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Nancy Franz
Iowa State University

Fred Piercy
Virginia Polytechnic Institute and State University

Joseph Donaldson
University of Tennessee

Robert Richard
Six Oaks Consulting

Johnnie Westbrook
Virginia Polytechnic Institute and State University

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HOW FARMERS LEARN: IMPLICATIONS FOR AGRICULTURAL EDUCATORS*

NANCY FRANZ

IOWA STATE UNIVERSITY

FRED PIERCY

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

JOSEPH DONALDSON

UNIVERSITY OF TENNESSEE

ROBERT RICHARD

SIX OAKS CONSULTING

and

JOHNNIE WESTBROOK

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

ABSTRACT

In this participatory action research, guided by a steering committee of farmers and agricultural educators, we examined how farmers learn and identified implications for agricultural educators. Since most educators teach the way they prefer to learn, this research could shape agricultural educators' practice with farmers. Focus group interviews and surveys with 115 farmers and agricultural educators helped us understand how and why farmers learn and the role of agricultural educators, especially Extension educators, in farmer learning. Farmers articulated a learning process that relies mostly on first-hand experiences motivated by saving time and money, learning about cutting edge research, and engaging in the social aspects of education. We also discovered that: a) differences exist in agricultural education needs among types of farmer groups, b) farmers enjoy peer teaching, c) farmers find value in participatory research, d) farmers desire more comprehensive educational programs, and e) farmers want educators to embrace the changing nature of agriculture. Implications of the findings for practice and research are suggested.

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This project examined how farmers in Louisiana, Tennessee, and Virginia learn and the related implications for agricultural educators, especially Extension educators. Agricultural educators use a variety of methods for teaching content and processes to enhance farmer learning and adoption of new practices. Davis (2006) stated that we learn best when our preferred instructional style of learning is used and that understanding how people prefer to learn is critical for the development and delivery of successful educational programming.

This participatory action research project sponsored by Southern SARE (Jordan and Constance 2008) specifically explored how farmers learn, what motivates them to learn, and the related roles of agricultural educators in farmer learning. Few studies have examined these aspects of farmer learning (cf. Eckert and Bell 2005; Eckert and Bell 2006). Peters (2006) suggested that the central problem of agricultural Extension education is teaching and that educators have not realized the best ways to help farmers learn. The results of this study could significantly shape the way agricultural educators, especially Extension educators, develop, implement, and evaluate educational programs with farmers as adult learners (Franz 2005).

PARTICIPATORY RESEARCH

Scholars have discovered the benefits of participatory research approaches to overcome perceived failures of top-down, one-size-fits-all research (Greenwood 1993; Ison and Russell 1999). Participatory action research is “a participatory, democratic, practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview” (Reason and Bradbury 2001:1). Participatory research attempts to reduce barriers between outside researchers and the community.

Participatory action research combines local insights of community members with the technical expertise of researchers to explore mutual interests and issues (Chambers 1999; Gaventa 1988) through a democratic and collaborative exchange (Percy 2005; Wing 1998). The advantage of this collaborative, nonhierarchical approach is that the research better fits the needs of communities. This results in an enhanced community investment in the research process. Gillespie and Gillespie (2006) also found that participatory research increases the validity and value of research and increases application of research results.

According to Morrison and Lilford (2001), several key tenets form the foundation of participatory action research. The first tenet is flexible planning. While some professional guidance is important, the exact content and process of the

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research are not fully determined at the outset. They take shape as the project progresses, and are continuously evaluated and revised. The second tenet of this type of research is the use of an iterative cycle. The cycle includes jointly: a) discussing the problem among researchers and community members, b) determining research methods to address the problem, c) conducting research, d) evaluating the research results, and e) conducting more research and reflection as needed. A third tenet of action research includes subjective meaning. What the community of stakeholders think is important shapes the research. A fourth participatory action research tenet is unique context. The researchers take into consideration the unique social and community contexts in all phases of the project.

ADULT LEARNING THEORY

Participatory action research with farmers and agricultural educators can enhance adult education (Dirkx 2006) and adoption of best practices (Rogers 1995). For farmers to be successful and remain competitive, they often participate in educational programs sponsored by Cooperative Extension. Many farmers participate in educational programs if the programs are relevant and directly address their needs (Tubene and Holder 2001). Therefore, agricultural Extension educators need to be aware of adult learning theory and plan programs that address the diverse needs of adult learners including farmers.

Knowles (1980) defined andragogy as the art and science of helping adults learn. The andragogical model includes the following six assumptions: 1) the need to know why, what, and how 2) the learner's self-concept as autonomous and self-directing, 3) the role of the learner's experiences as resources and mental models, 4) the readiness to learn that is life related, 5) an orientation that is learning-problem centered and learner centered, and 6) the learner's motivation as intrinsic and extrinsic (Knowles, Holton, and Swanson 1998). The andragogical model is not designed as a one-size-fits-all approach to adult education but provides flexibility in planning and implementing quality adult education programs (Knowles 1984).

Agricultural Extension educators should consider farmers' preferred learning styles, the context in which learning occurs, and cultural factors. Individual learning styles and a contextual approach to learning are two modes of adult learning (Caffarella and Merriam 2000). Individual learning focuses on the individual's learning. The contextual approach to learning combines individual learning and context. Interactive learning is the result of the individual interacting with other learners within the educational setting and structural learning combines social and cultural factors that affect learning, such as ethnicity, socioeconomic

status, gender, power, and oppression. Both approaches are effective but some adult educators prefer one approach over the other. To improve adult education, educators should practice the integrated perspective of learning that combines individual learning styles with the contextual approach.

Adult educators should consider what each individual learner brings to the learning environment and what the individual learner is experiencing at a specific point in time (Caffarella and Merriam 2000). For example, one individual learner may possess the skill of bringing everyone into the discussion or learning activity. If another learner has recently lost his/her job, this event will interfere with the learner participating in educational activities. Also, the setting where the educational program occurs will impact learning. For example, farmers tend to interact more during a field day or farm demonstration than during a lecture or role-playing scenario.

Farmers and agricultural Extension educators conducting scholarly research with scientists can promote critical reflection on personal practice, a key to adult learning (Brookfield 1987). The research process also helps farmers and agricultural educators to become more involved with adult education, and to interact more often with agriculture experts. Although some participatory action research with farmers has been documented in the literature, it remains uncommon (Percy 2005). Moreover, to our knowledge, farmers and agricultural Extension educators have not collaborated with researchers to explore farmer learning and its implications for the practice of agricultural Extension education.

FARMER LEARNING AND PRACTICE CHANGE

Röling and Pretty (1997) asserted that agricultural Extension educators must help farmers engage in learning, not just receive information. Lawrence and Vanclay (1994:60) pointed out the need to engage farmers in this process:

Extension agents considered farmers who failed to adopt new techniques to be recalcitrant and irrational. Farmers' attitudes and their lack of knowledge were considered to be main barriers to adoption. Little consideration was given to farmers' point of view. The idea that resistance or reluctance to change might have some logical basis was never considered.

Many factors can contribute to learning about, and resisting or adopting, new practices. Padel (2001) identified farmers' learning needs and barriers to change as part of an investigation of the process of conversion from conventional to organic

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milk production. Padel refers to the adoption/diffusion model created by Rogers (1995) in predicting and supporting the adoption of individual behavior by looking at personal characteristics, time, and characteristics of innovation. This model serves as a main theoretical foundation for agricultural Extension education (Blackburn 1989).

Learner-centered education uses many instructional methods delivered in a variety of ways to help learners adopt new ideas (Seevers, Graham, and Conklin 2007). Lasley, Padgitt, and Hanson (2001) conducted a study that explored farmers' adoption of electronic communications in Iowa. The study found that one-on-one and personalized communication were preferred by farmers. A variety of non-electronic delivery systems were also strongly preferred by the farmers, including on-farm demonstrations and farmer involvement in applied research.

The benefits of agricultural education for farmers have changed throughout history as farmers' needs have changed. Kelsey and Mariger (2004) compared farmers who do and do not use Cooperative Extension as part of their learning process. Non-users of Extension planted fewer acres, belonged to fewer agricultural organizations, had fewer contacts in formal organizations, were less involved with the land grant system, and had a lower educational level than Cooperative Extension users. Non-Extension users largely preferred to learn through non-written sources of information from family, friends and other farmers, consistent with Rogers' (1995) discussion of later adopters' preferred communications channels. Researchers have asserted that Extension should serve all farmers, indicating that educators should employ a variety of teaching and informational techniques (e.g., targeted mass media advertising campaigns).

AGRICULTURAL EDUCATION

Building relationships and trust are crucial to meeting the educational needs of farmers. The following methods are often effective in establishing these trust relationships and thus reaching farmers: a) individual farm visits, b) on-farm focus groups, c) hands-on workshops, d) networking events, and e) on-farm demonstrations (Tubene, White, and Rose n.d.).

To design successful educational programs, agricultural educators must understand farmers' needs and struggles and design programs to address them (Tubene and Hanson 2002). According to Baharanyi and Zabawa (1996), four issues/questions should be addressed by educational programs targeted for farmers. The first issue is that of availability. That is, are the programs available that target the specific needs of the farmer? The second issue involves accessibility. Are

programs targeting the farmer accessible to them? Third is the issue of equity. Are farm programs funded and delivered in an equitable manner given the population and needs of the producers? The last issue deals with social capital. That is, do local farmers have the necessary social capital to allow them access to available programs and other related resources?

Van Crowder et al. (1998) found that current agricultural education curricula were not relevant to agricultural production. Change in the educational process, specifically the inclusion of Extension education, was found to make significant contributions to agricultural production and rural development. However, the gap between methods and curriculum content was found to create challenges for Extension agents in developing good communication with people in rural areas. These researchers recommended a shift in thinking in Extension training from expert-driven, technology-transfer educational approaches to collaborative learning approaches. They further suggested that effective agricultural education should use participatory teaching and learning strategies, applied field-based practices, and local context related to research-based farming methods. Finally, Van Crowder et al. (1998) asserted that agents with interdisciplinary training might be better able to meet the learning needs of the farmers.

Agricultural educators play a vital role in reaching farmers with education to improve their profitability and quality of life. Effective agricultural education needs to consider learning preferences and motivations of farmers to incorporate their needs into the design, implementation, and evaluation of educational programs (Franz and Townson 2008). Yet, few studies have specifically involved farmers in exploring their learning preferences, processes, and motivations to enhance agricultural education.

METHODOLOGY

A steering committee of farmers and agricultural educators guided our research project in Louisiana, Tennessee, and Virginia. They helped determine research methods and assisted with focus group participant recruitment and logistics. They also participated in data collection, analysis, interpretation, and dissemination. The Collegiate Young Farmers Club at Virginia Tech piloted the initial focus group questions and written survey.

In the first year of the project, data collection began with a survey of Extension agents and specialists on teaching methods they use with farmers. This survey helped shape the focus group protocol questions developed previously by the steering committee. In all, our study involved 15 focus groups of 94 farmers and 21

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Extension agents/specialists over a year and a half in Louisiana, Tennessee, and Virginia (Table 1).

TABLE 1. RESEARCH FOCUS GROUPS BY STATE AND TOPIC

STATE (N=3)	COMMODITY/GROUP (N=15)	NUMBER OF MEMBERS (N=115)
Louisiana	Extension Agents.....	4
	Organic Fruit and Vegetable Producers.....	4
	Rice Producers.....	4
	Young Farmers.....	7
Tennessee	Beef and Forage Producers.....	9
	Extension Agents/Specialists.....	7
	Organic Fruit and Vegetable Producers.....	10
	Tobacco Producers.....	9
	Value-Added (Clients of the Center for Profitable Agriculture).....	11
	Women in Agriculture.....	9
Virginia	Alternative Agriculture.....	11
	Dairy Producers.....	6
	Extension Agents/Specialists.....	10
	Women in Agriculture.....	6
	Young Farmers.....	8

We used a purposive convenience sample of farmers for this study. We selected specific types of farmers in consultation with Cooperative Extension agricultural program leaders to represent a variety of agricultural perspectives and commodities in each state. Participants were also mostly recruited by Extension educators who secured farmers to attend the focus groups. In some instances, groups of farmers were already meeting for other purposes and changed their usual agenda to participate in the focus group.

Each focus group was facilitated by a Project Investigator. Focus group participants were given a written survey during the session about their learning preferences. Observations of focus group participants were also recorded by steering committee members, the graduate student on the project, or another project staff member.

Data were analyzed by hand noting common themes within and across focus groups. After each focus group was transcribed, researchers coded lines in the transcript to identify emerging themes. Quotes from the transcripts were then arranged around each theme. Researchers also wrote associated notes in the margins of the transcripts and made entries in their personal research journals

related to emerging patterns from the themes. After the coding process was conducted by individuals, the team jointly compared and contrasted interpretations of the themes and patterns. This practice moved back and forth between inductive and deductive processes with focus groups in each state and then across all the focus groups. These procedures follow the case analysis processes suggested by Eisenhardt (1989) and grounded and pattern theory approaches to data analysis (Cresswell 1998; Strauss 1987).

Results were triangulated by comparing themes derived from the focus group analysis with the results of the agent and specialist survey, focus group participant surveys, and other data. An additional survey was conducted the first year to determine the value of the steering committee member experience in participatory action research. Data from focus groups were also triangulated with other sources of data in each state (e.g. Extension educator reports, farmer conference panels) about how farmers learn and the practices of agricultural educators.

Several steps were taken to enhance the credibility, trustworthiness, and transferability of the data (Anfara, Brown, and Mangione 2002; Guba and Lincoln 1989; Koch 1994; Rogers and Cowles 1993). Table 2 describes these actions in detail.

FINDINGS

How Farmers Learn

All focus group participants discussed ways farmers prefer to learn and how specific situations or events lead farmers to learn. These situations and events motivate farmers to “gather information” over time from many sources (see Figure 1). During the “gathering information” stage, the farmer seeks evidence to support decisions, determines the costs and benefits of the decision, discovers any pitfalls of the potential decision, and then applies or doesn’t apply the decision in their situation. As a result of this process, the farmer will choose to make, or not make, a change to save time and/or money. The statement of one agricultural educator in our focus groups is illustrative of many farmers. He said,

Farmers learn well either one-on-one or as a part of interactive peer groups. Establishing farmer-to-farmer relationships is normally fruitful as well. These exercises build a sense of community trust among farmers and lend credibility to the Extension agent.

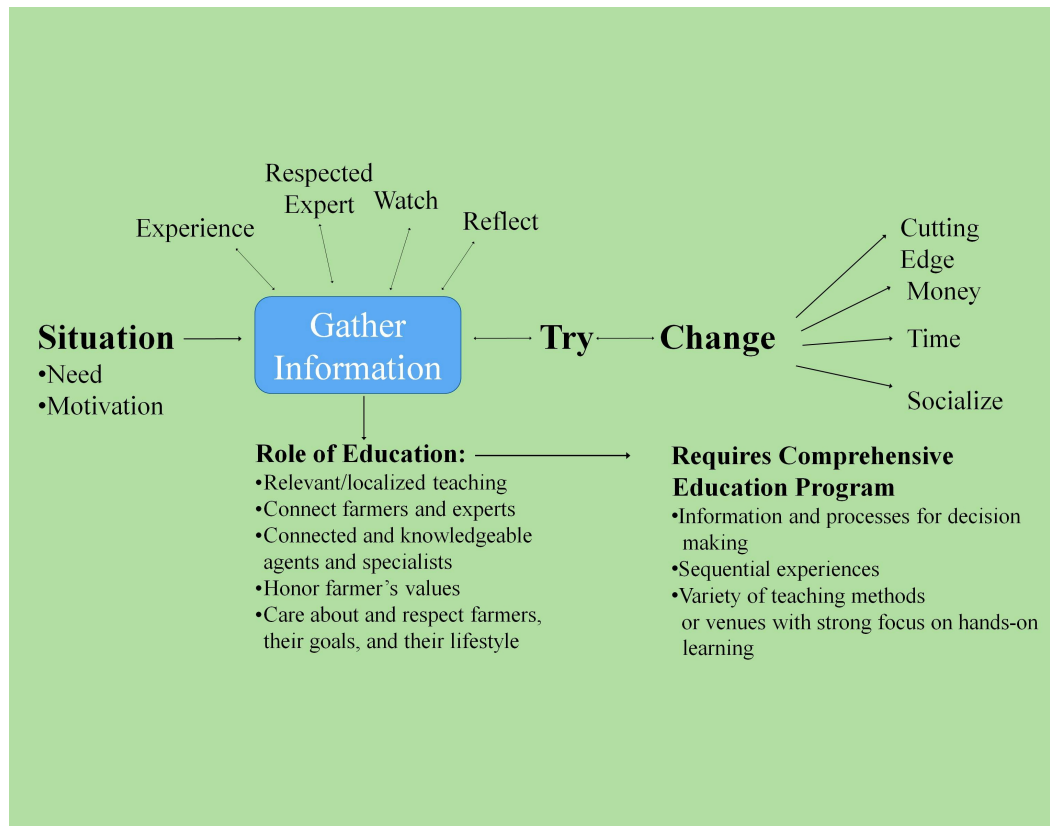
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TABLE 2. METHODS USED TO IMPROVE CREDIBILITY, TRUSTWORTHINESS, AND TRANSFERABILITY

Credibility: readers know results are consistent with data collected (internal validity)	Trustworthiness: readers know findings can be trusted (external validity)	Transferability: readers know findings relate to others' experiences (reliability)
<ul style="list-style-type: none"> • prolonged engagement in the field • steering committee debriefing and examination • triangulation of surveys, transcripts, observations, field notes, researcher journal entries, and secondary data • constant comparative method of data analysis • analytic induction • discussion of researcher bias 	<ul style="list-style-type: none"> • triangulation of surveys, transcripts, observations, field notes, researcher journal entries, and secondary data • constant comparative method of data analysis • analytic induction • discussion of researcher bias • thick description developed of farmer and agent/specialist experience • purposive sampling 	<ul style="list-style-type: none"> • triangulation of survey transcripts, observations, field notes, researcher journal entries, and secondary data • discussing unique cases and the possible resultant effects on the data • utilizing a research steering committee of those being studied to assist with research design, participant recruitment, data collection, data analysis, and findings dissemination • discussion of researcher bias • audit trail using documentation in field notes and journals

FIGURE 1. FARMERS LEARNING PROCESS, MOTIVATIONS, AND ROLE OF EDUCATION.



Detailed findings on farmers' preferred learning methods indicate that farmers from this study most often prefer hands-on methods. Interestingly, a majority of farmers, regardless of age, use the internet to learn. Further detail on these preferences and how they compare with teaching preferences of agricultural educators is reported elsewhere (Franz et al. 2010).

Farmer Motivation to Learn

The focus group members all stated that farmers are motivated to learn to save time and money, to learn about cutting edge research, and to engage in social aspects of agriculture (see Figure 1). Most farmers stated they were interested in making a profit. This motivates them to learn and to make decisions about how to maintain or improve their quality of life, preserve and continue a legacy for themselves and their family, and/or sustain their family in a rural economy.

Many of the participants prefer to learn about something new if an expert can demonstrate how it will save them time and money. One farmer said, "Marketplace

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agriculture is now so global you have to be on the cutting edge or you are going to be behind all the time so you have to have relevant information presented to you in order to keep your operation on the edge.” Another farmer said, “You have to put a dollars and cents figure on it...don’t come up with new technology without putting any numbers behind your technology and what it’s going to do for our operation and how it can benefit us.”

Roles of Agricultural Education in Farmer Learning

Provide relevant and localized teaching. The teaching methods used by agricultural educators need to be relevant to the farmer by taking into account the producer’s experience with farming, their level of education, the scale of their operation, and their geographic location. Many focus group participants agreed that information to help farmers learn needs to be understandable regardless of education and experience levels but also specifically tailored to their context. One participant stated, “There’s nothing that’s going to lose my attention more then [*sic*] if you give me some background information that I learned when I was nine years old. You’re wasting my time.”

The farmers often mentioned that educators need to know their audience well to provide appropriate information. One farmer stated, “If you’ve got a master’s degree in dirt, but you don’t know how to [explain what you know] so people understand what you’re talking about, then what good are you to the community?” Another farmer said he “wants to know if this variety is good, this variety is bad, and that’s all. That’s it.”

Farmers were clear that their agribusinesses are not the same and a one-size-fits-all approach to learning does not work. One participant stated, “Not even once did I hear a prescription from that [seasoned] farmer. You can’t go into that person’s situation and land and give them a system to do exactly as you were doing it.” Another said, “You call over here to the research station and they will tell you one way to do it but that’s not the way it really works in your situation.” One farmer described the difference between two expert opinions he had sought, and he summarized the importance of localized education by stating, “One of them is local and he knew what you needed to know.”

Connect farmers and experts. The nature of agricultural education is changing. Educators must now be able to meet the needs of a wide variety of producers, from conventional agriculture to alternative agriculture to part time farmers and those farmers who hire others to run their operations. For example, Cooperative Extension is no longer seen as the primary source of agricultural information and

education for farmers. Therefore, educators increasingly need to facilitate farmer-to-farmer networks and other group processes to help farmers and experts learn from each other. One farmer said,

The reason I was interested in coming here is not to run my mouth on what I already know but you know, try to soak up and utilize somebody...that's been doing this for years, [who] could tell me just one thing definitely not to do that could save me time or money or headache.

Another farmer said, "I just discovered [in this focus group] that there are other "go to" people that I have to talk to and having a network would be great." One other farmer said, "Sometimes it helps just to bounce questions off someone that you know who is willing to talk to you."

Farmers also want agricultural educators to set up farmer/expert networks. One farmer said,

You know maybe the agent should say well maybe I don't know...let me get to this gentleman, give him his number, and maybe he can help you field this question because that's not really my expertise...I think the Extension Service sees there is a great need for this and they are pushing in that direction.

Provide connected, trusted, and knowledgeable educators. Farmers prefer that agricultural educators be well-connected with agricultural groups, agencies, and resource people. Educators also need to have a broad base of agricultural knowledge and build deep and trusting relationships with a diverse array of farmers. These relationships are often based on farmers trusting educators with experience in the field, not just academic training. One farmer said, "I never call the county agent unless there is a problem. Nobody else knows what's going on." One educator said about his relationship with farmers,

If you consider education more than just gaining knowledge, you have to have that good rapport for them truly to take what you said at face value...because they are not going to trust you as much. They may read your newsletter or find your information on the Internet.

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Agricultural educators also build trust with farmers by helping them interpret information. Farmers indicated that they use educators as a neutral party to “check” the validity of information. One farmer said,

I like to get my information from somebody that’s not biased...I don’t want a drug rep. telling me that his drug’s the only drug that’s going to cure that sick cow. I like to go to somebody, get my information from somebody that’s not going to make a profit off something he tells me.

Another farmer summarized the value of the educator-farmer relationship when he said, “It you can trust them, you’re more likely to listen to them.”

Honor farmers’ values. Agricultural educators may have been exposed to a limited view or practice of agriculture or a specific set of values that guide agricultural production. These educators need to be willing to work with farmers who hold a wide variety of values and practice a variety of production methods. One organic producer stated, “There has been a reliance in academia upon spraying and chemicals. And that has been the paradigm that’s been taught in the universities which permeated the agricultural process in teaching throughout the U.S., probably the world.” In contrast to profitability, these organic producers identified their major reasons to farm organically as personal, specifically the pursuit of family health, the desire for locally-grown food, and the desire to sustain agriculture. Other farmers’ value systems are often based on economic success. One farmer said, “We’ve got to make a profit, so let’s see where the profit line is drawn.”

Care about and respect farmers, their goals, and their lifestyle. Farmers appreciate agricultural educators who take the time to show that they care about them as individuals; their profession, their dreams, and who they are in the world. Many of the focus group participants talked about the importance of educators understanding their agribusinesses before they are interested in learning from them. Focus group participants said their work ethic and values should be understood and respected before educators start teaching. One farmer said,

I really like the Cooperative Extension websites. I think they are great. I go there a lot and look up things that I’m dealing with like how to grow certain crops. But I think it would be nice if there were more perspectives...it seems for a given topic there will be one farmer’s or one grower’s perspective on how to grow it or control the pests but if there were multiple people from multiple areas giving input it would be more well rounded.

Other Findings

Differences among farmer groups. Alternative and organic farmer focus group participants spent more of the focus group time than other farmers sharing information with each other to help one another succeed or save time or money. Alternative and organic producers also relied more often on books and manuals to learn than other groups of farmers.

Female producers noted that they learn and operate differently than their male counterparts. They specifically believe that they multitask more often and more successfully, are more organized, and are more adaptable to change. One female producer said, "I mean as women we are multitaskers...cause it seems like I have a wonderful husband but it's like one thing at a time." Another female producer said, "I just think women like change [and] are adaptable to change better than men. Men like the security of routine and they like to know what to expect." Finally, one female farmer said, "I think a woman has more of an effect to get them [men] there [to educational events]."

Farmers enjoy teaching each other. Peer teaching and learning were mentioned by many of the focus group participants. This included apprenticeships with experienced farmers or helping a new farmer get started. Another farmer said, "I had no agriculture background when I wanted to start farming. I found a farm and went and worked for them for two seasons." And another said, "We did have a vineyard for several years but before we really started on ours I basically apprenticed myself out to another vineyard." Many participants commented on the importance of learning across the generations within and outside of their families. One farmer said, "My learning began with my grandmother and my father and my mother and I'm still learning from my mother who is ninety one years old."

Value of the participatory research process for the steering committee. Farmers and educators on the research steering committees valued their participation in this participatory action research project. They indicated that they gained knowledge, networking opportunities, and other benefits. One farmer said, "It allowed me to gain insight on how other farmers prefer to learn new information and to network with Extension agents and specialists to learn how they are trying to meet the needs of the agriculture community." Another farmer said, "I enjoyed being part of a process that will shape the information delivery to farmers." An educator said, "I've got a first-hand view of a participatory research project, and I've learned a lot about the life of farmers and their relationship with Extension." Finally, an educator said,

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For me, the value is in working with a team of people that are interested in program development and concerned about the ineffective role Extension plays in the sustainable agriculture community. It is also valuable in that it inspires me to think about new and creative ways that my work can influence change. Also, working on a project with [a researcher], who is very well accepted and liked in Extension, had gotten me some “ins” with other Extension agents and specialists.

Comprehensive educational program. Meeting farmers’ educational needs, they told us, requires providing information and processes that help them make good decisions. Sequential educational experiences with farmers are needed to help them build experience, interact with experts, watch others, and reflect on potential changes. Farmers also want a variety of teaching methods or venues with a strong focus on hands-on learning to help them address issues.

Changing demographics and nature of agricultural education. All communities (rural, urban, and suburban) are changing due to migration. There are fewer traditional farmers and farms and an increasing demand from new audiences for agricultural education. Demand is also increasing from hobby farmers, retirees, and homeowners engaging in agriculture for the first time. On top of these demands, there is increased public interest in locally and naturally grown food. This means that agricultural educators are trying to meet the needs of a wider, more diverse audience than in the past which results in less time for on-farm visits and demonstrations and more reliance on forming educational networks and collaborations to reach more farmers with diverse needs.

DISCUSSION

We used focus groups and surveys of farmers and agricultural Extension educators in three southern states to examine how and why farmers learn and the implications for agricultural Extension educators. Farmers prefer learning from peers and experts who have experience with their situation. They are motivated to learn by saving time and money, gaining knowledge about cutting edge research and best practices, and engaging in the social aspects of agriculture. The role of agricultural Extension education in this learning process is to help farmers gather information. During this process farmers want relevant and localized teaching and networks with experts. They also want educators to be connected and knowledgeable, to honor their values, and to care about them. In this study we found learning differences between organic and alternative farmers and between

female and male farmers, as well as among farmers of different ages. We found that farmers enjoy teaching each other, and that a need exists for a comprehensive educational program for farmers. With the changing nature of agricultural education, there is, as uncovered in this study, value in involving farmers and agricultural Extension educators in the research process.

These findings affirmed the value of conducting participatory research that collaboratively involves the participants (e.g. farmers, Extension agents and specialists) in the planning, execution, analysis, and dissemination stages of discovery (Percy 2005; Reason and Bradbury 2001; Wing 1998). This participatory research reduced barriers between researchers and the agricultural community, and promoted critical reflection on the personal practices of farmers and agricultural educators (Brookfield 1987). The participatory research survey results from steering committee members indicated that this type of research process should be used more often since it benefits both researchers and participants, and has the potential to improve agricultural Extension education and adoption of agricultural best practices.

Farmers and Extension agents and specialists in this study affirmed the importance of moving adult education beyond information dissemination to more fully involving farmers in learning processes (Lawrence and Vanclay 1994). Rogers' (1995) concepts of diffusion theory were also affirmed by this study including the role of personal characteristics of farmers and agricultural educators and the timing of education in effecting behavior change. In addition, this study supported Rogers' (1995) finding that characteristics of change agents (e.g. agricultural Extension educators) are linked to farmer learning and the effectiveness of technology transfer. He described the change agent's subject matter competence as one key to the adoption process, and asserted that one of the main tasks of the change agent is creating rapport with clients.

Consistent with prior research, this study supported the need for change agents to have empathy for clients, to understand needs of clients and to build credibility with clients (Havelock and Zlotolow 1995; Rogers 1995). This research also supported other studies that have demonstrated the importance of teaching the economic benefits of an innovation (Bracewell et al. 1993; King and Rollins 1995). Finally, this study found, similar to other studies (Lasley, Padgitt, and Hanson 2001; SeEVERS et al. 2007; Van Crowder et al. 1998), that variety in educational delivery methods and personal relevance are important for successful agricultural education. Moreover, this study expanded the literature by discovering that farmers are specifically compelled to learn by desires to save time and money, learn about

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cutting edge research, and access the social aspects of agriculture. Theory development in agricultural education should look more closely at these motivators of farmer learning.

This study sets the stage for future research projects about farmer learning and agricultural education. First, the farmers in this study indicated a preference for learning in networks with other farmers and experts. Research is needed to determine the potential costs and benefits of these networks and the best practices for developing, maintaining, and evaluating these groups. Studies should also be conducted to determine whether and how agricultural education improves as a result of designing program implementation and evaluation in keeping with farmers' learning preferences and motivations. As indicated by several farmers, Extension agents and specialists, this should include a close look at how Internet use can improve farmer learning and practice, especially since our research found a much higher use of the Internet by farmers than did previous studies (Suvedi, Campo and Knight Lapinski 1999). Finally, this research suggests that more work is needed to determine how social aspects of agriculture such as family legacy, quality of life, and rural lifestyles motivate farmers to learn and change behavior or practices.

This research suggests several implications for agricultural educators and Extension educators in particular. For agricultural educators to offer meaningful educational experiences and opportunities, farmers in the focus groups indicated that they should provide: a) help with interpreting information, b) increased knowledge, c) help with relationship building, d) local support for problem solving, and e) opportunities to save time and money. This means that agricultural educators need to be not only experts in content but also architects of learning processes and environments that directly meet these needs for farmers (SeEVERS et al. 2007). To support this work, agricultural educators who participated in the focus groups want their institutions to: a) understand the dynamics of learning, b) provide and extend resources, and c) recognize and remove barriers to teaching and education. Administrators of agricultural education programs should work to address these requests.

This research revealed five key implications for agricultural educators that triangulate with research in adult learning and agricultural education including the adoption-diffusion process (Rogers 1995):

- Provide holistic educational programs that are outcomes-based, sequential, and intentional to build long-term relationships, trust, and deeper learning among

- farmers. This is consistent with prior adult learning research that found that adults learn best in trusting relationships (Mackeracher 2004);
- Build time into educational programs for farmers to see and try new things that appeal to their interest in hands-on learning (Knowles et al. 1998);
 - Attend to the social side of agriculture (Burkhart-Kriesel and Caine 2004) by helping farmers to network with experts and peers to discuss family and agricultural legacies and quality of life;
 - Strive for transformative education for increased adoption of new practices, not just content transmission that less often results in change (Franz 2005); and
 - Hone interpersonal skills to be a successful agricultural educator and to build relationships with farmers and other experts (Hagarty and Evans 1995).

PROJECT LIMITATIONS

All but one of the focus groups were organized by Extension educators, which may have biased the data in favor of their occupation, geography, or organization. In addition, steering committee members sometimes attended focus groups as observers, which may have influenced participants' input. In both instances, discussion may not have been as rich, deep, honest, or open with educators and steering committee members present.

The focus groups were conducted in the fall and winter seasons. Farmers' responses may have differed if they were asked the same questions at a different time of the year due to the seasonality of their work. Conducting focus groups at varying times of the year may alleviate this limitation.

This research included a small number of farmers from a limited slice of agribusiness. As a result, findings should not be generalized to other farmers or groups. And finally, a downturn in the economy took place when the focus groups were conducted. This may have shaped the participants' participation and responses since \$75 stipends were offered for participating in the focus groups.

CONCLUSION

Agricultural education can be improved by understanding how and why farmers learn and better aligning educational opportunities between farmers' preferences and motivations for learning. Through participatory action research methods, this study helped farmers authentically voice their learning preferences and motivations to influence the improvement of agricultural education, specifically Extension education program development and delivery. In particular, the farmers and agricultural educators involved in this study believe that agricultural educators

should through experiential methods: a) address how education can save farmers time and money, b) help farmers understand and adopt cutting edge practices, and c) create opportunities to socialize in educational venues.

AUTHOR BIOGRAPHY

Nancy Franz is the Associate Dean for Extension and Outreach for Families and 4-H Youth Development in the College of Human Sciences and the Director of ISU to Families at Iowa State University. She is also a professor in the Department of Educational Leadership and Policy Studies at ISU. She has almost 30 years of experience working with Cooperative Extension in Wisconsin, New York, New Hampshire, Virginia, and Iowa in 4-H Youth Development, Program Development and Evaluation, and administration.

Fred Piercy is Associate Dean for Graduate Studies and Research in the College of Liberal Arts and Human Sciences at Virginia Polytechnic Institute and State University. He is also a Professor in the Department of Human Development. He has over 30 years of experience in teaching, research, and outreach work in child development and family studies in Indiana, Texas, Florida, Indonesia, and Virginia.

Joseph Donaldson is an Extension Specialist for Program Planning and Evaluation with the University of Tennessee Extension. He has 10 years experience working with Extension in Tennessee. He has experience with 4-H Youth Development as an Extension agent and Extension Program Development and Evaluation as a state-wide specialist.

Robert Richard recently retired as Department Head/Professor for Extension Program and Staff Development with the Louisiana State University AgCenter. He served for over 30 years as a 4-H agent and Extension specialist in Program Evaluation. He now serves as CEO of Seven Oaks Consulting in Scott, Louisiana, focusing on program evaluation, data analysis, leadership development, and organizational functioning.

Johnnie Westbrook serves as the Graduate Research Assistant in the Department of Agricultural and Extension Education at Virginia Polytechnic Institute and State University. He is also an Extension Program Development and Evaluation Specialist with Alcorn University. He has worked with Extension programs in agriculture, 4-H youth development, and program development and evaluation in three states.

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