Participatory Research and Education: Science in Service to Horticultural Producers

John M. Gerber[1]

There has been a gradual weakening of the extension-research linkage within the U.S. land-grant system (Feller, 1986) and the international agricultural development community (Seegers and Kaimowitz, 1990). Changes within public horticultural research and extension organizations have been documented (Gerber, 1989; Gerber and Masiunas, 1989; Poling et al.; 1991). Recent policy statements from federal-level cooperative extension leaders call for a new interdependence model that strengthens the relationship among extension, research, industry, public agencies, and farmers (Bennett, 1990). This paper introduces a model for strengthening the extension-researcher-producer linkage by focusing on the needs of both horticultural producers and the general public. Further, it offers an alternative to the research and extension education paradigm in which knowledge is "discovered" by university researchers, "transferred" through extension education programs, and "put into practice" by producers. The participatory research and education model changes the largely unidirectional flow of information from researchers to practitioners (Watkins, 1990), and modifies current relationships among growers, extension educators, researchers, agricultural industry representatives, and community leaders (Francis et al., 1990). It provides a model for agricultural research and extension education based on a vision of partnership that better accommodates the changing needs of society and horticultural industries.

The participatory research and extension model

The participatory research and education model is designed to use the specific skills and knowledge of people with diverse training, experience, and interests. When participatory programs are developed to address agricultural problems, the active involvement of growers, researchers, extension educators, consumers, and agricultural supply and support industries is important to the process. Since each group provides the type of input into the research and educational process for which it is best suited, the partnership that develops is mutually respectful and supportive. The process encourages growers to be involved by asking critical researchable questions and suggesting practices for demonstration that would be of interest to their industry. Researchers participate by developing appropriate experimental designs that can be implemented on farms and result in useful and valid new information. Extension educators are involved by designing appropriate learning opportunities for sharing new knowledge and understandingwith a broader community. Agricultural suppliers and support industries offer products and services that make implementation of new solutions possible. Community groups represent a concern for how agricultural research and education will affect community viability and environmental integrity. In all cases producers must be full participants in identifying the problem, setting objectives, selecting alter-

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[1]*Assistant Director and Professor.*

Agricultural Experiment Station, University of Illinois, 1301 W. Gregory Drive, Urbana, IL 61801.

native solutions for testing or demonstration, and interpreting results. While others must be involved in the process at various stages, only growers can finally implement new practices, procedures, and principles that will result in improved situations.

The need for meaningful farmer participation in agricultural research and education has been recognized by the international agricultural development community (Chambers et al., 1989; Farrington and Martin, 1988; Whyte, 1991). The emergence of the farming systems research and extension model as a framework for international agriculture programs was based on social science research demonstrating the need for increased citizen participation in community development (Habana-Hafner and Reed, 1989; Whyte et al., 1991). However, most U.S. agricultural research and extension education programs have not explored this new paradigm actively. Some agricultural scientists have difficulty accepting their proposed role as partners or co-learners in the process, rather than as experts. Some growers have voiced concern over the utility of a research methodology that demands replication and complex sets of treatment variables in experimentation. Participatory research and education may provide a means of resolving this conflict.

The dilemma

Francis et al. (1989) describe the characteristics of a research or educational project that are useful to producers. These are: *plots* that are large and provide clear visual results; *treatments* that cause modest investments and/or minor changes in equipment; *focus* on yield, profitability, and risk reduction; *experimental conditions* that are representative of their farm and farming operation; *results* that can be implemented on their own farms.

On the other hand, the characteristics that make research or education projects useful to a scientist are: *plots* designed for statistical validity; *treatments* that allow control of nontreatment variables; *focus* on publishable results; *experimental conditions* that are representative of a large region; *results* that yield universal truths.

While scientists are trained to search for universal truths, growers seek local solutions. A methodology that allows both is needed for various groups to gain ownership of the process. Participatory research and education may provide such a method.

The method

Participatory research and education programs generally will consist of a multiple-stage process (Maguire, 1987) consisting of: a) identifying the problem; b) setting objectives; c) selecting alternative solutions and project design; d) implementing the project; e) interpreting the observations; and f) sharing the results.

This may be more fully described in an agricultural situation as follows:

a) ***Identifying the problem.*** Groups of producers, researchers, educators, consumers, and representatives from agricultural industry discuss problems and opportunities in an open forum. Growers must play an active role at this stage to help identify problems of real concern. This is an on-going process of sharing ideas, knowledge, opinions, and visions. Growers are involved in developing theories to explain observations made of their own world. These theories provide the basis for hypotheses for research, or practices for demonstration.

b) ***Setting objectives.*** Research and/or educational objectives are determined through dialogue and mutual agreement. Educators and researchers participate by helping growers define objectives clearly. It should be determined at an early stage in the process whether an objective is primarily research or educational. If previous research or substantial experience suggests that a farming practice is likely to be successful, an educational format is in order. If no general consensus regarding the value of a practice can be reached, or specific implementation questions still exist, research is in order.

If partnership is to be achieved, objectives should reflect both the needs of growers and the abilities of the researchers or educators involved as participants. Further, if public university staff are involved, a concern for the public good must be considered. Often consumer or community group representatives can provide this perspective. Mutual respect, honest dialogue, and compromise should result in the selection of appropriate objectives.

c) ***Selecting alternative solutions and project design.*** Participants develop their own theories explaining the cause of the selected problem and offer alternative solutions. If the project is primarily research, solutions should be suitable for testing using appropriate scientific methodologies. Research methods may range from small field plots to whole-enterprise analyses. If the project is educational, solutions should have been proven to work through either previous research or extensive experience. Project design should be determined through dialogue and mutual consent of growers, researchers, and educators.

d) ***Implementing the project.*** Particular aspects of implementation should be conducted by the most appropriate member of

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the team. Implementation includes set up, care, observations, and perhaps data collection for research projects. On-farm plots should be planned by all participants, but daily care will be left to the judgment of the grower in consultation with the researcher or educator. While the researcher often will provide leadership for collection of data, growers must make their own visual observations and conclusions as well.

e) Interpreting the observations. Interpretation of research findings or educational impact should be made by everyone involved in the project. Growers should be asked to provide observations and make conclusions that are valid from their perspective. It is likely that the grower will "see" things differently than the researcher or educator. Researchers or educators should also provide interpretive input from their science-based perspective. All of the participants should meet regularly to discuss observations, results, and conclusions. A working relationship built on partnership and respect will result in a fair and honest interpretation of the project.

f) Sharing the results. Extension educators and/or research staff should organize meetings and/or publications to share experiences, opinions, and new knowledge. Grower observations and interpretations must be included in the process. Meetings should be arranged to allow maximum participation and dialogue. Since participatory research and education represents a circular process that never really ends, the observations, conclusions, and opinions developed during one year will result in new questions for research and new objectives for future educational programs.

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Validity

Although some researchers (Rzewnicki et al., 1988) have demonstrated that on-farm research using large plots and active farmer participation can meet the conditions necessary for statistically reliable research, many scientists remain skeptical. The controversy over the relative value of on-farm vs. experiment station research has been going on since the inception of the experiment station system (Kerr, 1987). Among the components of this controversy are conflicts between the following perspectives (Taylor, 1990): 1) disciplinary vs. multidisciplinary approaches; 2) whole-farm vs. single-practice analysis; 3) short- vs. long-term objectives; and 4) synthesis vs. analysis frameworks for research.

In addition to these conceptual problems, a number ofprocedural questions exist. An exploration of the following issues relating to participatory on-farm research is needed (Taylor, 1990): 1) sample selection procedures; 2) number of sampling units required; 3) comparative tests among farms; 4) design of the on-farm research plots.

The conceptual foundation

In the social sciences, attention has been given to a process called participatory action research (Maguire, 1987; Whyte et al., 1991). This process is employed when the objective of research is not only to seek solutions to a problem but to encourage people to take action based on the new understanding. Thus, participatory action research removes the traditional separation between knowing and doing, and provides a strategy in which research and action are closely linked (a traditional role for extension).

Sriskandarajah et al. (1989) describe three ways of learning: propositional (learning for knowing); practical (learning for doing); and experiential (learning for being). "Learning for knowing" is an explicit goal of basic research. "Learning for doing" is a foundation of applied research and many extension educational programs. "Learning for being" is a concept that integrates the first two and describes further how people see themselves in relation to their family, community, and environment. While the first two learning modes support the business of farming, "learning for being" supports the lifestyle of farming. The agricultural academic community recognizes the importance of the first and second learning modes, while generally ignoring the third. Participatory research and education attempts to remove the separation between these three ways of learning (Tandon, 1981). Participatory programs include, but go beyond, an objective investigation of facts (learning for knowing). They result in more than a recommendation on how to act (learning for doing). They have the intention of understanding reality to make improvements in either the physical system and/or the people involved in the study (learning for being) (Hall et al., 1982). Thus, participatory research and education combines investigation, education, and action in a single process in which the traditional boundaries between scientific research, extension education, and practical farming become less important.

Conclusion

The participatory research and education model represents for some a rediscovery of an old tradition, the land-grant mission of service. It encourages researchers and extension educators to focus on the needs of growers rather than their own special inter-

ests. While the participatory model may not be appropriate for much of the research conducted at land-grant universities, it should have a place in many applied research and extension educational programs. Participatory programs are needed today, not only because they are more democratic than an expert/student relationship between scientists and growers, but also because they can be more effective than the expert/student model. Since most active adult learning is learner-driven, i.e., adults actively learn what they perceive they need to know (Tough, 1982), new research findings are more likely to be understood and acted upon by growers when they are participants in the research process.

The introduction of a new conceptual framework for a research and education paradigm to the scientific community is not an easy endeavor, and the early reaction is likely to be outright rejection. Nevertheless, the exploration of a new paradigm followed by improved understanding and perhaps acceptance is more likely during a period of discomfort with the old paradigm (Kuhn, 1970). For example, the failure of some "top-down" international agricultural development programs resulted in the need for, and ultimate exploration of, the farming systems research and extension model (Farrington and Martin, 1988). Recent periods of financial stress, coupled with increased public criticism, may provide an environment in which land-grant universities are more likely to explore a new way of doing business.

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