FS 02-07 October 2002

IMPROVING EXTENSION EFFECTIVENESS FOR ORGANIC CLIENTS: CURRENT STATUS AND FUTURE DIRECTIONS

LUANNE LOHR

TIMOTHY A. PARK

Luanne Lohr and Timothy A. Park are Associate Professors, Department of Agricultural and Applied Economics, The University of Georgia, Athens, GA, 30602.

Dept. of Agricultural & Applied Economics
College of Agricultural & Environmental Sciences
University of Georgia

IMPROVING EXTENSION EFFECTIVENESS FOR ORGANIC CLIENTS: CURRENT STATUS AND FUTURE DIRECTIONS

LUANNE LOHR
TIMOTHY A. PARK

Department of Agricultural and Applied Economics
University of Georgia
Athens, GA 30602-7509

llohr@agecon.uga.edu
tpark@agecon.uga.edu

ABSTRACT---
Responses from a national survey of U.S. organic farmers indicated substantial dissatisfaction with the extension service. An ordered probit model was used to identify the factors influencing effectiveness ratings of extension advisors by farmers. This study showed that part time, higher income organic farmers who used a variety of highly rated private sector information sources rated extension providers as more effective. Farmers in the Northeast and West regions rated extension usefulness more highly than in other regions. Not accounting for these demographic components in effectiveness ratings may result in under- or overestimation of results of organic-targeted extension programs. Extension agents can improve their credibility with organic farmers by complementing educational and technical services offered by the private sector, and by facilitating farmer information exchanges as well as presenting relevant research findings as they have traditionally done.

-----KEY WORDS-----
organic farming, extension service, ordered probit model

Faculty Series are circulated without formal review. The views expressed are those of the authors. This paper was completed while the authors were visiting faculty at the University of Minnesota. Dr. Park received support from the Sloan Foundation and The Food Industry Center. Dr. Lohr received support from the School of Agriculture Endowed Chair in Agricultural Systems and the Minnesota Institute for Sustainable Agriculture. Research for this paper was also supported by Cooperative Agreement 43-3AEK-9-80002 with the USDA-ERS. The cooperation of the Organic Farming Research Foundation is gratefully acknowledged.

IMPROVING EXTENSION EFFECTIVENESS FOR ORGANIC CLIENTS: CURRENT STATUS AND FUTURE DIRECTIONS

Introduction

The National Research Council (NRC, 1996) charged that the role of the publicly funded extension service is to transmit information and management techniques that have significant social benefits but which do not lead to short-term private benefits. The report commented (p. 96) that "the private sector has insufficient incentives to transfer agronomic management practices and technologies that reduce off-farm pollution." Caswell *et al.* (2001) emphasized the need for technical support in the case of information-intensive technologies, which tend to be more complex than input-driven technologies and more public goods-oriented. Information intensiveness and environmental improvement characterize organic production methods. The organic sector would appear to be an ideal setting for a research-extension-farm interface to successfully emerge. Such has not been the case in most regions of the U.S. In this article, we explore the reasons for failure of the extension service to connect with the organic farm economy.

Agricultural extension program leaders are acutely aware of the difficulties and limitations of the land grant system in adapting to changes in the agricultural and rural economy. A report on the Colleges of Agriculture at the Land Grant Universities (National Research Council, 1996) emphasized that among the elements of the tripartite land grant mission, extension faced the most difficult external challenges. Extension leaders must evaluate and extend their roles in serving both farm and non-farm clients while adapting to increasing competitive pressures from private advisors and consultants. McDowell (1992) characterized extension as held hostage by traditional audiences, unable to effectively inform their clientele on important emerging agricultural issues and lacking the vision to broaden their client and program portfolio.

Criticisms of the performance of cooperative extension are even more pointed from the proponents of organic production methods. Information on organic production constraints was gathered by the Organic Farming Research Foundation (OFRF) in a nationwide survey of U.S. organic producers in 1997. Respondents were asked to indicate the degree to which 10 specified constraints inhibited production, using a scale from 1 to 5 (where 5 represents a "serious constraint or problem"). Nearly 50% of 1,092 organic farmers identified "uncooperative or uninformed extension agents" as a significant constraint. Farmers most likely to rate extension as a barrier to organic production were in the South (80%) and North Central (54%) regions.

These survey results stand in sharp contrast with previous success stories touting the efficacy of agricultural extension in promoting innovative programs in sustainable agriculture. Postlewait *et al.* (1993) claimed that extension advisors were major promoters of integrated pest management and sustainable agricultural programs and were especially effective in influencing adoption at the early stages before the tangible program benefits in terms of sellable commodities and products were documented. Napit *et. al.* (1998) demonstrated that contact with extension advisors was linked to the adoption of integrated pest management systems. They attributed this to the Low Input/Sustainable Agriculture (LISA) program, which was designed to utilize extension expertise and team-building skills to combine the efforts of farmers, private research institutions, and government agencies to improve agricultural sustainability.

While extension may have successfully promoted sustainable agriculture among its traditional, chemical-using clientele, organic farmers have not perceived these programs as beneficial to their sector. Hanson (1997) noted an important standard for evaluating excellence in extension programming is meeting the needs of the projected audience. To bridge the gap between extensionists and organic farmers, it is critical to improve communication between the

two groups and to use this information in developing educational programs that are useful, credible, and accessible to the organic sector.

The objective of this article was to identify avenues for successful extension programs to serve the organic clientele. Survey evidence was synthesized to establish the current level of reported effectiveness. An econometric model was used to identify the significant factors that influence organic farmer perceptions of extension effectiveness and to evaluate their relative impact on probability of farmer ratings of effectiveness. The results suggested both problems with traditional approaches and promising ways to enhance the extension-organic farmer linkage.

Satisfaction with Information Sources Used

The comprehensive national survey of certified organic farmers administered by OFRF in 1997 solicited farmer evaluations of information sources for organic production techniques. These data may be used to describe the comparative performance of extension advisors relative to other information providers and to highlight emerging constraints on extension effectiveness. Although the survey sample and methods are described more completely below, a brief discussion of these preliminary results is useful in framing the issue as a prelude to formal development of the econometric model.

A list of 12 personal information sources was provided for respondents to indicate both the usefulness of and the number of contacts with each source (see Question 2.2, Walz, 1999, p. 38). Farmers seeking production information from non-university outlets relied on three main sources: other farmers, organic certification personnel, and grower's associations. The largest percentages of producers recorded contacts with other farmers (80%) and organic certification personnel (74%) as the primary sources. Extension personnel (58% contact rate) and university researchers (43%) were both below the levels recorded by the private sector information sources,

whether for profit or nonprofit. Information from other farmers was ranked as the most useful source with a mean value of 2.76 on an integer scale of one to four, followed by organic certifiers rated at 2.18. Extension advisors had an average rating of 1.5, outperforming the 1.25 rating by growers associations.

A summary of the overall effectiveness of the production information sources is apparent in the distribution of responses across the ranked categories. More than 58% of growers rated information from other farmers at the highest level ("very useful") while only 18% gave extension advisors this rating. Extension advisors received the highest percentage of "never useful" ratings at 6%. With more than half of respondents reporting at least one contact with extension, this rating is not likely due to lack of familiarity with extension services.

This summary data strongly suggests that extension is performing comparatively below the standards set for private sector providers of organic production information. The econometric model in the next section tests this hypothesis and accounts for the interaction of factors that affect perceived ratings of effectiveness.

Modeling Effectiveness Ratings for Information Sources

The producer's "usefulness" rating for extension advisors as recorded in the OFRF survey represents an unobserved latent measure of effectiveness, EFF_i^*, which in turn is related to a set of explanatory variables z_i:

$$EFF_i^* = z_i'\delta + \varepsilon_i, \quad \textbf{(1)}$$

where EFF_i^* is the true but unobserved effectiveness of the information source as perceived by the i^{th} organic producer, z_i represents the explanatory variables, and ε_i is the unobserved error term.

The parameter δ is a vector of coefficients that measures the average impact of the explanatory variables on the effectiveness rating. The true level of effectiveness is not observed but is elicited in the categories defined by the survey. The observed variable EFF_i represents the ordered classes of ratings but not the actual level of effectiveness that the producer associated with the source.

The ordered probit model is an extension of the bivariate probit recognizing that the dependent variable is ordered or ranked, as in this case. The i^{th} farmer's equation is:

$$EFF_i = j \quad if \quad \gamma_j < EFF_i^* \leq \gamma_{j+1} \qquad j = 0, \ldots, J-1. \tag{2}$$

where J is the number of classes, γ_0 is set to $-\infty$ and γ_J is set to $+\infty$, and γ_1 is normalized to zero. The four categories of the effectiveness rating used in the OFRF survey range from never useful (1) to very useful (4). The log-likelihood function for the ordered probit model is given by:

$$L = \sum_{i=1}^{n} \sum_{j=0}^{3} 1(EFF_i = j) \cdot \log\left[\Phi\left(\frac{\gamma_{j+1} - z_i'\delta}{\sigma_i} \right) - \Phi\left(\frac{\gamma_j - z_i'\delta}{\sigma_i} \right) \right] \tag{3}$$

where $\Phi(\cdot)$ is the cumulative standard normal distribution function. Assuming a normal distribution for the error term, the probabilities of each of the k effectiveness measures are:

$$\begin{aligned} Prob(EFF_i = j|x) = {} & \Phi(\gamma_0 + z_i'\delta) && if\ j = 0 \\ & \Phi(\gamma_j + z_i'\delta) - \Phi(\gamma_{j-1} + z_i'\delta) && if\ 0 < j \leq k-1, \\ & 1 - \Phi(\gamma_{k-1} + z_i'\delta) && if\ j = k \end{aligned} \tag{4}$$

The unknown parameters of the model are δ along with γ_i which represent the estimated boundary points of the scale measuring the latent attitude. Maximum likelihood estimates of the parameters of the ordered probit model obtained using LIMDEP (Greene, 2000) are

asymptotically efficient and asymptotically normal.

Data Description

The Organic Farming Research Foundation (OFRF) is a private not-for-profit organization that supports and conducts research on organic production systems and public policy. The questionnaire for the third biennial survey in 1997 was reviewed by a committee of nationally recognized organic practitioners, extensionists, researchers, and government specialists . The stated purpose was to "...provide the most comprehensive picture currently available about the state of organic farming in the United States, *from the organic farmer's perspective*" (Walz, 1999, p. 1). The questionnaire was mailed to all U.S. certified organic farmers, based on lists from certifying organizations.

Data on production and marketing practices of organic farmers were gathered, as well as details of production and marketing problems, information sources, and demographic information (Walz, 1999). The data represent all crops grown organically, and all regions in which organic production is conducted. Of the 1,192 surveys returned to the OFRF (26% response rate), sufficient detail was provided in 613 responses to test the model. The data were obtained by special agreement with the OFRF as part of a project to assess the U.S. organic sector.

Table 1 shows the variable descriptions and summary statistics for the dependent and independent variables estimated for the ordered probit model, as well as the question number from the OFRF survey results (Walz, 1999) matching each variable. The dependent variable for the effectiveness ratings, EffExt, corresponds to EFF_i in Equation 4. The survey questionnaire initially asked farmers the number of times each of the 12 information sources was used on a yearly basis. Next, the effectiveness of each information source was rated. The usefulness measure ranged from 1 to 4 with the responses defined in the survey as "never useful,"

"sometimes useful," "useful" or "very useful." Organic farmers who rated a source (from 1 to 4) and who had used the source at least one time were included in the analysis. The mean effectiveness rating of extension advisors by these farmers was 1.65.

Of farmers who had previous experience with extension, the highest percentage (41%) rated the service as "sometimes useful," and the second highest percentage (34%) said extension was "useful." The data revealed no consistent relationship between frequency of use and rating. Some farmers with only one contact gave the service the highest rating, while others who had many contacts remained unenthusiastic about its effectiveness. Frequency of contact was not incorporated into the dependent variable due to this inconsistency, which would obscure the effectiveness measure.

The Independent Variables

To characterize the clientele group that may be described as "organic farmers who use the extension service, " a number of structural, demographic, and management factors were included among the independent variables. Additionally, perceptions of extension effectiveness could be shaped by familiarity with the service and with its private sector competitors. Proxies for these variables were also included.

Farm structure variables for ownership status in Table 1 reflect the range of management flexibility for the farmer. Sole proprietorships (SoleProp) involve a single decision maker and maximum flexibility, while corporations usually feature multiple decision makers and more demanding financial requirements. In our sample, 70% of farms were sole proprietorships and 7% were corporations. Alternative types of farm organization, including partnerships, cooperatives, and property management firms, were grouped and omitted from the regression.

Assessment of the quality of information received was expected to be related to basic

organic agriculture knowledge and congruity of the information with that knowledge. Variables that proxy this latent knowledge include time commitment to farming and experience with organic farming. About 39% of our sample were part time farmers (PartTime). Experience in organic farming averaged 9 years (YrsOrg), although a few farmers reported no previous experience and some reported several decades using organic practices. Experience was also squared (YrsOrgSq) to account for the possibility of nonlinearity.

Producers who had been involved in organic farming for the longest periods of time provided the lowest ratings for extension. Among farmers with at least 13 years' experience, 48% gave rated extension as "never useful," possibly because their experience exceeded that of the agents consulted. Among those rating extension as "very useful," the largest share (35%) had less than 5 years' organic farming experience.

Two dimensions were combined to proxy previous and current experience with the extension service. Under the U.S. regulation, farmers may certify as organic less acreage than they farm, leading to parallel organic and conventional systems being managed by the same operator. Only 24% of the OFRF respondents reported conducting this type of mixed farming. Farmers who were originally conventional producers but transitioned to organic production account for 40% of the OFRF respondents, compared with 58% who began farming as organic producers. The subset of farmers who transitioned to organic farming, but maintained mixed farming operations (TranMixd) accounted for 11% of our sample.

These producers were expected to have more familiarity and closer linkages with extension advisors due to their history and continuing use of conventional production techniques. The perception that extension is a barrier to sector expansion is more likely to hold among farmers who were originally organic producers, and those who farmed only organic acreage, that

is, the rest of the sample. The transitional mixed farmers had fewer contacts with extension advisors (2.88 times per year on average) compared to all other farmers (3.49 contacts). However, the mean effectiveness rating from the transitional mixed farmers was higher (averaging 2.84) than the rating from all other farmers (2.63).

A scale effect for farm size was expected to hold, in that larger farms have the most incentive to use the technical information distributed by the extension service, which usually offers at low cost the latest research-based, labor-saving technologies. The smallest farm in the sample was 0.125 acre, the largest was 6,000 acres, and the mean farm size was 136 acres (OrgAcre). Over 40% of the lowest effectiveness ratings originated from organic farmers with five or fewer acres, as small farmers express the most dissatisfaction of any size class. The smallest organic farms tend to be mixed horticultural crops, and are more labor-intensive than larger farms, making technology-reliant advice less adaptable.

The gross organic income variable (OrgInc) was included to test whether extension advising was perceived as an equally useful service across all income classes, or whether one group favored extension more heavily. The mean of the income variable was 4.04, implying that the average farm income from organic sales was between $100,000 to $249,999. In our sample, 13% of respondents grossed between $100,000 to $249,999 in organic sales, and an additional 36% grossed at least $250,000. Of the ratings in the “very useful” category, the largest share (37%) was from farmers in the highest income category.

Hanson discussed the implications for managing extension of determining whether the public information and consulting services are substitutes for or complements to the services provided by private sector sources. Extension’s role may evolve to advisory, as opposed to technical, tasks such as helping farmers assess the quality and value of private services or assisting

farmers to effectively use the information that private companies provide. Ilvento (1997) suggested that increasingly sophisticated and specialized farmers will turn for assistance to specialists at research universities and in the private sector rather than the traditional extension sources such as the county agent. Such information is more individualized and as such, may be perceived as superior to publicly available information.

To test whether this effect held in the organic sector, a composite variable (EffPrivat) of the effectiveness ratings for four private information sources was formed. This variable was constructed by sum ming the ratings (from 1 to 4) across four private sector sources - field consultants, other farmers, organic certification agencies, and grower associations - producing a variable ranging from 1 to 16. A score of 4 indicated all the private sources received the lowest effectiveness rating while a score of 16 meant the maximum rating was given for each. The mean effectiveness rating for private information sources was 8.43. Transitional mixed farmers rated the private sources at 8.94. The correlations of the individual private sources with the index were uniform, ranging from 0.43 to 0.65, indicating that the index was not skewed by any one component.

Regional variation exists in climate, organic cropping history, crop production practices, and regulatory environments. Variations in resources allocated to the extension service are also apparent at the regional level, with the result that practices advocated by extension have been unevenly adopted. Comer *et al.* (1999, pp. 30-31) noted that "despite economic and non-economic disadvantages of conventional agriculture, farms have been slow to adopt [sustainable agricultural] practices, and adoption appears to vary widely by region and crops."

To assess institutional support and information provided by the extension service, we used the four USDA Sustainable Agriculture Research and Education (SARE) regions as proxies for

the regional variation expected in effectiveness ratings. A dichotomous variable was created for each region, equal to one if the respondent's farm was in that region, and zero otherwise. In our sample, 35% of farmers were in the SARE 1 region (West), 28% in the SARE 2 region (NorthCent), 9% in the SARE 3 region (South), and 28% in the SARE 4 region (Northeast).

Estimation Results

Coefficient estimates and asymptotic standard errors for the ordered probit model in equation 4 are presented on Table 2. The statistically significant and positive estimates of μ_1 and μ_2 confirmed that the effectiveness ratings reflected an underlying ordering of preferences by organic producers and validated the ordered probit model.

For the variables with statistically significant coefficients the marginal effects on the probability of each effectiveness category are presented on Table 2. The effects are the derivatives of the conditional mean function with respect to the variable. The continuous variables are measured at their sample means. For the discrete variables, the marginal effects denote the change in probability for a rating when the condition exists (SoleProp = 1) versus when it does not (SoleProp = 0). The marginal effects on the probabilities must sum to zero across the categories for a single variable. By examining these percentages, it is possible to interpret the baseline expectations for extension advisor ratings under different conditions.

Neither of the business structure variables (SoleProp, Corporat) significantly influenced the effectiveness ratings of extension advisors. Part time farming status (PartTime) positively affected the ratings. Lohr and Park (2002) showed that part time organic producers adopt a smaller portfolio of pest management techniques than full time farmers, and that the methods tend to be less labor-intensive. Since extension traditionally promotes technology-intensive, rather than information-intensive, farming systems, this approach would earn them higher ratings with

part time farmers.

The marginal effects indicated that, controlling for other factors, 10% of part time organic farmers would rate extension as “very useful.” Thus, an extension program that targets part time farmers would have to be rated by more than 10% of participants as “very useful” in order to claim a program effect. Conversely, almost 11% of full time organic farmers would be expected to rate extension advisors as “somewhat useful” at best, making this a more difficult group to impress with existing programming.

The quadratic form for organic farm experience (YrsOrg and YrsOrgSq) was not significant, although the general functional form suggests an increasing rate of dissatisfaction with extension as experience increases. The more organic experience an audience has, the less likely that the technical support offered by extension contributes useful information, a clear signal that extension programming in organic agriculture has not been keeping up with current practices, let alone offering new solutions. Familiarity with the extension service (TranMixd) and farm size (OrgAcres) did not significantly affect the usefulness ratings. This suggests that efforts to maintain contacts with farmers who transition to organic agriculture will not alone gain favorable ratings for extension, nor will targeting larger growers as has been the trend in extension services.

Farmers with higher gross organic incomes evaluated extension information more favorably, according to the significant income variable, OrgInc. The marginal effects indicated that the highest income group was only 2% more likely to rate extension “useful” or “very useful” than the mean group with $100,000 to $249,999. Given that farm size was not a factor, these findings showed that extension advisors were successful in targeting relevant information to the economically viable and top performing producers.

Positive perceptions of private sector information sources (EffPrivat) had a significant

positive effect on the usefulness ratings of public sector extension advisors. For each additional point in the private source-effectiveness index rating, from the mean of 8, the probability of a "useful" or "very useful" rating for extension increased almost 2%, based on the marginal effects. This result supports a possible complementary role for extension as context provider or interpreter of individualized information provided by private sources.

This result is also consistent with a principal-agent model that cast the farmer as a principal seeking advice on the adoption and use of best-practice production techniques from the extension advisors and private information providers, who served as the agents (Levitt, 1995). In our application, farmers seeking advice would define "best" practice as the most timely and appropriate technical information that was provided to the organic farmer. Using multiple information sources-agents would give the farmer-principal the greatest chance of finding the "best" information, given the spotty availability of research-based information and complexity of ecosystem-dependent production systems.

The regional effects were positive and significant for two (West and Northeast) of the three SARE region dummy variables included in the model. Extension agents located in these regions scored significantly higher on effectiveness ratings reported by organic producers. The LISA program (predecessor of SARE) was designed to be administered at the regional level to exploit decision making expertise and information on local soil, climate, crop and other conditions (Madden, 1988). The West and Northeast regions historically have made greater spending and institutional commitments to organic research and education, and continue to offer greater support for organic farmers. Being in the West region offered nearly 16% probability that the "very useful" rating would be awarded, while being in the Northeast accorded a 10% probability for this score, based on the marginal effects.

Interpreting Farmer Evaluations

Client feedback in the form of program evaluation is used by extension to improve existing services and to suggest new information offerings. An observed rating may be decomposed into the score that would be expected on the basis of target audience characteristics and the score that reflects marginal value of the program itself. This is particularly important with organic farmers, who reported substantial dissatisfaction with extension in the national farm survey by OFRF. Using the coefficients from the ordered probit model on Table 2, the probability that an extension advisor would receive a given effectiveness rating, independent of the specific program content, can be calculated (Liao, 1994).

Table 3 shows the calculated probabilities that a farmer would rate extension advisors in any of the four effectiveness categories, given a baseline set of farmer characteristics and variation in conditions. The examples on Table 3 may be repeated for any set of the characteristics or conditions estimated in the regression model. For dichotomous variables, the condition must be either "on" or "off." In the examples considered here, the baseline was a full time transitional mixed organic producer who was a sole proprietor. For Case 1, the farmer was in the West SARE region, and for Case 2, the geographic location was varied. The remaining explanatory variables were evaluated at the mean values given on Table 1.

In Case 1, the effect of changes in the effectiveness rating of private sector sources was calculated. The hypothetical producer had a 3% probability of rating extension advisors as "never useful," but a 24% probability of rating them as "very useful" when the mean value of the private sector index (8.43) was used. This mean represented the 50^{th} percentile for the variable.

According to the regression results from Table 2, better perceptions of private sector effectiveness generate a complementary positive change in the farmer ratings of extension.

Although this generally holds, Table 3 shows that decreasing the private sector rating to the 25th percentile reduced the probability of a "very useful" rating for extension by more than increasing the private sector rating to the 75th percentile raised it (19% vs. 26%, from the baseline of 24%). Conversely, the probability of a "never useful" rating for extension increased by more at the 25th percentile rating than it decreased at the 75th percentile (4.3% vs. 2.3%, from the baseline of 2.9%). This means that extension ratings are less likely to rise when an abundance of highly rated private sector information sources are being used, and more likely to fall when such sources are not as widely used.

Case 2 examined the effect of region (West, North Central, South, Northeast) on the probability the hypothetical farmer from Case 1 would rate extension in each of the four categories. All other baseline conditions were the same, and all other variables were evaluated at their means. The West and North Central regions represented the extremes. In the West region, extension advisors have only a 3% probability of being rated "never useful" and a 24% chance of being rated "very useful," compared with 8% and 12% for these categories in the North Central region. Statistical tests established a significant difference between the probabilities for the West and North Central regions at the 95% confidence level. This indicates that the credibility of extension advisors is perceived differently across regions, with the North Central region being the most pessimistic about extension effectiveness.

Summary and Conclusions

This study fills a gap in information about the relationship between extension advisors and organic farmers. This study showed that part time, higher income organic farmers who used a variety of highly rated private sector information sources rated extension service providers as more effective. Furthermore, farmers in the Northeast and West regions rated extension

usefulness more highly than in other regions. Not accounting for these demographic components in effectiveness ratings may result in under- or overestimation of results of organic-targeted extension programs.

More contacts with the extension service do not necessarily translate into higher effectiveness ratings by organic farmers, nor does previous and continuing contact with farmers who transitioned from conventional farming. Nationally, 35% of organic farmers have less than 5 years' experience. Extension advisors need to understand the information needs of the entering and newer organic farmers and adapt products and programming to the level required by these producers. Previous research has demonstrated that farmers adopt more management techniques as they gain experience with organic methods (Lohr and Park, 2002). "Growing" a clientele for public sector organic information will require continued effort to develop appropriate and credible advice, which in turn requires research that leads, rather than following, the organic information curve.

In the organic industry, private sector information sources are more widely used and are considered more reliable than public sources. Extension agents can improve their credibility with organic farmers by complementing educational and technical services offered by the private sector. Private sector providers may directly obtain information from university sources and repackage it for clients, as well as provide individualized recommendations that extension is not sufficiently staffed to do. However, the majority of information transfer in the organic sector occurs farmer-to-farmer in a free arrangement of mutual exchange. Extension programming should incorporate farmer experiences as well as research-based information to maximize the credibility of the messages presented. One possible role for extension is to catalog the information available from farmers and systematically offer it to existing and aspiring organic

farmers. The diffusion model traditionally followed by extension is ideal for this purpose.

User fees to supplement public extension financing have been proposed (NRC, 1996). While fees could make extension more accountable to client segments and free resources for supporting limited resource farmers, as the NRC (1996) suggested, acceptability of this system requires that organic farmers be both able and willing to pay the fees. Nationally fewer than 15% of organic farmers made more than $100,000 in 1997 (Walz, 1999), and most organic farmers are used to obtaining information for free from other farmers. In this sector, user fees would need to be justified by the exclusive availability of new information or unique formatting that gives farmers technical support in ways they could not obtain from other farmers.

Toward this end, extension advisors need to realize their strengths and weaknesses. Regionally, the North Central and South region extension services must overcome a strong belief that they are barriers to organic agriculture. Nationally, 63% of organic producers are full time farmers, and probably know more than the local extension advisor about the agroecology that determines the success or failure of the organic system. Rather than compete with this knowledge base, extension should find ways to support on-farm experimentation, such as through rapid dissemination of relevant conventional and organic research results. Awareness of organic regulations and familiarity with local organic productivity problems would enhance extension's responsiveness to this client group. Assisting in transfer of information among farmers, and testing farmer theories in a scientifically rigorous setting, are other avenues that complement existing private sector efforts.

The organic sector could rejuvenate extension as a truly multi-directional information conduit, a role that has been fading in conventional agriculture. Lessons learned from dealing with problems in the organic sector will improve extension's suitability for the less chemical-

dependent agriculture foreseen by the NRC (1996). The onus is on extension to improve their relationship with the organic farming sector into a more flexible, responsive approach or be left behind as American agriculture evolves.

References

Caswell, M., K. Fuglie, C. Ingram, S. Jans, and C. Kascak. Adoption of Agricultural Production Practices: Lessons Learned from the U.S. Department of Agriculture Area Studies Project. AER-792. USDA Economic Research Service, Washington, DC. January, 2001.

Comer, S., E. Ekanem, S. Muhammad, S.P. Singh, F. Tegegne. "Sustainable and Conventional Farmers: A Comparison of Socio-economic Characteristics, Attitudes, and Beliefs." *J. Sustain. Agr.* 15(1999):29-45.

Greene, W.H. *Econometric Analysis.* 4th Edition. Upper Saddle River, New Jersey: Prentice Hall, 2000.

Hanson, J.C. "Opportunities and Challenges in Cooperative Extension for Agricultural Economists." *Agr. Res. Econ. Rev.* 26(1997):143-152.

Ilvento, T.W. "Expanding the Role and Function of the Cooperative Extension System in the University Setting." *Agr. Res. Econ. Rev.* 26(1997):153-165.

Levitt, S.D. "Optimal Incentive Schemes when only the Agents' 'Best' Output Matters to the Principal." *RAND J. Econ.* 26(1995):744-760.

Liao, T.F. *Interpreting Probability Models: Logit, Probit, and Other Generalized Linear Models.* Thousand Oaks, CA: Sage Publications, Inc., 1994.

Lohr, L. and T.A. Park. "Choice of Insect Management Portfolios by Organic Farmers: Lessons and Comparative Analysis" *Ecol. Econ.* 43(2002):87-99.

Madden, P. "Low-input/Sustainable Agricultural Research and Education -- Challenges to the Agricultural Economics Profession." *Amer. J. Agr. Econ.* 70(1988):1167-1172.

McDowell, G.R. "The New Political Economy of Extension Education for Agriculture and Rural America." *Amer. J. Agr. Econ.* 74(1992):1249-1255.

Napit, K..B. G.W. Norton, and R.F. Kazmierczak,, Jr., and E.G. Rajotte. "Economic Impacts of Extension Integrated Pest Management Programs in Several States." *J. Econ. Ent.* 81(1988):251-256.

National Research Council. *Colleges of Agriculture at the Land Grant Universities: Public Service and Public Policy*. Washington, D.C.: National Academy Press, 1996.

Postlewait, A., D. Parker, and D. Zilberman. "The Advent of Biotechnology and Technology Transfer in Agriculture." *Tech. Forecast. Soc. Chng.*.43(1993):271-87.

Walz, E. Final Results of the Third Biennial National Organic Farmers' Survey. Organic Farming Research Foundation, Santa Cruz, CA. Available online as of February 2002 at http://www.ofrf.org/publications/survey/Final.Results.Third.NOF.Survey.pdf, 1999.

Table 1. Variable Descriptions and Summary Statistics

Variable	Description	Mean	Standard Deviation	Survey Question[a]
EffExt	Effectiveness rating for extension advisors	1.65	0.84	2.2A
	Share of farmers across rating categories			
	1 Never useful	0.06		
	2 Sometimes useful	0.41		
	3 Useful	0.34		
	4 Very useful	0.18		
SoleProp	Farm is a sole proprietorship, 1 if yes	0.70	0.46	8.2
Corporat	Farm is a corporation, 1 if yes	0.07	0.25	8.2
PartTime	Operator is part time farmer, 1 if yes	0.39	0.49	8.3
YrsOrg	Years as an organic farmer, from 0 to 45 years	9.39	7.13	8.10
TranMixd	Farmer originally a conventional producer only, now farms both organic and conventional acres, 1 if yes	0.11	0.32	6.1, 8.1
OrgAcre	Acreage farmed organically, from 0.125 to 6,000 acres	136.39	400.41	8.6A
OrgInc	Total gross organic farming income, integer variables for 5 categories	4.04	2.19	8.8
	Share of all farmers by income category			
	1 if less than $5,000	0.07		
	2 if $5,000 to $14,999	0.23		
	3 if $15,000 to $99,999	0.21		
	4 if $100,000 to $249,999	0.13		
	5 if at least $250,000	0.36		
EffPrivat	Effectiveness rating for private sources, rating (1 to 4) multiplied by number used (1 to 4), from 1 to 16	8.43	2.98	2.2A
West	Farm is in SARE Region 1, 1 if yes	0.35	0.48	8.12
NorthCent	Farm is in SARE Region 2, 1 if yes	0.28	0.45	8.12

South	Farm is in SARE Region 3, 1 if yes	0.09	0.29	8.12
Northeast	Farm is in SARE Region 4, 1 if yes	0.28	0.45	8.12

[a] The question number in Walz corresponding to each variable.

Table 2. Results of Ordered Probit Analysis of Extension Effectiveness[a]

		Marginal Effect on Probability of Usefulness			
Variable	Coefficient	Never Useful	Sometimes Useful	Useful	Very Useful
Constant	0.835* (3.394)				
SoleProp	-0.067 (-0.585)				
Corporat	0.101 (0.478)				
PartTime	0.298* (3.002)	-0.015	-0.090	0.003	0.102
YrsOrg	-0.032 (-1.441)				
YrsOrgSq	0.008 (1.022)				
TranMixd	0.220 (1.572)				
OrgAcres	-0.00003 (0.231)				
OrgInc	0.065* (2.513)	-0.007	-0.019	0.009	0.017
EffPrivat	0.040* (2.560)	-0.004	-0.012	0.006	0.010
West	0.488* (4.168)	-0.030	-0.148	0.020	0.158
South	0.177 (1.026)				

Northeast	0.323* (2.732)	-0.023	-0.099	0.023	0.099
μ_1	1.551* (17.291)				
μ_2	2.581* (25.814)				
N	613				
Model χ^2	48.38				

[a] Asymptotic t-values in parentheses with significance at 0.10 level. Critical value for $\chi^2_{12,\ 0.90}$ = 18.55.

Table 3. Calculated Probabilities of Effectiveness Ratings for Extension Under Changing Conditions (percentage)

Case 1. Change in Effectiveness Rating of Private Sector Sources[a]

Extension Rating	Mean Value[b]	25th Percentile	75th Percentile
Never Useful	2.9	4.3	2.5
Sometimes Useful	33.8	39.2	31.9
Useful	38.8	37.2	39.1
Very Useful	24.5	19.3	26.5

Case 2. Regional Variation in Effectiveness Ratings[c]

Extension Rating	West	North Central	South	Northeast
Never Useful	2.9	8.0	5.7	4.2
Sometimes Useful	33.8	47.9	43.2	38.9
Useful	38.8	32.1	35.3	37.3
Very Useful	24.5	11.9	15.8	19.6

[a] Baseline farmer was a full time transitional mixed organic operator who was a sole proprietor located in the West SARE region.
[b] Ratings were calculated at the mean private sector index rating (50th percentile), and the 25th and 75th percentile of this value.
[c] Same conditions as for the baseline, except geographic region varied.