiences of failure). Therefore, facilitators should emphasize creation of learning environments based upon trust—and this begins with having a group facilitator who is consistently and transparently committed to the well-being of all participants in the learning group.

Vision and Challenges of Learning Groups

Presently, approaching education through learning groups may appear to be a luxury because they seemingly involve a considerable investment of time in relatively few participants. However, when one considers that such approaches may become routine as agricultural research increasingly shifts from product-based technologies (e.g., herbicide-based weed management) to management-intensive and integrative strategies, we feel that there is likely to be a shift to more use of interactive learning group approaches. These absolutely require an engaged, responsive learner for successful implementation. Moreover, researchers need to participate in learning groups because they should not develop management strategies outside of the context of field-based problems. Through learning
groups, researchers acquire ongoing insight into interactions between agroecological systems (e.g., dynamic pest pressures) and closely linked social systems (e.g., farmer decision-making and labor dynamics) and can therefore develop and refine management strategies for complex agronomic challenges.

However, participation in learning groups requires considerable change in the roles, norms, and values (i.e., the professional cultures) of farmers, extension educators, and researchers. In the USA, members of all three categories are typically busy with their urgent responsibilities and would thus seem to have little opportunity to experiment with new approaches such as learning groups. Therefore, it is crucial for institutions to adopt policies and support structures that foster such initiatives. This is especially important for public institutions (e.g., extension services, agricultural colleges) since they are under intense budgetary pressures that can often increase workers’ responsibilities and reduce the capacity for trying new things.

Some key questions remain regarding learning groups and their implementation:

- Are learning groups cost-effective, given that they involve relatively few farmers? Can this apparent problem be alleviated by recruiting farmers as participants on the premise that these farmers will multiply the influences of the learning group within neighboring communities?
- To motivate ongoing participation and achieve collaborative learning outcomes, learning groups appear to require a shared and urgent concern among the participants. Can groups be organized and facilitated to address problems or opportunities (e.g., soil quality degradation) that are regarded as less salient? Perhaps groups formed to address clearly urgent problems can help gain the immediate experience needed to better understand the learning group process and then other forms of social capital can be applied to less urgent crop management challenges.
- Can learning groups be formed that are self-sustaining over longer periods of time (i.e., permit turnover in leadership and participant composition)?

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