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Improving Extension Effectiveness for Organic Clients: Current Status and Future Directions

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Responses from a national survey of U.S. organic farmers indicated dissatisfaction with the extension service. An ordered probit model was used to identify the factors influencing effectiveness ratings of extension advisors by farmers. Study findings show 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 usefulness to 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: extension service, ordered probit model, organic farming

Introduction

In its 1996 report, *Colleges of Agriculture at the Land Grant Universities: Public Service and Public Policy*, the National Research Council (NRC) 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 comments, "the private sector has insufficient incentives to transfer agronomic management practices and technologies that reduce off-farm pollution" (p. 96). Caswell et al. emphasize 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 United States. In this article, we explore the factors that influence the effectiveness ratings of extension agents as reported in a nationwide survey of organic farmers.

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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. The NRC report cited above 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 characterized extension as held hostage by traditional audiences, unable to effectively inform its clientele on important emerging agricultural issues and lacking the vision to broaden its client and program portfolio. Boehlje and King commented that failure to respond to a segmented demand for information, outdated delivery methods, and lack of value added to information from extension have caused clientele to rely more on private-sector information sources.

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 1 was "not a constraint or problem" and 5 was "a serious constraint or problem" (see Walz, question 6.3, p. 91). "Uncooperative or uninformed extension agents" was rated 5 by 24% of 1,126 respondents to this question, with a mean rating of 3.08. "Information on organic practices unavailable or hard to find" received a rating of 5 by 8% of these respondents, with a mean rating of 2.56, statistically different from the mean extension rating at the $\alpha = 0.01$ significance level. The problem of extension's failure to deliver information was identified as a bigger barrier than was the quality and availability of information. 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 to previous success stories touting the efficacy of agricultural extension in promoting innovative programs in sustainable agriculture. Postlewait, Parker, and Zilberman claimed 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 of marketable commodities and products were documented. Napit et al. 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 clientele, organic farmers have not perceived these programs as beneficial to their sector. Hanson noted an important standard for evaluating excellence in extension programming is meeting the needs of the projected audience. It is inevitable that the organic sector, growing at 20% per year in retail sales for the last 10 years and doubling its cropland every four to five years (Greene 2001), will demand information from the extension service. The organic sector is well defined by national regulations and, with an average of three organic farms in each of 1,208 U.S. counties, representing 39% of all U.S. counties (Lohr), represents a relatively easy target to develop as a clientele group. Organic agriculture has a dramatically increasing national profile, as

demonstrated by the existence of several organic-specific federal grant programs, the availability of organic federal crop insurance, and the formation of a bipartisan Congressional Caucus for organic agriculture.

Despite recent industry growth, the total acreage allocated to organic agriculture in 1997, when the OFRF survey was conducted, was only 0.2% of all U.S. cropland and pasture land. By crop categories, the organic shares ranged from 2% of horticultural cropland to 0.1% of corn and soybean acreage. To bridge the gap between extensionists and organic farmers, it is critical to improve communication between the two groups and to use information about the factors that affect organic farmers' choice of information sources in developing educational programs which are useful, credible, and accessible to the organic sector. The results of this research suggest both problems with traditional extension approaches and promising ways to enhance the extension-organic farmer linkage.

Modeling Effectiveness Ratings of Information Sources

A producer's "usefulness" rating for information obtained from a public or private source represents an unobserved latent measure of effectiveness, EFF_i^*, which in turn is related to a set of explanatory variables $\mathbf{z}_i$:

$$EFF_i^* = \mathbf{z}_i'\delta + \varepsilon_i, \tag{1}$$

where EFF_i^* is the true but unobserved effectiveness of the information source as perceived by the ith organic producer, $\mathbf{z}_i$ 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 the producer associated with the source.

The ordered probit model is an extension of the binary probit recognizing that the dependent variable is ordered or ranked, as in this case. The ith farmer's equation is denoted by:

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

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 data range from 1 = "never useful" to 4 = "very useful." The log-likelihood function for the ordered probit model is given by:

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

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:

$$(4)\qquad \text{Prob}(EFF_i = j \mid x) = \begin{cases} \Phi(\gamma_0 + \mathbf{z}_i'\delta) & \text{if } j = 0, \\ \Phi(\gamma_j + \mathbf{z}_i'\delta) - \Phi(\gamma_{j-1} + \mathbf{z}_i'\delta) & \text{if } 0 < j \le k-1, \\ 1 - \Phi(\gamma_{k-1} + \mathbf{z}_i'\delta) & \text{if } j = k. \end{cases}$$

The unknown parameters of the model are δ and 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 which 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, p. 1). The questionnaire was mailed to all U.S. certified organic farmers, based on lists from certifying organizations.

The OFRF data represent all crops grown organically, and all regions in which organic production is conducted. Of 49 states with organic producers in 1997, 44 states were represented in the OFRF survey (Greene 2001; Walz). No organic farmers from Alaska, Arkansas, Delaware, Mississippi, Nevada, or Wyoming responded to the OFRF survey. These states represented only 1,492 acres, or 0.18% of the total 850,177 certified organic cropland acres in 1997 (Walz; Greene 2001).

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). 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.

Respondents were provided with a list of 12 personal information sources, and were asked to indicate both the usefulness of and the number of contacts with each source (see Walz, question 2.2, p. 38; reproduced here in an appendix). Farmers seeking production information from non-university outlets relied on three main sources: other farmers (83% of organic farms used this source), organic certification personnel (75%), and input suppliers (62%). Extension personnel (58% contact rate) and university-based researchers (44%) were both below these levels in terms of numbers of farmers using the source. Information from other farmers was rated by all users in the OFRF survey as the most useful source, with a mean value of 3.44 on an integer scale of 1 to 4 (1 = "never useful" and 4 = "very useful"), followed by organic certifiers rated at 2.96 and input suppliers at 2.99. University researchers had an average rating of 2.73 among users, outperforming the 2.64 rating for cooperative extension advisors.

A summary of the information source effectiveness is apparent in comparing other farmers, the top-ranked information source based on ratings of usefulness, with other sources. Five of the other six private information sources, all the for-profit entities shown in the appendix, ranked higher than the public sources. Cooperative extension

advisors ranked 10th of the 12 sources listed in the survey, below all the private sources as well as government agencies such as ATTRA and university-based researchers. Only state agriculture departments and the USDA national or regional offices were rated less useful than cooperative extension advisors.

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%, while other farmers had the lowest percentage of such ratings at 0.4%. With more than half of respondents reporting at least one contact with extension, the rating is not likely due to lack of familiarity with extension services.

These summary data from the entire survey suggest that extension is performing comparatively below the standards farmers set for private-sector providers of organic production information. The econometric model accounts for the interaction of factors affecting perceived ratings of effectiveness.

Data Used in Estimation

Of the 1,192 surveys returned to the OFRF (a 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 provides the variable descriptions and summary statistics for the dependent and independent variables used in estimating the ordered probit model, as well as the question number keyed to the OFRF survey results (Walz) matching each variable. The dependent variable for the effectiveness ratings, *EffExt*, corresponds to EFF_i in (4). As shown in the appendix, the survey questionnaire asked farmers the number of times each of the 12 information sources was used on a yearly basis. Next, the usefulness of each information source was rated using the scale previously described. Organic farmers who rated extension and who had at least one contact with an extension advisor were included in the analysis. The mean effectiveness rating of extension advisors by these 613 farmers was 2.64.

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, although others reported that their one contact was not useful. Others who had many contacts remained unenthusiastic about its effectiveness, even though some frequent users rated extension highly. Frequency of contact was not incorporated into the dependent variable due to this inconsistency. If contact frequency had been multiplied by the usefulness rating for the dependent variable, some of the highest and lowest ratings would have appeared more neutral, which would have obscured the effectiveness measure.

The Independent Variables

To characterize the clientele group 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

Table 1. Variable Descriptions and Summary Statistics (N = 613 farms)

Variable	Description	Mean	Standard Deviation	Survey Question[a]
EffExt	Effectiveness rating for extension advisors	2.64	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 five categories	2.42	2.19	8.8
	Share of all farmers by income category:			
	1 if less than $5,000	0.30		
	2 if $5,000 to $14,999	0.21		
	3 if $15,000 to $99,999	0.33		
	4 if $100,000 to $249,999	0.09		
	5 if at least $250,000	0.07		
EffPrivat	Effectiveness rating for four 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.

could be shaped by familiarity with the service and with its private-sector competitors. Proxies for these variables were also included. Table 2 shows a comparison of the sample data means with the means for the entire OFRF response set representing all organic farmers and with the means for all U.S. farmers from the *1997 Census of Agriculture* (USDA). As discussed below, the sample is highly representative of all organic farmers and is consistent with key descriptors of all U.S. farmers.

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 (*Corporat*) usually feature multiple decision makers and more demanding financial requirements. In the sample, 70% of farms were sole proprietorships and 7% were corporations versus 72% and 6% of all organic farmers. In the United States as a whole, proprietorships compose about 90% of all farms, and partnerships make up from 5% to 6%. Alternative types of farm organization, including partnerships, cooperatives, and property management firms, were grouped and omitted from the regression.

Table 2. Comparison of Sample with OFRF Respondents and All U.S. Farmers

Variable	Description	Sample	OFRF Respondents	All U.S. Farmers
EffExt	Effectiveness rating for extension advisors	2.64	2.16	—[a]
	Share of farmers across rating categories:			
	1 never useful	0.06	0.31	
	2 sometimes useful	0.41	0.33	
	3 useful	0.34	0.24	
	4 very useful	0.18	0.12	
SoleProp	Farm is a sole proprietorship, share[b]	0.70	0.72	0.90
Corporat	Farm is a corporation, share	0.07	0.06	0.05–0.06
PartTime	Operator is part-time farmer, share	0.39	0.37	0.62
YrsOrg	Years as an organic farmer	9.39	7.13	—[a]
TranMixd	Farmer originally a conventional producer only, now farms both organic and conventional acres, share	0.11	—[c]	—[a]
OrgAcre	Acreage farmed organically, from 0.125 to 6,000 acres	136.39	140.00	262.00[d]
OrgInc	Total gross organic farming income, integer variables for five categories	2.42	2.33	—[a]
	Share of all farmers by income category:			
	1 if less than $5,000	0.30	0.27	—[e]
	2 if $5,000 to $14,999	0.21	0.21	0.52[e]
	3 if $15,000 to $99,999	0.33	0.34	0.30
	4 if $100,000 to $249,999	0.09	0.08	0.09
	5 if at least $250,000	0.07	0.06	0.08
EffPrivat	Effectiveness rating for four private sources, rating (1 to 4) multiplied by number used (1 to 4), from 1 to 16	8.43	7.40	—[a]
West	Farm is in SARE Region 1, share	0.35	0.36	0.14
NorthCent	Farm is in SARE Region 2, share	0.28	0.31	0.39
South	Farm is in SARE Region 3, share	0.09	0.08	0.39
Northeast	Farm is in SARE Region 4, share	0.28	0.25	0.07
n	Number of farms in set	613	1,192	1,911,859

Sources: Walz (1999); Hoppe et al. (2001); *1997 Census of Agriculture* (USDA).
[a] This variable does not apply to all U.S. farmers.
[b] Share is based on the number of farms in the set.
[c] This variable is not available for all organic farmers.
[d] For all U.S. farmers, the comparison variable is acres of owned land operated.
[e] For all U.S. farmers, the comparison variable is total revenue from sales of agricultural products. The lowest class is less than $10,000 in sales and the next lowest class is $10,000 to $99,999 in sales. The remaining classes match those for organic farmers.

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 which proxy this latent knowledge include time commitment to farming and experience with organic farming. About 39% of the sample were part-time farmers (*PartTime*), compared with 37% of all organic farmers and 62% of all U.S. farmers (table 2). Experience in organic farming averaged nine years (*YrsOrg*), slightly higher than the seven years reported by all organic farmers. 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% 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 fewer than five years of 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 accounted 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, i.e., 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 information at low cost on the latest research-based technologies. The smallest farm in the sample was 0.125 acre, the largest was 6,000 acres, and the mean farm size was 136 organically certified acres (*OrgAcre*), compared with 140 acres for all organic farms, and a national average for all U.S. farms of 262 acres of owned land operated per farm. Over 40% of the lowest effectiveness ratings originated from organic farmers with five or fewer acres, as smaller farmers expressed the most dissatisfaction of any size class.

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 2.42, implying the average farm income from organic sales was between $5,000 and $14,999. In the sample, 51% of respondents grossed less than $15,000 in organic sales, 33% grossed between $15,000 and $99,999, 9% grossed between $100,000 and $249,999, and an additional 7% grossed at least $250,000. These differ little from the shares by category for all organic farmers. Among all U.S. farmers, 52% were in the USDA's lowest sales class (less than $10,000), 30% were in the "low sales"small farms class (sales from $10,000 to $99,999), 9% were in the "high sales" small farms class (sales between $100,000 and $249,999), and 8% were in the "large farms"class (sales at least $250,000). Of the ratings in the "very useful" category, the largest share (37%) was from organic farmers in the highest income category.

For managing extension, Hanson discusses the implications of determining whether 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 provided by private companies (Boehlje and King). Ilvento argues 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 private sources are substitutes or complements for extension in the organic sector, a composite variable (*EffPrivat*) of the effectiveness ratings for four private information sources was formed. The variable *EffPrivat* was constructed by summing the sources (from 1 to 4) across four private sector sources and multiplying by the ratings (from 1 to 4). 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. Field consultants, other farmers, organic certification agencies, and grower associations were included in this variable because all have a regular on-farm presence or, in the case of grower associations, are composed of individuals with an on-farm presence. The mean effectiveness rating for private information sources was 8.43 (table 2). 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 the index was not weighted unduly 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. note, "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" (pp. 30–31).

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 the sample, 35% of farmers were located 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*). The regional breakdown of the sample is consistent with that of all organic farmers. The majority of all U.S. farmers are in the North Central and South SARE regions, each with 39% of farms, with only 14% in the West region and 7% in the Northeast region (table 2).

Estimation Results

Coefficient estimates and asymptotic t-statistics for the ordered probit model in equation (4) are presented in table 3. The statistically significant and positive estimates of γ_1 and γ_2 confirmed 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 reported in table 3. The effects are the

Table 3. Results of Ordered Probit Analysis of Extension Effectiveness (N = 613 farms)

		Marginal Effect on Probability of Usefulness			
Variable	Coefficient	Never Useful	Sometimes Useful	Useful	Very Useful
Constant	0.835* (3.506)				
SoleProp	-0.067 (-0.635)				
Corporat	0.101 (0.514)				
PartTime	0.298* (2.954)	-0.031* (-3.232)	-0.087* (-5.852)	0.040 (0.543)	0.078* (2.379)
YrsOrg	-0.032 (-1.774)				
YrsOrgSq	0.0008 (1.392)				
TranMixd	0.220 (1.559)				
OrgAcre	-0.00003 (-0.299)				
OrgInc	0.065* (2.696)	-0.007* (-2.636)	-0.019* (-2.686)	0.010 (1.320)	0.016 (1.501)
EffPrivat	0.040* (2.609)	-0.004* (-2.555)	-0.012* (-2.601)	0.006 (1.513)	0.010 (1.365)
West	0.488* (4.209)	-0.047* (-4.104)	-0.144* (-9.526)	0.059 (0.612)	0.132* (5.892)
South	0.177 (1.017)				
Northeast	0.323* (2.701)	-0.031* (-3.349)	-0.096* (-6.202)	0.040 (0.533)	0.087* (2.655)
γ_1	1.551* (28.204)				
γ_2	2.581* (41.177)				
Model $\chi^2 = 48.38$ Critical Value for $\chi^2_{12,0.90} = 18.55$					

Note: Numbers in parentheses are asymptotic t-values with significance at $\alpha = 0.05$ level.

derivatives of the conditional mean function with respect to the variable. The continuous variables are measured at their sample means. For the dichotomous variables, the marginal effects denote the change in probability for a rating when the condition exists (e.g., *SoleProp* = 1) versus when it does not (*SoleProp* = 0). For explanatory variables with multiple integer categories, such as income, the marginal effect is evaluated with respect to a change from the mean income category ($5,000 to $14,999) to the next higher category. 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 expectations for extension advisor ratings under different conditions. Asymptotic standard errors for the marginal effects were obtained using the delta method (Greene 2000) and converted to the t-statistics shown in table 3.

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. As shown in a recent study by Lohr and Park, part-time organic producers adopt a smaller portfolio of pest management techniques than full-time farmers, and the methods tend to be less labor-intensive. Because extension agents traditionally promote technology-intensive rather than information-intensive farming systems, this approach would earn them higher ratings with part-time farmers.

Controlling for other factors, the marginal effects indicated 8% 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 8% of participants as "very useful" in order to claim a program effect. Conversely, almost 12% of full-time organic farmers would be expected to rate extension advisors as "sometimes 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, as was observed in the summary data for the full sample. Familiarity with the extension service (*TranMixd*) and farm size (*OrgAcre*) did not significantly affect the usefulness ratings. This finding suggests that efforts to maintain contacts with farmers who convert to organic agriculture will not alone gain favorable ratings for extension, nor will targeting larger growers.

Farmers with higher gross organic incomes evaluated extension information more favorably, according to the significant income variable, *OrgInc*. The correlation coefficient between income and acreage is only 0.28, probably because the more highly valued horticultural crops tend to be small to medium sized farms, while row crop farms are predominantly larger operations. As a consequence, the income variable is significant while the farm size variable is not. The marginal effects indicated the highest income group was 3% more likely to rate extension "useful" or "very useful" than the mean group with $5,000 to $14,999 in organic sales. Given that farm size (*OrgAcre*) was not a significant factor, these findings suggest extension advisors were providing relevant information to the economically viable and top-performing producers.

Positive perceptions of private-sector information sources (*EffPrivat*) had a significant positive correlation with the usefulness ratings of extension advisors. For each additional point above the mean private source-effectiveness index rating, the probability of a "useful" or "very useful" rating for extension would be observed to be almost 2%, based on the marginal effects. This result supports a possible complementary role for extension advisors to interpret the data collected and supplied for each farm by private sources (Boehlje and King).

This result is also consistent with a principal-agent model in which the farmer is cast 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). In our application, farmers seeking advice would define "best" practice as the most timely and appropriate technical information provided to the organic farmer. Using multiple information sources and 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 of the three SARE region dummy variables tested by the model (*West* and *Northeast*), with respect to the omitted variable for the North Central region. 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).

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. The West and Northeast are home to the nation's oldest organic farm and certifying organizations, California Certified Organic Farmers, Oregon Tilth, and the Northeast Organic Farmers' Association, which have had more than 20 years to develop a research and education agenda and cultivate positive relations with state and local extension advisors. California enacted the first state law to define organic foods in 1982. California and Washington were among the first extension services to conduct outreach and applied research on organic agricultural systems using teams of extensionists rather than individuals. Being in the West region offered nearly 13% probability that the "very useful" rating would be awarded, while being in the Northeast region accorded a 9% 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 in table 3, the probability of an extension advisor receiving a given effectiveness rating, independent of the specific program content, can be calculated (Liao).

Table 4 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. To obtain the probabilities in the baseline ratings, the estimated ordered probit regression coefficients were multiplied by the mean values of the respective variables. The examples in table 4 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 reported in 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. According to the regression results from table 3, better perceptions of private-sector effectiveness are related to a complementary

Table 4. 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]	Decrease by One Std. Dev.	Increase by One Std. Dev.
Never Useful	2.9	3.8	2.2
Sometimes Useful	33.8	37.5	20.2
Useful	38.8	37.8	39.3
Very Useful	24.5	20.9	28.3

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] The 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, and one standard deviation below and above this value.
[c] Conditions are the same as for the baseline, except the geographic region varied.

positive change in the farmer ratings of extension. Table 4 shows that decreasing the private-sector rating index by one standard deviation, to 5.4, reduced the probability of a "very useful" rating for extension by less than increasing the private-sector rating by one standard deviation, to 11.4, raised it (20.9% vs. 28.3%, from the baseline of 24.5%). The probability of a "never useful" rating for extension increased by more with an index rating that was one standard deviation below the mean than it decreased at one standard deviation above the mean (3.8% vs. 2.2%, from the baseline of 2.9%). This means extension ratings are more 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 results for case 2 in table 4 are for the baseline conditions specified, except for variation in regional condition. We chose these conditions to represent the emerging organic farmers (full-time transitional mixed organic operator who was a sole proprietor), who will likely come from the existing conventional farm sector. In this context, the model predicted that more than 50% of organic farmers would rate extension favorably ("useful" or "very useful") in the West, South, and Northeast regions.

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 finding indicates the usefulness of extension advisors is perceived differently across regions, with the farmers in 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. Results show 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 converted from conventional farming. Nationally, 35% of organic farmers have fewer than five 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). "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 follows, the organic information curve.

In the organic industry, private-sector information sources are more widely used and are considered more useful 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). While fees could make extension more accountable to client segments and free resources for supporting limited resource farmers, as the NRC 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), and most organic farmers are accustomed 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 which 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 expressed in the OFRF survey responses that they are barriers to organic agriculture. Because these regions contain 78% of all U.S. farmers, they are the most likely areas in which new organic farmers will be recruited. Evidence from Greene (2001) shows these regions are adopting organic agriculture at a more rapid rate than the West and Northeast regions. Organic acreage increased by more than 50% in the South region

(174,078 acres) and more than 10% in the North Central region (72,903 acres) between 2000 and 2001, compared with 5% in the West region (59,026 acres) and 7% in the Northeast region (8,777 acres). Extensionists in these regions should be aware of the potential for burgeoning demand for organic information.

Nationally, 63% of organic producers are full-time farmers, and probably know more than the local extension advisor about the agroecology determining the success or failure of the organic system. Rather than attempt to 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. The onus is on extension to improve its relationship with the organic farming sector by means of a more flexible, responsive approach or be left behind as American agriculture evolves.

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Appendix:
Text of Survey Question on Information Sources

Reproduced here is the text of the question on information sources in the Organic Farming Research Foundation 1997 "National Organic Farmers' Survey" (used with permission of OFRF).

When you seek information regarding organic <u>production practices</u>, what resources do you utilize most often, and which are most useful to you? Following is a list of potential information resources. If you "use" them, indicate how many times per year (PLEASE USE A NUMBER!), rank their usefulness (4 = very useful, 3 = useful, 2 = sometimes useful, 1 = seldom or never useful), and tell us if you have a particular favorite (the level of specificity is up to you) that you think is especially good.

	1 Frequency Used (# of times/year) *Please use a number*	2 Usefulness (4 = very . . . 1 = never) *Circle number below*	3 Any Favorites? Where applicable, please list. *Please name resource*
Part I: From Whom?			
COOPERATIVE EXTENSION ADVISORS	_____	4 3 2 1	_____
UNIVERSITY-BASED RESEARCHERS	_____	4 3 2 1	_____
FIELD CONSULTANTS	_____	4 3 2 1	_____
OTHER FARMERS	_____	4 3 2 1	_____
ORGANIC CERTIFICATION PERSONNEL	_____	4 3 2 1	_____
GROWERS' ASSOCIATIONS	_____	4 3 2 1	_____
OTHER NON-PROFIT ORGANIZATIONS	_____	4 3 2 1	_____
STATE AGRICULTURE DEPT.	_____	4 3 2 1	_____
USDA NAT'L or REGIONAL OFFICE(S)	_____	4 3 2 1	_____
OTHER GOV'T AGENCIES (e.g., ATTRA, others)	_____	4 3 2 1	_____
BUYERS	_____	4 3 2 1	_____
SUPPLIERS (e.g., seed, equip. materials)	_____	4 3 2 1	_____
OTHER _____	_____	4 3 2 1	_____