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Agricultural Landowners' Lack of Preference for Internet Extension

Abstract
Extension providers need to improve the communication of watershed conservation practices. In order to determine landowners' communication preference a survey was mailed to a random sample of landowners from four selected watersheds in Michigan. Four hundred three landowners from four agricultural watersheds completed the survey. A majority (77%) expressed support for written communication media, while a minority (19%) supported the Internet. Younger, more educated, more affluent landowners with home Internet access expressed more support for using the Internet. Results suggest that Extension staff need to provide more Internet training and experiences if the Internet is to contribute to watershed conservation.

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Background

Given the increase in Internet use among many different segments of U.S. society (U.S. Department of Commerce 2002), Extension professionals and agricultural educators express an increasing desire to inform farmers about improved management practices and other issues via the Internet (Hall, Dunkelberger, Ferreira, Prevatt, & Martin, 2003; O'Neill, 1999). In the 1990s, research indicated limited experience and perception of the Internet for educational communication purposes.

For example, a 3-year longitudinal study determined that while the percentage of respondents who used the Web to gain Extension-related information increased from 1.4% to 10%, the vast majority of respondents did not rely on that information source (Suvedi, Campo, & Lapinski, 1999). Farmers rated Internet-delivered instructional technologies much lower than traditional instructional techniques (Trede & Whitaker, 1998). Gloy, Akridge, & Whipker, (2002, p.18) suggests that, "At this point, it appears that the Internet might be a compliment rather than a substitute for traditional information sources."

Recent trends suggest that the Internet may now provide a more useful communication strategy. In 2001 an estimated 54% of U.S. population utilized the Internet, with children and teen-agers comprising the most frequent users (U.S. Department of Commerce 2002).

Rural Internet use grew 24% annually between 1998-2001, equalizing the level of urban use at 53% (U.S. Department of Commerce 2002). However, rural users often lack choices of service providers (Malecki, 2003) and access to high-speed connections (Malecki, 2003; U.S. Department of Commerce, 2002).

Between 1998-2001, Internet use increased 25% annually for homes with less than $15,000 annual income (U.S. Department of Commerce 2002), suggesting that even limited income homeowners

continue to overcome such economic constraints. Farmers who utilize precision agriculture and other technologically driven production strategies may not view the Internet as a hurdle, but may view the Internet as the best way to obtain cutting-edge information (Ferguson, 2002). Therefore, evidence suggests that Extension needs to continue to embrace the use of the Internet (Hall et al., 2003; O'Neill, 1999; Tennessen, PonTell, Romine, & Motheral, 1997).

Methods

In order to obtain information about the role of communication preferences of Michigan's agricultural landowners with respect to watershed conservation, a random sample of residents from four agricultural watersheds was asked to complete a survey instrument titled "A Survey of Landowner Watershed Information Needs." In the Spring of 2001, 922 survey instruments were mailed to landowners in four agricultural watersheds within the state of Michigan: the Lake Macatawa, the Gun River, the North Branch Flint River, and the Upper Thornapple.

Watersheds were chosen based on level of watershed conservation activity and existing Extension contacts. The Lake Macatawa and Gun River included Total Maximum Daily Load (TMDL) and Clean Water Act Section 319 planning and implementation activities. Both watersheds also included Extension staff who participated actively in watershed activities. In contrast, few watershed conservation activities occurred in the Upper Thornapple and North Branch North Branch Flint River watersheds.

The design enables longitudinal comparison where more changes in landowner attitude and behavior are expected in active watersheds than less active watersheds. Names and addresses of landowners were retrieved from county geographic information systems (GIS) or Equalization offices for each of these watersheds.

The survey, including both open- and closed-ended questions, was developed using many question items derived from previous, peer-reviewed and field-tested studies from agricultural communication professionals in order to ensure validity and reliability. Once the survey questions were formulated, the survey instrument was peer reviewed by a number of Extension agents and water quality professionals before it was mailed to agricultural landowners.

In the questionnaire, participants were asked to report demographic information such as age, education level, income, farm operation, farming status, and farm size. Respondents also identified how often they participated in Extension programs and which communication strategies they preferred to learn about watershed conservation issues. In addition, respondents provided information about their Internet access location and how often they use the Internet for management decisions.

Survey methodology followed Dillman's Total Design Method (Salant & Dillman, 1994). The survey instrument was initially mailed to the sample of agricultural landowners in May of 2001. A reminder postcard was sent to the sample population approximately 3 weeks later. About 4 weeks following the second mailing, non-respondents were mailed a second copy of the questionnaire. Respondents completed and returned 403 of the 922 survey instruments, providing an overall response rate of 43.7%.

Survey Data Analysis

Data were analyzed using SPSS 10.0.7 statistical software for social statistics (SPSS, 2000). Statistical analysis consisted of Pearson's correlation (r), Pearson's Chi-square test of independence (X^2), and One-way Analysis of Variance (F-test) depending on the nature of the variables tested. Relationships between two ordinal variables were analyzed using Pearson's correlation. Comparisons between means were examined using ANOVA, while differences between proportions were assessed using Pearson's Chi-square test of independence. The homogeneity of variance was then tested using Levene's statistic.

In all cases, Levene's statistic was greater than 0.05, indicating that one would fail to reject the null hypothesis that the variances are equal and that ANOVA could be used. If differences between groups were detected using ANOVA, Bonferroni's Post Hoc test was used to determine which means differed significantly. Bonferroni's Post Hoc test uses a more stringent confidence level for each interval than other multiple comparison procedures, ensuring the overall confidence level is acceptably high.

Non-Response Analysis

Because the study did not obtain a 100% response rate, differences between respondents and non-respondents could threaten external validity. To address representativeness, the research team specifically compared early and late respondents on Likert-type scale items and demographic information. (Lindner, Murphy, & Briers, 2001). Because late respondents tend to be similar to non-respondents (Miller & Smith, 1983; Pace, 1939), demographic data and responses to Likert-type scale questions from early respondents were compared to data from late respondents. If no differences are found, then respondents are said to adequately represent the sample (Miller & Smith, 1983).

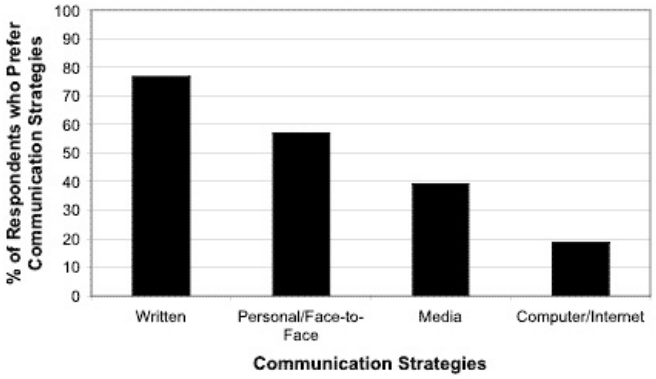
Results

Of the 29 variables tested for non-response bias, only 2 came out significant between early and late respondents. Compared to non-respondents, respondents implement higher cover crop use and less frequent manure application on the same field (r=0.245, p=0.005 and r=0.195, p=0.028, respectively).

Overall, the most preferred communication strategies were written methods such as newsletters, printed bulletins, and fact sheets. The least preferred communication strategies were computer and Internet methods such as software, e-mail, and World Wide Web pages (Figure 1).

Of all the communication strategies presented to respondents, 76.6% of respondents preferred written communication strategies such as newsletters, printed bulletins, and fact sheets to learn more about watershed conservation. Most (57%) of the respondents preferred personal, face-to-face communication strategies such as farm meetings, workshops, field days, demonstration tours, visits to resource offices (Extension or conservation district), personal visits to their homes by resource persons, and visits to a university to learn more about watershed conservation. In addition, 39% of respondents preferred media sources such as newspapers, televisions, radios, and video tapes to learn more about watershed conservation, while 18.7% of respondents preferred computer or Internet sources such as software packages, e-mail, and World Wide Web pages to learn more about watershed conservation.

Figure 1.
Survey Respondents' Preference for Traditional or Technological Communication Strategies to Learn About Watershed Conservation Practices



Note: Percentages add up to more than 100% because respondents were asked to indicate all communication strategies that applied.

Watershed Results

Results indicate that watershed residence had no significant effect on agricultural landowners' preference for communication strategies. Overall, respondents from all four watersheds had a higher preference for written materials than all other communication strategies. There is no statistical difference (Table 1) in preference for communication strategies among watersheds (written communication strategies, X^2=0.997, p=0.802; personal communication strategies, X^2=4.503, p=0.212; media, X^2=2.401, p=0.493; and computer/Internet, X^2=5.480, p=0.140).

Table 1.
The Effect of Watershed Residence on Respondents' Preference for Communication Strategies

	Watersheds				Statistics	
Strategies	North Branch Flint River (%)	Gun River (%)	Lake Macatawa (%)	Upper Thornapple (%)	x^2	p-value
Written	78.4	75.0	78.0	70.0	0.997	0.802
Personal or Face-to-Face	62.2	39.3	57.3	60.0	4.503	0.212
Media	41.9	28.6	42.7	33.3	2.401	0.493
Computer or Internet	12.2	32.1	19.5	20.0	5.480	0.140

Demographic Explanatory Factors

Age

Table 2 demonstrates the influence of age on communication strategy preference. There is a statistical difference between age groups and preference for written communication strategies, media, and computer or Internet methods of learning about watershed conservation issues. Results specifically indicate that age has a significant effect on respondents' preference for computers and Internet for learning about watershed conservation issues. Younger age groups have a higher preference for computer-based resources than older age groups.

Table 2.
The Effect of Age on Respondents' Preference for Communication Strategies

	The Effect of Age on Respondents' Preference for Communication Strategies			**Statistics**	
Strategies	**20-40 Years Old (%)**	**41-60 Years Old (%)**	**61+ Years Old (%)**	X^2	**p-value**
Written	75.0	84.8	68.2	7.306	0.026*
Personal or Face-to-Face	62.5	57.0	56.6	0.295	0.863
Media	58.3	42.4	30.7	6.787	0.034*
Computer or Internet	41.7	24.2	5.7	20.312	0.000**
*=Statistically significant result at the p=0.05 level **=Statistically significant result at the p=0.01 level					

Education Level

Table 3 demonstrates the influence of respondents' education level on respondents' preference for communication strategies to learn about watershed conservation issues. A statistical relationship exists between respondents' levels of education and preference for computers or Internet as communication strategies (r=0.303, p=0.000). As level of education increases, so does respondents' preference for computers and Internet as a communication strategy.

Table 3.
The Effect of Education Level on Respondents' Preference for Communication Strategies

	Effect of Education Level on Respondents' Preference for Communication Strategies							**Statistics**	
Strategies	**Grade School (%)**	**Some High School (%)**	**High School Graduate (%)**	**Voca-tional or Trade School (%)**	**Some College (%)**	**College Graduate (%)**	**Post Graduate Degree or Work (%)**	**Pear-son's Correl-ation (r)**	**p-value**
Written	60.0	82.4	81.1	71.4	71.4	85.7	80.8	0.027	0.702
Personal or Face-to-Face	60.0	58.8	58.1	35.7	73.5	47.6	46.2	-0.040	0.567
Media	60.0	47.1	41.9	35.7	22.4	66.7	30.8	-0.082	0.235
Computer or Internet	0.0	11.8	9.5	14.3	20.4	38.1	42.3	0.303	0.000**
**=Statistically significant result at the p=0.01 level.									

Gross Annual Income Level

Table 4 demonstrates the effect income level has on respondents' preference for communication

strategies to learn about watershed conservation issues. There is a statistically significant difference between level of income and respondents' preference for computers and the Internet as communication strategies. Specifically, as respondents' gross annual income level increases, so does their preference for computers and the Internet to learn about watershed conservation issues.

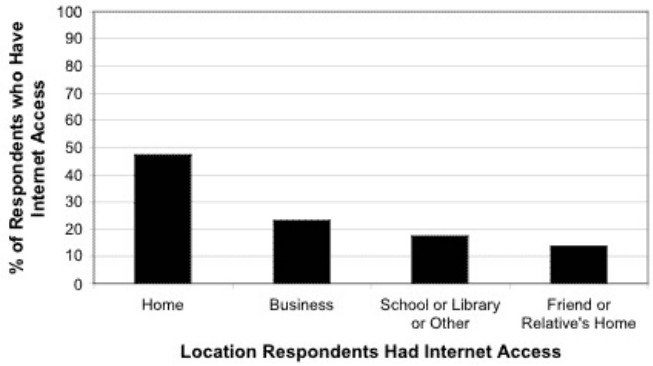
Table 4.
The Effect of Gross Annual Income Level on Respondents' Preference for Communication Strategies

	The Effect of Gross Annual Income on Respondents' Preference for Communication Strategies					**Statistics**	
Strategies	**$15,000 - $25,000 per Year (%)**	**$25,001 - $35,000 per Year (%)**	**$35,001 - $50,000 per Year (%)**	**$50,000 - $75,000 per Year (%)**	**>$75,000 per Year (%)**	**Pearson's Correl-ation (r)**	**p-value**
Written	65.5	80.5	94.3	82.5	69.8	0.007	0.925
Personal or Face-to-Face	51.7	56.1	57.1	65.0	58.1	0.057	0.439
Media	44.8	39.0	34.3	42.5	32.6	-0.058	0.432
Computer or Internet	6.9	14.6	14.3	22.5	27.9	0.180	0.014*

Role of Internet Access

32.2% of respondents did not have Internet access. Of all respondents with Internet access, 47.4% of them had Internet access in their home, 23.2% of respondents had Internet access at their business, 17.5% of respondents had Internet access at a local school or library, and 13.6% of respondents had Internet access at a friend's or relative's home (Figure 2). Regardless of Internet access, the majority of respondents (74.6% of respondents with Internet access and 77.8% of respondents without Internet access) still preferred written materials such as newsletters/mailers and printed bulletins/fact sheets than the other communication strategies.

Figure 2.
Internet Access Locations



* Note: Percentages do not add up to 100% because respondents were requested to indicate all locations where they had Internet access.

However, access to the Internet significantly affects respondents' preference for computers and the Internet. Survey respondents with Internet access expressed a significantly higher preference (27.5%) for computers and the Internet than did landowners without Internet access (1.6%, χ^2=18.607, p=0.000) (Table 5). In addition, results indicate that the location of Internet access has a significant effect on respondents' preference for the Internet as a communication strategy. A significantly higher percentage of respondents preferring the Internet had Internet access in their homes (χ^2=16.948, p=0.000), their business (χ^2=9.502, p=0.002), or at a local library or school (χ^2=4.813, p=0.028) than did respondents who did not prefer the Internet as a communication strategy.

Table 5.
The Effect of Internet Access on Respondents' Preference for the Internet as a Communication Strategy

	The Effect of Internet Access on Respondents' Preference for Communication Strategies		Statistics	
Strategies	Respondents with Internet Access (%)	Respondents Without Internet Access (%)	x^2	p-value
Written	74.6	77.8	0.232	0.630
Personal or Face-to-Face	59.2	50.8	1.242	0.265
Media	41.5	34.9	0.802	0.370
Computer or Internet	27.5	1.6	18.607	0.000**
**=Statistically significant result at the p=0.01 level				

Discussion

Overall, survey respondents preferred traditional written communication strategies such as newsletters, printed bulletins, and fact sheets. These findings are supported by research conducted by Gloy et al. (2000) that revealed the strong importance of farm publications as communication tools. In addition, respondents expressed the least amount of preference for technological communication strategies such as computers, e-mail, and the Internet. These findings mesh with results by Tavernier, Adeaja, Hartley, and Schilling (1996) that indicate the lack of preference by farmers for modern communication technology.

Despite an overall lack of support for the Internet, it is important to know whether preference for innovative communication strategies is related to farmers' demographic characteristics. Results indicate that respondents' preference for computers and the Internet as communication strategies to learn about watershed conservation issues is related to respondents' age, level of education, and gross annual income level. Younger, more educated farmers demonstrate a greater appreciation for modern sources of information (Hall et al., 2003; Riesenberg & Gor, 1989). The youngest respondents in the current study indicated a significantly higher preference for computers and the Internet than did older respondents.

Because one would expect younger farmers to be more inclined to utilize modern technology (Kolodinsky, Cranwell, & Rowe, 2002; U.S. Department of Commerce, 2002; Tavernier et al., 1996), one could argue that while farmers currently prefer traditional written communication strategies over computers and the Internet to learn about watershed conservation issues, farmers may prefer technological communication strategies in the future. In support of these findings, Suvedi et al. (2000) illustrated that farmers' use of Internet sources in Michigan increased from 1.4% to 10.0% between the years 1996 and 1999.

Results also indicate that level of education is positively correlated to respondents' preference for written materials and computers. According to Gloy et al. (2000), higher levels of education are expected to be positively related to the usefulness of information received from all information sources. In addition, higher levels of education should increase the usefulness of information received from the sources that deliver the most sophisticated information (Gloy et al., 2000).

Results from this study resemble results from other studies (Richardson & Mustian, 1994; Bowen & Escolme, 1990). According to Richardson and Mustian (1994), college graduates were found to have a significantly higher preference for method demonstration and videotapes than did persons who have less than a college education. Bowen and Escolme (1990) discovered that three-fourths of farmers who used computers had at least some college education.

Additionally, gross annual income levels are positively correlated with respondents' preference for computers and the Internet. These results are consistent with previous research (Tavernier et al., 1996) where farmers with high gross annual incomes (more than $100,000/year) increasingly adopted computer technology. Further, those who adopt high technology precision agriculture are also more likely to utilize Internet communication (Ferguson, 2002). This derives in part from the suggestion that more profitable farmers have a greater capacity to purchase the newest and most expensive technology (Tavernier et al., 1996).

Not only are farmers' preferences for computers and Internet related to demographics such as income and education level; farmers have also been reluctant to adopt computers and innovative technologies due to lack of convenient Internet access (Hall et al., 2003; Samson, 1998**;** Tavernier

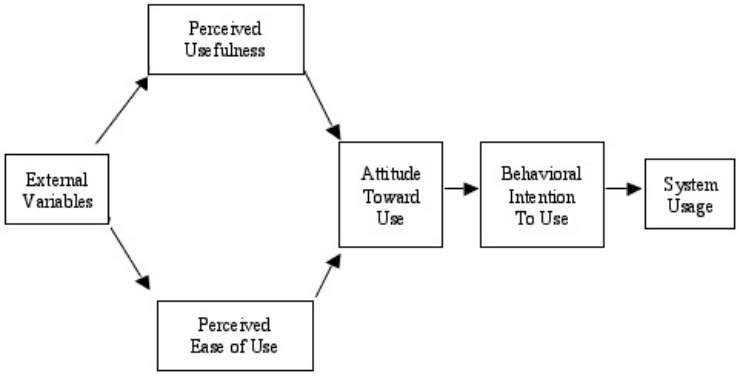
et al., 1996; Iddings & Apps, 1992). Regardless of whether respondents had Internet access, the majority of respondents still preferred written materials to the Internet to learn about watershed conservation issues. These results suggest that even if agricultural landowners have Internet access, they will likely still express a higher preference for more traditional or written communication strategies. However, having access to the Internet at home or work does significantly increase one's preference for the Internet as a communication strategy.

Extension Implications

Based on previous direct experience research such as the Technology Acceptance Model (TAM) and user acceptance studies focusing on individual differences (Irani, 2000), subjects with greater prior experience with a technology will more likely use it than those who lack experience (Figure 3). Previous research indicates that Internet experience and perceived usefulness were the strongest predictors of behavioral intent to use Internet communication tools (Irani, 2000). Therefore, understanding the factors that influence attitude and user perceptions toward technology is a critical need (Irani, 2000). The Technology Acceptance Model states that increased perceptions of ease of use and technology usefulness lead to increased use (Figure 3).

Figure 3.

The Technology Acceptance Model (Hubona & Geitz, 1999)



If information technology and telecommunications are to satisfy the informational needs and extend the capabilities of the farmer, both the technology and the dissemination strategy must be sufficiently flexible to adapt themselves to the farmers' way of working (Wilde & Swatman, 1996). Extension should organize seminars, institutes, and workshops to train farmers in computer applications for agriculture (Bamka, 2000; O'Neill, 1999; Findlay, Zabawa, Morris, & Oben, 1993). For example, incorporating youth to work with senior citizens significantly improved the seniors' perceptions of their comfort and skill levels regarding Internet use up to six months after training (Kolodinsky et al., 2002).

However, a need exists to determine the actual effectiveness of Web sites both with and without training sessions to help guide participants through the program. Technical training (Bamka, 2000; O'Neill, 1999) and application to real needs emerge as crucial aspects to reach beyond the innovators and early adopters (Hall et al., 2003; Ferguson, 2002; Carr, 1999).

If farmers perceive technology as difficult to learn, too time consuming to use, or in some way presenting a threat, they probably will not use it (Carr, 1999). Therefore, in addition to providing training sessions to introduce farmers to the benefits of using the Internet as a communication strategy, educators must specifically address reasons why farmers are hesitant to utilize the Internet as a communication strategy on an individual needs basis (Hall et al., 2003). This is particularly important if a strong desire exists among specialists to provide data via Web sites because they prove to be more time and cost efficient than newsletters and brochures.

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