Are Traditional Extension Methodologies Extinct or Just Endangered?

William M. Eberle* and James P. Shroyer

ABSTRACT

Traditional extension educational methods and extension specialists' roles have evolved over the past 200 yr. However, the need to deliver a sound agronomic extension program using a variety of methods remains. New technologies have provided new tools and opportunities to reach clientele, but one or two methods cannot reach everyone. Albeit on-farm demonstrations, public meetings, and printed publications are not as glamorous as these new delivery methods, they are still important components of an overall extension program because of the clientele contact and educational benefits. Farmers obtain information from numerous sources, but they still prefer to observe new or appropriate practices under local conditions and to have direct interaction with the extension educator. Also, extension specialists benefit from the clientele interaction by hearing farmers' concerns and new ideas for research and development of effective educational programs.

ELECTRONIC TECHNOLOGY has given us the ability to assemble, analyze, transmit, and receive vast amounts of information. Dillman (1986) described the information age:

> We are now experiencing an astonishing revolution in people's abilities to organize, store, retrieve, and transmit information. The essence of the information age is massive increases in all of the following: the speed by which communication may occur between one place and another; the amount of information that can be transmitted from one point to another; the fidelity of long- distance communications; miniaturization of computer and communication technologies; the ability to send as well as receive information from virtually any point on earth; the relative importance of telecommunicated messages compared with transactions requiring physical movement as determinants of people's behavior; the ability to select from data banks the precise information needed for making decisions; the ability through artificial intelligence to conceptualize problems and possible solutions in ways beyond individual human capabilities; the relative importance of information versus labor and energy in the production of goods and services; the rate of change in who interacts with whom for what purpose.

Dillman's description still applies to the information/communication age we are now experiencing. However, in 1986, the Internet was in its infancy, broad access to the World Wide Web was still several years away, and personal computers were capable of only minimal tasks and available only to a few. Perhaps no one could have foreseen the speed with which new information and communication technology would change the way people acquire information.

Extension specialists and agents have begun to take advantage of these new technologies for delivering educational information to clients. Clients increasingly are capable of accessing that information and have come to expect the instant response that technology can provide. Given the vast quantity and potential quality of information that can be made immediately available to clients, what are the effects on what we view as traditional extension educational methods? Are these methods becoming insignificant or even worthless? Are they endangered, or are they already extinct?

Evolution of Extension Educational Methods

What are traditional extension educational methods? History tells us much about how the role of the extension worker, using a variety of agronomic education teaching methods, has evolved over more than two centuries. Although new educational methods and tools have emerged, many others began with the earliest days of agricultural extension work.

Modern cooperative extension programs had their formal beginning with the Smith-Lever Act of 1914 (Prawl et al., 1984). That law authorized cooperative extension work between the land-grant universities and the USDA. It specifically defined extension work as "the giving of instruction and practical demonstrations." However, extension and its educational methods have roots that extend to the founding of the nation.

The Philadelphia Agricultural Society, organized in 1785, was one of the first of many agricultural societies founded in the 18th century to promote agriculture (Kelsey and Hearne, 1955). George Washington was known to have communicated with the group and in 1785 encouraged expansion of their philosophy into other geographic regions.

> The Agricultural Society, lately established in Philadelphia, promises extension usefulness if it is prosecuted with spirit. I wish most sincerely that every State in the Union would institute similar ones; and that these Societies would correspond fully and freely with each other, and communicate all useful discoveries founded on practice, with a due attention to climate, soil, and seasons to the public (Library of Congress, 1998–1999).

Minutes of the Massachusetts Agricultural Society in 1792 describe meetings held to forward improvements in agriculture (Kelsey and Hearne, 1955). These likely were among the first *extension meetings* in the USA.

By the mid-19th century, the agricultural society movement had spread across much of the nation. In 1854, Charles Flint, Massachusetts secretary of agriculture, saw a need for agricultural education for farmers and believed that the formation of farmers' institutes might supply that need. Leaflets were distributed on subjects such as manures, pasture renovation, grain crops, fruits, and fencing. Publications soon were followed by discussions and lectures by leading agriculturalists

Department of Agronomy, 2014 Throckmorton Hall, Kansas State Univ., Manhattan, KS 66506. Contribution no. 00-239-E from the Kansas Agric. Exp. Stn. Received 3 Jan. 2000. *Corresponding author (weberle@oznet.ksu.edu).

Published in J. Nat. Resour. Life Sci. Educ. 29:135–140 (2000).
http://www.JNRLSE.org

Table 1. A methodological classification of cooperative extension education.†

	Teaching approach		
	Individual	Group	Mass
Teaching method	Office call Letter Demonstration Farm and home visit Self-directed learning	Meeting Tour/field day School/class Workshop Conference Demonstration Lecture	Exhibit Radio Television Fair/show Movie Newspaper
Teaching tool, aid, device, technique	Telephone Computer terminals Cassette, audiotape Cassette, videotape Chart Chalkboard Bulletins Models Tools Specimens	Photograph Poster Leaflet Bulletins Movie Panel Projected visuals Flip charts	Gaming/simulation Teaching machine Television Buzz session Role playing Circular letter Displays

† Adapted from Prawl et al., 1984.

on soils, butter making, cattle (*Bos taurus*) breeding, grape (*Vitis* sp.) culture, and other subjects (Kelsey and Hearne, 1955). Those leading agriculturalists possibly were the first extension specialists. However, many of them were not based at colleges, because the land-grant system of agricultural colleges, agricultural experiment stations, and extension were still beyond the horizon.

Over the next several decades, agricultural societies and farmers' institutes began to flourish in the Midwest. The 1862 Morrill Act enabled establishment in each state of land-grant colleges offering practical education in agriculture and engineering. Increasingly, the expertise used in farmers' institutes came from these agricultural schools. The Kansas Board of Regents, in 1868, directed Kansas Agricultural College to set up a lecture series to disseminate the benefits of farming according to correct practices (Rasmussen, 1989). One of the first in the Midwest, The Union Agricultural Society of Kansas was founded in 1868 and held its first farmers' institute at Manhattan later that year (Teagarden, 1964). *Kansas Farmer* magazine reported on that first farmers' institute, helping to spread the word about this relatively new, agricultural education program to farmers in rural areas. This is an early example of the importance of mass media for distribution of information.

The Hatch Act of 1887 established a national network of agricultural experiment stations at the land-grant colleges. By the end of the 19th century, many colleges undertook various types of extension work, including field demonstrations, cooperative experiments, extension lectures, reading courses based on popular bulletins, traveling libraries, and other kinds of outreach programs (Kelsey and Hearne, 1955). These early extension educational programs were delivered by college teachers or experiment station research personnel who were assigned extension-type responsibilities. As the extension idea grew, agricultural colleges began to develop organizational structures for extension work and hired personnel for those specific duties.

The concept of "taking the university to the people" began to evolve. Traveling great distances to participate in farmers' institutes was difficult for farmers in remote areas, so colleges initiated ways to take educational programs to the farmer. In several states, the railroad was seen as a way to reach out into the countryside. In 1905, President Nichols of Kansas State Agricultural College persuaded the Rock Island Railroad to operate a farmers' institute train. The train covered 1648 km (1030 miles), and made 30-min stops in 135 locations over a 2-wk period (Teagarden, 1964). In some states trains sometimes remained in a community the better part of a day, and several train cars or local halls were used for concurrent training on several topics.

By the beginning of the 20th century, most expertise in agricultural educational was located on the college campus, with faculty *extension specialists* traveling to more remote locations when possible. Travel and communication to many rural areas remained difficult, and the brief programs on limited topics reached only those farmers who could travel to the sites. Actual face-to-face contact between agronomic educators and farmers was limited (Rasmussen, 1989). However, personal contact methods were seen as important in building the confidence of farmers in the extension worker (Kelsey and Hearne, 1955).

Agricultural colleges increasingly saw the need to have professional educators located off-campus to work more closely with farmers on their farms. By the time the Smith-Lever Act was passed in 1914, many states had already gained significant experience in implementing what we know today as the county extension agent network. The legislation moved that process along rapidly during the first two decades of the century. With a network in place, farm and home visits, on-farm demonstrations, and regular one-on-one contact by local extension agents became viable methods for program delivery.

The role of extension specialists changed, also. As the knowledge base grew, they became more specialized. Although they continued direct delivery of educational programs to farmers, their role became one of providing more specialized knowledge, not only to producers, but also to the network of county agents. With their campus location, they increasingly became interpreters of agronomic research and teachers of highly specialized subject matter.

By 1930, a set of methodologies was in place that most extension specialists will recognize today as traditional extension methods. Rasmussen (1989) describes these as:

1. Result and method demonstrations
2. Exhibits
3. Farm and home visits
4. Meetings
5. Printed material
6. Newspapers and magazines

Prawl et al. (1984) further expanded extension teaching methods and proposed a categorization that included teaching approaches, teaching methods, and teaching tools (Table 1). They categorized teaching approaches according to the type of audience: individual, group, or mass. They viewed them as a continuum from personal to impersonal contact.

These methods and associated tools differ from Rasmussen's classification primarily in their inclusion of new technologies introduced over several decades. Even in 1984, though, it would have been difficult to foresee the emerging electronic communication technologies of the last decade of the 20th century.

Technology always was and remains important in extending the reach of traditional methods. Just as the extensive railroad system permitted the use of trains to reach rural communities, the automobile and an improved road system allowed education to be taken directly to the farm. Radio, and later television, supplemented newspapers and magazines in reaching mass audiences. Development of telephone systems in rural areas allowed extension workers, especially campus-based specialists, to communicate individually with each other and agricultural producers without always needing to travel to the farm or local community. Although these are familiar technologies to us, those early organizers of agricultural societies could not have begun to imagine them.

Technology also enhanced the quality of teaching as photography, lantern slides, filmstrips, and motion pictures became commonplace teaching tools. Later came color slides and overhead transparencies, audiotapes, and videotapes. During the last decades of the 20th century, computers and other electronic technology have permitted movement of huge volumes of information to nearly anywhere in the world. Satellite technology permits live visual and audio contact between farmers and distant specialists. However, most of those technologies did not add to the list of extension methods. For the most part, they just provided tools to make existing methods more effective.

Understanding How Producers Learn and Adopt New Practices

As a set of extension methods evolved, so did understanding of the process by which farmers adopted new ideas and practices and how extension methods related to that process. Lionberger (1960) identified the steps of the adoption process as

1. Awareness: When an individual is first exposed to a new idea, practice, or product.
2. Information: When an individual actively begins to seek detailed information about the idea to determine its possible usefulness and applicability.
3. Evaluation: When an individual studies and analyzes the acquired information to see how it might fit his (or her) situation.
4. Trial: When an individual puts the new information to the test.
5. Adoption: When an individual integrates the new idea, practice, or product in an ongoing operation.

Mass media and newsletters, along with publications and individual contacts, are important in creating awareness. Publications, group meetings, and individual contacts are traditional methods to provide information. Method demonstrations, group meetings, and individual contact are important in advancing the farmer through the evaluation phase. Finally, a farmer is more likely to adopt a new practice if he or she can actually see it work and get first- hand information about the practice. This trial phase usually requires result demonstrations and individual contact. Adoption is most likely to occur if the farmer is aware of a need, has adequate information, has the opportunity to evaluate the practice, has the opportunity to see it work, and receives individual guidance. Individualized personal contact becomes increasingly important as the farmer moves closer to adoption. The importance of knowing the extension worker personally is emphasized by studies showing that people who have had personal contacts with extension workers have used four times as many practices as have people who have had no contact (Kelsey and Hearne, 1955).

By the 1920s, the science of adult education also began to evolve. It became apparent that adult learners have special characteristics that affect the way they learn. Through empirical research, those characteristics have been identified; Knowles (1984) described an andragogical model based on the following assumptions about adults as learners.

1. Adults have a need to know why they should learn something.
2. Adults have a deep need to be seen as self-directing.
3. Adults have a greater volume and different quality of experiences from youths.
4. Adults become ready to learn when they experience a need to know or be able to do in order to cope effectively with their real-life situations.
5. Adults are life-centered (or task-centered or problem-centered) in their orientation to learning.
6. Adults are motivated to learn by both extrinsic and intrinsic factors.

These assumptions imply that adults as learners need interaction with the *teacher* in helping to design the educational experience. This understanding of adult learning further solidified the extension tradition of developing educational programs in response to producers' needs and working with them on an individual basis. To develop effective agronomic educational programs, extension specialists must have sufficient personal contact with farmers to understand their needs and concerns.

The Evolution of New Educational Technologies

Many educational technologies of the past now have become traditional tools for extension education, particularly in the area of electronic communication. Where telephone access to rural areas was rare in the early 20th century, it is now an everyday communication staple in extension program delivery. With cellular telephone technology, specialists can reach, or be reached from, any rural location. Fax machines that utilize the telephone network have become standard office equipment. Radio was a novelty as a mass communication tool in the 1920s. It evolved into an important tool, and television has offered the added advantage of being able to transmit motion pictures. Audio tape recording added to live radio transmission as a way to enhance voice communication. Motion picture films have been replaced largely by videotape. Satellite communication and computer technology now permit direct audio and visual communication to and from remote locations.

Computer technology developments during the past two decades have contributed to innovations in extension educational technology. Computer programs have been developed as decision-making tools for agricultural producers. Thousands of databases have been developed. Computer-generated, digital educational presentations are replacing slides and overhead transparencies as educational visual aids. Extension workers have excelled in preparation, printing, and delivery of all kinds of printed documents. Now printed publications

are supplemented, and sometimes replaced, by electronic versions that can be accessed by anyone in the world, and entire libraries of publications can be published on a single CD-ROM disk. People from scattered areas can be brought together through teleconferencing.

Computer networks have revolutionized the communication of information to remote areas through electronic mail and the Internet. Electronic mail has become widely accepted and used as a means of fast communication among individuals and groups. The evolution of the World Wide Web has had perhaps the greatest impact on the electronic sharing of information. Most of what we now know as the Web began only in 1993 with the development of the Mosaic Web browser at the University of Illinois (Lineberger, 1998). Today, the Internet and World Wide Web are pervasive in society. Television and radio programs commonly list their email and Web addresses. Advertisers encourage customers to view their Web sites. Millions of people, including most extension workers, now have email addresses, and many of them have their own home pages on the Web. Anyone with computer communication capability can access millions of pages of electronic information in formats that include the printed word, sound, and still and moving images, all in full color.

The World Wide Web reduces access time and cost, lowers cost of instructional material, enlarges the scope of material available, and enhances the learning process by creating a learning environment in which access to instructional material is managed by the learner, rather than controlled by the educator (Biggs and Grove, 1998).

Traditionally, extension has been the major provider of objective, research-based agricultural information. As owner of the information, it had a great deal of control over the types of information and its distribution. With mass availability of electronic communication, any person or organization can become a provider of agricultural information. The Internet does not have a set of standards for accuracy or value of information provided. The private sector has moved rapidly into information distribution beyond traditional farm newspapers and magazines. Extension and the land-grant system bring two dominant strengths to the customer: objectivity and overall accuracy. However, these attributes alone may not counter the relative value of convenience and ease of access of private-sector information available anytime, anyplace, and anywhere (Boehlje and King, 1998).

Extension's rural agricultural clients are moving quickly into the information/communication age. A recent study by the National Agricultural Statistics Service (1999) shows that computer access on farms is growing rapidly, especially on large commercial farms. From 1997 to 1999, the percent of all farms with computer access increased from 38 to 47%, and among commercial farms (sales of $100 000 or more), computer access increased from 60 to 68%. Although cost and accessibility of telecommunication are inhibiting factors, farm Internet access more than doubled during that 2-yr time period (from 20 to 43% among commercial farms).

What is the impact of all of these new educational technologies? Does their emergence imply that traditional extension educational methodologies are no longer as important or are unnecessary? Or are they simply new tools for using traditional extension educational methods—tools that may themselves be viewed as traditional as the telephone in the future?

Usefulness of Extension Methods

Several studies have investigated the relative usefulness of various extension educational methods and tools. Most of them dealt with methods from a user preference viewpoint, and no single study has compared all methods and tools over a wide range of programs. Few have attempted to measure the effectiveness of extension methods in improving learning. Because of the relatively recent emergence of information and communication technology as a driving force, most studies do not directly compare the use of new technologies vs. traditional approaches.

In a national assessment of extension, Warner and Christensen (1984) found that the most common way users came into contact with extension was through written materials, including bulletins, newsletters, and other publications, followed closely by radio and television. At a distant third were meetings or workshops. Of course, at that time, the Internet was quite new, and the Web did not exist.

Several studies have compared various traditional extension educational methods and tools. Call and Boone (unpublished data, 1996) asked producers to indicate the usefulness of methods for delivery of pesticide information in northeast Kansas. The pesticide label, demonstration plots/fields, field days, and farm visits were rated first, second, third, and fourth, respectively. These were followed, in rank order, by meetings, manuals, fact sheets, and newsletters. Photos or charts, radio and television, magazines, newspapers, and slides and videos were rated as being of little or no usefulness.

In a survey of persons attending tours of wheat variety demonstration plots, Shroyer et al. (1992) found that 89% rated those tours above average to high in importance for the information provided. These were followed closely by publications at 80%. Only 58 and 56% rated the importance of information at winter crop schools and preplant wheat schools, respectively, as above average or high.

Obahayujie and Hillison (1988) investigated methods of getting information to beef producers in Virginia. Both full-time and part-time producers placed high value on newsletters/publications, visits to experiment stations, office calls, telephone calls, personal letters, tours/field trips, and on-farm demonstrations. In general, full-time producers expressed a relatively greater preference for mass contact methods such as newsletters, bulletins, leaflets, and radio programs compared with part-time producers. Part-time producers showed a relatively greater preference for more individual contact methods such as on-farm demonstrations, farm and home visits, and workshops.

A more recent study in North Carolina (Richardson et al., 1997) produced quite similar results showing that beef producers preferred newsletters, other publications, personal visits, field days, method demonstrations, and meetings. Neither the Virginia nor the North Carolina study included communication technology choices other than a single choice on computer software or computer messages. In both cases, these tools were rated near the bottom of client preference.

In a study of educational outreach on integrated pest management and producer adoption in Utah, Alston and Reding (1998) found that for ongoing educational programs, extension, and industry publications and workshops were the preferred formats. For quick access to pest advisory information,

extension publications were preferred. Computer access and radio and television programs were the least preferred formats for obtaining information.

As part of a study of educational needs of beginning farmers in Iowa, Trede and Whitaker (1998) identified educational media preferences of clients. Beginning farmers expressed a high level of preference for personal involvement such as: experiential learning, production agriculture skill development, and hands-on problem-solving. These are methods requiring personal interactions such as those required in workshops and one-on-one visits. They rated radio, informational services, marketing services, newspaper, television, and extension pamphlets higher than such contemporary media as satellite dish, Internet–World Wide Web, and videotapes. Although more than two-thirds of the beginning farmers reported having access to a computer, fewer than 30% reported having a fax machine, using electronic mail, or subscribing to an on-line computer service.

King (1999) surveyed Pennsylvania farmers to identify effective and efficient methods for pacing of instruction on soil sampling. Farmers preferred group-paced instruction rather than self-paced instruction. They indicated preferences for extension meetings, workshops accompanied by a pamphlet, and one-on-one instruction. The researchers concluded that extension programs using pamphlets and meetings should be continued.

Electronic technology is sometimes substituted for human resources to reduce program costs. In Kentucky, county extension agents reported that they spent more than half of their time on individual contacts, such as visits, office calls, and telephone calls. This reflects the proximity of the county agent to the user. Thirty-nine percent of extension agent time was spent just on visits outside the office, the most expensive method of making contacts (Warner and Christensen, 1984, p. 108–110). Although the study did not address contacts by specialists, observations indicate that, although specialists are more likely to be involved in development of written materials and media presentations, they also spend significant time in individual educational activities.

In a Vermont study, dairy producers were asked to place a dollar value on farm visits (Calderwood, 1997). Forty-three percent of farmers surveyed felt that visits increased their profitability by more than $500, although larger producers tended to value such visits more highly than small dairy operators.

Shroyer (1998, unpublished data) interviewed experienced agents to estimate the relative time requirements and costs of various methods. Mass communication methods such as newsletters, news columns, and radio programs required relatively little time per event and cost the least per contact. Individual contact activities include farm visits, telephone calls, and office visits. Telephone and office visit contacts required relatively little time per event, but because of the individual nature, were seen as being fairly costly per contact. Farm visits were costly per contact because of additional time and travel requirements. Group contacts, such as meetings and demonstrations, were rated as some of the most expensive events to conduct. They involved significant preparation time and often required time and expenses of participating state or area specialists. However, group methods provided opportunities for targeting a specific client group.

A Texas study of using videoconferencing as a tool for achieving technology transfer (Hiel and Herrington, 1997) found that technology helpful in reaching large numbers of people at a relatively low cost. However, educators expressed concern about the loss of personal contact with clients.

Satellite-downlinked educational programs were used to reach maple producers in New York, Pennsylvania, Michigan, Minnesota, and Quebec (Staats, 1995). Travel costs and time commitment of specialists were reduced by 90%. Most participants indicated high satisfaction with the downlinked programs, although New York participation was only about half of that with previous traditional methods.

What can we learn from these studies? The relative usefulness of different methods depends on client perception and the subject matter. For some audiences, individual contact with the extension educator is of high importance. Others find that printed material best meets their needs. Costs usually increase for more individualized methods. Nevertheless, personal contact methods appear to be favored by many extension specialists.

DISCUSSION

Traditional extension teaching methods that have evolved during the last 200 yr are still important today. Many new communication and information technologies have emerged in the past two decades. Most of these technologies, are not new methods but, rather, provide new tools to expand the reach of traditional methods, often at a reduced cost.

Information/communication technologies are becoming widely used to disseminate information critical for decision-making, supplementing, and often replacing such mass- distributed print media as bulletins, newsletters, and news releases. These technologies have the potential to make vast amounts of information available to farmers and can allow them to select that information most appropriate to their needs. Information can be accessed quickly, at a low cost, at any time, and from any place. Communication technologies, such as the World Wide Web, can reduce the cost of material preparation and delivery and greatly expand the scope of available information. However, because not all farmers have ready access to newer technologies, printed versions will continue to remain important.

Extension is respected for its unbiased, research-based information. Almost anyone can load information into the World Wide Web, and some of it may be biased. How will extension set itself apart from other information sources, when it is no longer sole owner of the primary distribution system for agricultural information? Traditionally printed publications will likely continue to be a primary means by which extension provides information. However, that information will have to be simultaneously directly available through the Internet and World Wide Web with other information sources.

Users of extension educational programs generally still prefer individualized access to needed specialized assistance to help them deal with unique complex problems. Extension workers see face-to-face individualized methods as helping to keep them current on farming issues. Farm visits, office visits, and personal communication will continue to be significant extension methods. However, telecommunication technology already has expanded the capability for personal com-

munication with cellular phones, email, voice mail, and fax. Computer-based simulations and worksheets can be placed on the Web for individual producers to use in solving their specific problems.

Information/communication technologies also have provided tools to enhance group educational methods. The extension meeting has always been a basic method. Technology has now added satellite broadcasting with two-way communication; teleconferencing; and interactive, educational, Web-based programs. Virtual field days can be developed on the Web, permitting those from some distance away to gain the same type of information as those who attended.

Traditional extension methods are neither extinct nor necessarily endangered. Technology can provide new tools to enhance delivery of agronomic extension programs. These tools have potential to reduce costs and help in reaching new audiences within resource constraints. However, the basic set of extension methods will continue to be the framework that can support a wide variety of new technological tools. The success of extension educational programs will depend on selection of the proper methods for specific program needs and tools that will make those methods more effective and efficient. More research is needed to determine the relative usefulness of information and communication technologies compared with traditional approaches, both in terms of user preference and learning effectiveness. Extension specialists and agents will need to integrate what is known about how adults learn and the adoption process with what can be achieved with technologies. The challenge will be to discover how to use new tools without losing the personal individual contact between extension specialists and farmers for which extension has become known. Traditional extension methods are endangered only to the extent that extension professionals fail to relate two centuries of experience to the use of new technologies.

REFERENCES

Alston, D.G., and M.E. Reding. 1998. Factors influencing adoption and educational outreach of integrated pest management. J. Ext. 36(3) [Online]. Available at http://www.joe.org/joe/1998june/a3.html (verified 1 Sept. 2000).

Biggs, A.R., and G.C. Grove. 1998. Role of the world wide web in extension plant pathology: Case studies in tree fruits and grapes. Plant Dis. 82:452–464.

Boehlje, M.D., and D.A. King. 1998. Extension on the brink: Meeting the private sector challenge in the information marketplace. J. Appl. Commun. 82(3):21–34.

Calderwood, L.H. 1997. Survey of dollar value and importance of farm visits to eastern Vermont dairy farmers. J. Ext. 35:(2) [Online]. Available at http://www.joe.org/joe/1997april/rb2.html (verified 1 Sept. 2000).

Dillman, D. 1986. Cooperative extension at the beginning of the 21st century. The Rural Sociologist 6(2):102–119.

Hiel, E.R., and D. Herrington. 1997. Plausible uses and limitations of videoconferencing as a tool for achieving technology transfer. J. Ext. 35(4) [Online]. Available at http://www.joe.org/joe/1997august/rb1.html (verified 1 Sept. 2000).

Kelsey, L.D., and C.C. Hearne. 1955. Cooperative extension work. 2nd ed. Comstock Publ. Assoc., Ithaca, NY.

King, R.N. 1999. Identifying effective and efficient methods to educate farmers about soil sampling. J. Ext. 37(1) [Online]. Available at http://www.joe.org/joe/1999february/rb3.html (verified 1 Sept. 2000).

Knowles, M. 1984. The adult learner: A neglected species. 3rd ed. Gulf Publ. Co., Houston, TX.

Library of Congress. 1998–1999. The writings of George Washington from the original manuscript sources, 1745–1799. John C. Fitzpatrick (ed.) Vol. 28. *In* The George Washington Papers at the Library of Congress [Online]. Available at http://memory.loc.gov/cgi- bin/query/r?ammem/mgw:@field(DOCID+@lit(gw280219)) (verified 1 Sept. 2000).

Lineberger, R.D. 1998. Integrating the world wide web into existing extension and educational technology. Hort Technol. 8:313–319.

Lionberger, H. 1960. Adoption of new ideas and practices. Iowa State Univ. Press, Ames, IA.

National Agricultural Statistics Service. 1999. Farm computer usage and ownership. Sp Sy9. NASS, USDA, Washington, DC.

Obahayujie, J., and J. Hillison. 1988. Now hear this! J. Ext. 25(1) [Online]. Available at http://www.joe.org/joe/1988spring/a6.html (verified 1 Sept. 2000).

Prawl, W., R. Medlin, and J. Gross. 1984. Adult and continuing education through the cooperative extension service. Ext. Div., Univ. of Missouri-Columbia, Columbia, MO.

Rasmussen, W.D. 1989. Taking the university to the people: Seventy-five years of cooperative extension. Iowa State Univ. Press, Ames, IA.

Richardson, J.G., D.M. Clement, and R.D. Mustian. 1997. Reaching traditional and nontraditional extension audiences. J. Appl. Commun. 81(3):13–23.

Shroyer, J.P., D.L. Fjell, M. Mortvedt, M.E. Mikesell, D.G. Mosier, and R.G. Sears. 1992. Farmers' perception of county wheat cultivar demonstration plots and tours. J. Nat. Resour. Life Sci. Educ. 21:171–174.

Staats, L.J. 1995. Using satellite technology in traditional programs. J. Ext. 33(4) [Online]. Available at http://www.joe.org/joe/1995august/iw4.html (verified 1 Sept. 2000).

Teagarden, E.H. 1964. History of the Kansas Extension Service from 1868 to 1964. Vol. 1. Kansas State Univ. Coop. Ext. Service, Manhattan, KS.

Trede, L.D., and S. Whitaker. 1998. Beginning farmer education in Iowa: Implications to extension. J. Ext. 36(5) [Online]. Available at http://www.joe.org/joe/1998october/a3.html (verified 1 Sept. 2000).

Warner, P.D., and J.A. Christensen. 1984. The cooperative extension service: A national assessment. Westview Press, Boulder. CO.