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ABSTRACT---
A stochastic frontier model is used to explain the performance evaluation of U.S. university extension providers by organic producers. The model makes explicit the nonmanagerial factors that influence both performance ratings and performance efficiency, defined as achieving a rating as close to the "best" rating as possible. Results indicate that extension agents are performing at relatively high mean efficiency of 0.92, but that the average rating is relatively low at 2.66 on a four-point scale. Several sources of potential bias in ratings are identified as a way for managers to more accurately conduct individual performance assessments. Programmatic changes to emphasize more collaborative research and training are suggested by the positive effects on performance efficiency associated with farmer research commitment and production problem severity.

-----KEY WORDS-----

extension service, performance assessment, stochastic frontier, organic farmers

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Benchmarking Organizational Performance of University Extension: A Stochastic Frontier Approach

The role of performance evaluation in accountability for public sector services such as extension has been recognized by both land grant institutions and the federal government. In its report on the Colleges of Agriculture at the Land Grant Universities, the National Research Council (NRC) explicitly acknowledged that these universities face increasing pressure from the public to develop clear goals and measurable performance standards. The Government Performance and Results Act (GPRA) of 1993 requires every federal agency, including the research, education, and extension programs of the USDA, to have performance goals and measures for its programs. The Agricultural Research, Extension, and Education Reform Act (AREERA) of 1998 requires that Extension systems report state-level outcomes for funding decision purposes. Decision makers expect to see data and analysis on program results, impacts, and social and economic consequences of federally funded programs.

While necessary for making improvements, performance evaluation of service providers is difficult and time consuming. A review of the literature by Prendergast highlighted a gap in performance assessment for jobs such as public sector employment at universities where output is difficult to measure. Dixit noted that limited empirical analysis relates performance success in public sector agencies to specific observable characteristics of agencies, organizations, or service clients. Smith and Goddard critiqued performance assessments that fail to account for the full range of contingent factors that affect the measurements recorded. They argued that performance data are worthless unless subjected to analytic techniques that attempt to explain why a particular indicator of performance is observed.

Traditionally, extension evaluations have consisted of input measures - the number of programs offered, participants reached, hours worked, and dollars spent. Radhakrishna and Martin pointed out that input-based assessments are no longer adequate to assess program effectiveness. Even where extensionists conduct pre- and post-meeting satisfaction and learning surveys, the results are strictly applicable to the content and presentations of the particular meeting, and do not enable analysts to predict the success or failure of future programs. To address the assessment gap and permit strategic program development, the factors that influence stakeholder ratings of the extension service should be benchmarked. Understanding the sources of variation in ratings that are not attributable to managerial performance is necessary to make appropriate adjustments in programming (Smith and Goddard).

Our study develops a frontier model of extension performance based on evaluations provided by farmers. Our goal is to benchmark the nonmanagerial factors that influence external performance ratings and performance efficiency of university extension. Performance efficiency is the effectiveness of extension providers in achieving the maximum evaluations from their clientele conditioned on the characteristics and operational environment of the producers who are rating the service. We specify a stochastic frontier model to identify the significant factors that influence performance ratings and performance efficiency of extension agents.

By linking performance efficiency to observable characteristics of the farmer evaluators and their operations, policy makers may avoid incorrect interpretation of ratings associated with failure to account for the range of potential influences on the measurement (Smith and Goddard). Identifying the contingent factors that divide agents into leaders and laggards in terms of ratings permits more accurate assessment and managerial response.

We apply our model using data the Organic Farming Research Foundation's (OFRF) 1997 nationwide survey of U.S. organic producers. This group is an excellent test case for several reasons. First, the OFRF survey asked detailed questions about farm conditions and constraints, usefulness of and frequency of contact with a variety of information sources including extension, giving us a rich data set for the frontier analysis.

Second, organic producers represent a relatively new clientele for extension, and ratings may reflect the difficulty of questions relative to extension agents' preparation, consistent with basic personnel economics (Lazear, 1998). Performance evaluation has little value if service providers are all expected to perform well or the probability of a successful outcome is high. Farmers' questions about organic production may require agents to synthesize ecological and agronomic information from diverse sources into a systems-oriented response that accounts for the legal restrictions on organic production, an approach not typically part of agent training. This suggests that difficult technical questions will lead to lower performance evaluation of extension agents by organic farmers, representing a potential source of bias. The stochastic frontier model allows us to test this contention.

Finally, there is a perception among organic farmers that university extension is a barrier to production. "Uncooperative or uninformed extension agents" was rated as a "serious constraint" by 24% of 1,126 respondents to a question eliciting constraints in the OFRF survey (Walz). The stochastic frontier model enables us to determine whether farmer-evaluator characteristics affect the ratings assigned to extension by organic farmers, and hence whether extension is being fairly assessed.

Modeling Outcomes from Performance Evaluations

Lazear (1998) noted that performance evaluations are designed to provide two kinds of information. First, the service provider's general ability is revealed in the evaluation. Ability predicts the employee's long-term, stable performance and corresponds to the frontier of "best performance" that an employee can achieve. By evaluating a worker's general ability the hiring organization can assess how much training or human capital investment to provide the employee.

Second, the evaluation elicits information about the individual talents or skills that the worker possesses. By identifying the skills of each employee, the organization can match employees to specific types of tasks or job assignments. The employee's skill set influences the ability to deal with uncertainty and shifting environmental conditions which the worker cannot control. This element corresponds to the factors that are linked to inefficiency or performance less than the employee's best possible achievement level. Both elements are readily identified from a stochastic frontier model.

We adapt a public sector educational production function to model performance evaluation, focusing on agricultural extension agents who provide technical assistance to organic producers. The output of our performance evaluation model is the advisor rating by the farmer-evaluator. The input measures in this model reflect the characteristics and experience of the customers who use the service along with the types of problems for which the customers seek assistance. This makes explicit the transformation of inputs to outputs that is commonly lacking in economic performance measurement models (Smith and Goddard), and allows us to identify sources of variation in ratings.

The set of performance ratings **y** that can be attained given the input vector **x** and the exogenous technical or market conditions **r** facing the institution providing the service by the frontier $f(x, r; \beta, \gamma)$ where β and γ represent the set of parameters to be estimated. The stochastic performance frontier model incorporates a composite error term consisting of two random variables where $h(\epsilon) = (\nu - u)$. The first element reflects temporary or random shocks outside the control of the service providers that affect performance ratings. This symmetric noise error term is represented as ν. The asymmetric inefficiency error term, u, accounts for inefficiency in providing service along with environmental factors that reduce ratings and assumes only nonnegative values. Shocks that cannot be controlled by the extension service provider include variations in research information, farmer attitudes, and institutional commitment to information quality. These factors contribute to random deviations driving effectiveness ratings below the frontier.

The empirical specification of the extension performance ratings by the i^{th} farmer includes characteristics, experience, and human capital of the producers (x_i) who consult with the extension service. Environmental factors and constraints (r_i) that influence production patterns and the types of technical advice sought from the extension agents are also included. The resulting model is:

$$\begin{aligned} y &= f(x, r; \beta, \gamma) + h(\epsilon_i) \\ &= \beta' x_i + \gamma' r_i + \nu_i - u_i \end{aligned} \quad \textbf{(1)}$$

We follow Atkinson and Primont in using a fixed-effects approach for performance inefficiency variables which vary across the farmer-evaluators seeking extension advice, specified as $\mu = \lambda' f_i$. Individual-specific variables that shift the performance efficiency of extension agents are identified by f_i with estimated parameters λ. The frontier model is:

$$y = \beta' x_i + \gamma' r_i - \lambda' f_i + \nu_i - u_i^* \quad \textbf{(2)}$$

where $u_i^* = u_i - \lambda' f_i$. Performance efficiency measures are based on consistent estimators of the u_i from the distance function. The negative of the residuals from equation 2 are calculated as $\lambda' f_i. - \hat{\nu}_i + \hat{u}_i^* = \hat{u}_i - \hat{\nu}_i$ which are consistent estimates of $u_i - \nu_i$. These estimates are then regressed on $\lambda' f_i$. yielding fitted values which are consistent estimates for the u_i.

The one-sided error term which represents technical inefficiency must be non-negative. This restriction implies $\hat{u} = \min_i (\hat{u}_i)$, defining the estimate of the frontier intercept across all farms, so that $\hat{u}_i^* = \hat{u}_i - \hat{u} \geq 0$. Performance efficiency is estimated as $PE_i = \exp(-\hat{u}_i^*)$, where $0 < PE_i \leq 1$, which is implicit in the normalization of $\hat{u}_i^*$.

Data Description

The 1997 OFRF questionnaire was mailed to all U.S. certified organic farmers, based on lists from certifying organizations. Of the 1,192 surveys returned to the OFRF (26% response rate), sufficient detail was provided in 569 responses to test the 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, p. 38). Although we focus on extension service ratings in this application, the cross-sectional comparison of organizations needed for benchmarking (Smith and Goddard) is implicit in the data, due to the question format.

Summary data from the entire survey suggest that extension providers are performing comparatively below the standards achieved by private sector providers of organic production information. Cooperative extension advisors were the 10th ranked source of the 12 listed in the survey. Only 18% of OFRF respondents gave extension advisors the highest level rating ("very useful"). Of all sources, extension advisors received the highest percentage of "never useful" ratings at 6%.

Table 1 shows the variable descriptions and summary statistics for the dependent and independent variables estimated for stochastic frontier model, as well as the question number from the OFRF survey matching each variable. The dependent variable for the performance evaluation model is ExtRate. The extension rating was on an integer scale of 1 to 4, 1 being "never useful" and 4 being "very useful." Only farmers who had at least one contact with extension service providers were included in the analysis. The mean performance rating of extension advisors by these farmers was 2.66.

The Independent Variables

Identifying the range of characteristics that could influence performance ratings requires attention to farm structural, demographic, and management factors as well as farmer attitudes about comparable information sources. We focus on private sector competitors since extension is most likely to lose clientele to this group if not responsive to information needs (Boehlje and King).

Assessment of the quality of information received from extension sources is related to the producer's basic organic agriculture knowledge and congruity of the information with that knowledge. Time commitment to farming and experience with organic farming are measures of the producer's ability to assess and evaluate information. About 39% of our sample were part-time farmers (PartTime). Experience in organic farming (YrsOrg) averaged more than 9 years. Experience is also squared (YrsOrgSq) to account for possible nonlinear effects.

Producers are expected to have more familiarity with extension advisors if they previously used or currently use conventional production methods. In contrast to organic producers, conventional farmers consider extension service a reliable and useful source of information (Anderson *et al.*). To account for this type of previous and current experience with the extension service among organic producers, we combine two dimensions of farmer experience - parallel farming and transitional farming. 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. Transition farmers were originally conventional producers but converted some or all of their farms to organic production. The subset of farmers who transitioned to organic farming, and maintained mixed farming operations (TranMixd) accounts for 11% of our sample.

A scale effect for farm size is 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 mean farm size (OrgAcre) was 144 acres. Gross organic income (OrgInc) is included to test for differences across income classes in extension ratings. The mean of the income variable was 4.27, implying that the average farm income from organic sales was between $100,000 to $249,999.

Ratings of extension are expected to be lower if the service is perceived to be a weak substitute for competing private sector information sources. Boehlje and King argued that extension's role may evolve to a complementary rather than substitute advisory service, incorporating such tasks as helping farmers assess the quality and value of private services or assisting farmers to effectively use the information that private companies provide.

To test whether private sources are substitutes or complements for extension in the organic sector, a composite variable (PrivRate) of the usefulness ratings for four private information sources was formed. This variable was constructed by summing the ratings (from 1 to 4) across four private sector sources - field consultants, other farmers, organic certification agencies, and grower associations - producing an integer variable ranging from 1 to 16. A score of 4 indicated that 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. Correlations of the individual private sources with the index range from 0.43 to 0.65, indicating that the index is not weighted unduly by any one component.

Variation in institutional commitment to organic farming research affects the quality and quantity of information available to use in responding to farmer queries. Fewer resources devoted to research and training are expected to lower extension ratings. Variation in institutional commitment across states has been documented by Sooby. We use the four USDA Sustainable Agriculture Research and Education (SARE) regions as proxies for variation in institutional commitment, since SARE regions are the primary geopolitical units for federal funding and inter-institutional collaboration in organic and sustainable agriculture research. Each region develops its own research priorities, reviews proposals, awards grants, and administers the funding program. In our sample, 36% of farmers were in SARE 1 region (West), 28% in SARE 2 region (NorCent), 8% in SARE 3 region (South), and 28% in SARE 4 region (NorEast).

Producer-specific Fixed Effects

Two producer characteristics are relevant for the rating assigned to extension and affect the ability of extension advisors to attain the highest possible rating, defined as the performance efficiency. These characteristics, which compose the r_i elements in equation 2, influence the type of questions posed to extension and the satisfaction with the responses to those questions. These are fixed effects, exogenous to the extension service provider.

The first factor is the farmer's current participation in on-farm research projects with outside collaborators. Farmers having more familiarity with the research process are expected to demand a higher scientific standard for production advice offered by extension agents, and to better understand scientific information presented by extension. A measure of the farmer's research involvement (ResComt) was formed by recording the number of resource categories, of seven possible choices (providing land, financial support, labor, materials, or research advice, as well as publishing and distributing research results), that the farmer provided in collaborative research. In our sample, 75% of farmers contributed no resources, while 12% provided all seven resources. The mean resource commitment was 1.5.

The second factor in performance efficiency is the severity of production problems faced by the farmer. We expect that more severe problems will be more difficult to solve, and will result in lower ratings of extension advisors. The effect on performance efficiency could be positive if extensionists are perceived to be making a sincere effort to pull together as much information as they have, even if the information itself is not adequate to address the problems. An index of severity of production problems (ProdProb) was constructed by summing the rating of severity from 1 to 5, with 5 being most serious, across five production problems - difficulties in achieving the desired production level, finding organic inputs, costs of organic inputs, distance and transport of organic inputs, and the effectiveness of organic inputs and methods. The index ranges from 5 to 25 so that a score of 25 means the maximum rating was given for each production problem. The mean value of the production problems index was 14.15 for the organic farmers in the sample. There was no significant difference in ProdProb across the income levels.

Estimation Results

Coefficient estimates and asymptotic t-statistics for the performance evaluation model are given on table 2. We used a linear specification of the model following Wooldridge, who noted the robustness of the linear model to arbitrary forms of heteroscedasticity and serial correlation. By contrast, the ordered response model assumes that all conditional moments of y given x are correctly specified and lacks the robustness of the linear model.[1]

We tested for endogeneity of the ResComt and ProdProb variables in the stochastic frontier. Endogeneity tests using instruments which reflect the farmer's choices of crop and management strategies, information sources and outlets used to gather technical production and marketing information were performed. The hypothesis of weak exogeneity was not rejected as the calculated χ^2 of 2.49 was less than the critical value of χ_2^2 of 5.99 at the 95% confidence level.

The significant variables that positively affect farmer ratings of extension include PartTime, TranMixd, and OrgInc. Farmers who have less time to implement extension advice, are more familiar with extension approaches, or are earning sufficient revenue to supplement extension advice with private consultants are likely to be less critical of university extension.

PrivRate also has a significant positive effect on the performance ratings of extension advisors, suggesting a complementary information provider role for extension. For each additional one-point increase in the index rating for the four private information sources from the mean of 8, the rating for extension agents increases by 0.10. This result aligns with a principal-agent model that casts the farmer as a principal seeking production advice from extension advisors and private information providers, who serve as the agents (Levitt). Using multiple information sources and agents provides the farmer-principal the greatest chance of finding the "best" information, given the limited availability of research-based information and the complexity of ecosystem-dependent production systems.

The significant positive estimate for West implies that extension advisors in the region obtain 0.18 point higher ranking than the U.S. average rating, while the significant negative estimate for NorCent suggests a 0.14 point lower rating for agents in that region. Regional differences in resources allocated to the extension service do exist, with the result that practices advocated by extension that could promote sustainable and organic production have been unevenly adopted.

When organic farmers face more serious production constraints, extension agents receive lower performance ratings, as documented by the significant negative coefficient estimate for ProdProb. This result is consistent with the claim that difficult technical questions from farmers lead to lower performance ratings.

The West SARE region historically has made greater commitments to organic research and education. The West is home to the nation's oldest organic farm and certifying organizations, California Certified Organic Farmers and Oregon Tilth, which have had more than 20 years to to develop a research and education agenda and develop 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.

Performance Efficiency

Table 3 shows the overall performance efficiency from the stochastic frontier model with fixed effects and decomposes the two determinants that influence the ratings. Performance efficiency is defined here as the effectiveness of extension agents in achieving the maximum evaluations from their clientele conditioned on the farm level characteristics and environmental resources and constraints of the organic farmers. The mean performance efficiency measure is 0.923. This suggests that extension agents are not likely to earn much higher ratings from organic farmers in the absence of institutional or structural changes in the organization.

The model indicates that producer involvement in collaborative research contributes to the performance efficiency of extension providers. ResComt is significant and negative, indicating that farmer involvement in collaborative research projects reduces the level of performance inefficiency as expected. Lazear's (1997) model of the research decision demonstrated that more productive individuals are more likely to initiate and become involved in research projects. The results suggest that participation in research is an indicator of the ability to successfully make use of information from extension agents, a result which aligns with Lazear's (1997) model. The mean performance efficiency level of extension agents rated by producers who participate in collaborative research was 0.946, compared with 0.916 for agents evaluated by nonparticipating farmers. The difference in the efficiency scores was statistically significant at the 95% confidence level.

More than 78% of farmers involved in collaborative research have between four and seven research partners. We estimated separate models to examine whether the efficiency-enhancing effects of research involvement are linked to the specific collaborative partner. Interaction terms indicating whether the research was initiated with other farmers, university colleagues, private companies, or private research organizations were included in the specification. None of these factors were significant in shifting the performance efficiency measure. These findings indicate that performance efficiency is not linked to specific collaborative partners.

The model suggests that performance efficiency is enhanced when extension agents are confronted with difficult production problems, as indicated by the statistically significant negative coefficient for the inefficiency determinant. The hypothesis that observed effort to address more complicated problems is rewarded in ratings is supported.

We decomposed the severity determinant into high severity, which are farms with an index that exceeded the mean value of ProdProb by more than one standard deviation, and low severity, which are farms with an index below the mean index value by one standard deviation. Extension service personnel who provide assistance to producers with severe constraints achieved performance efficiency ratings of 0.958, statistically higher than the rating of 0.883 for extension experts serving farmers with less severe production problems.

Benchmarking Extension Performance

Organizational performance evaluation is designed to identify ways that employees can improve their performance and to guide changes in institutional goals and programs. Lovell noted that overall performance may be most readily improved by focusing on the laggards or poor performers and linking them to role models or leaders to follow. Any factors that influence farmer-evaluations of the two groups may be benchmarked to serve as a basis for performance evaluation.

We defined laggards as extension advisors whose performance efficiency scores fell below 0.900, while leaders were defined as those whose scores exceeded 0.950. Explanatory variables from the group of 119 laggards and 94 leaders were compared to identify relevant benchmark factors that distinguish the two groups.

The key factor differentiating leaders and laggards was the farmer resource commitment variable (ResComt). The leaders interacted more with farmers who were involved in collaborate research than did the laggards, 78 percent compared with six percent. Clients consulting with the leaders were involved in an average of four research roles compared to less than one role for farmers who worked with the laggards.

From a manager's perspective, the results of this comparison and those in the preceding sections clarify several points related to organizational and individual agent evaluations. First, the quality and availability of information are insufficient to meet the needs of extension agents interacting with organic farmers. Although the average performance efficiency is 0.923, meaning agents are relatively close to the ratings frontier, the average rating is only 2.66 on a four-point scale. Farmers give agents credit for attempting to answer complex organic production questions, as shown by the efficiency gain associated with ProdProb, but express dissatisfaction with the results in their lower ratings of agents. The only way to significantly increase the average rating of extension agents by organic farmers is to move more agents toward the frontier, which will entail institutional and/or structural changes. These findings are consistent with

Kalirajan and Shand's suggestion that a main constraint in achieving technical efficiency in agricultural production is the lack of information on best practice techniques.

The estimated coefficients for the ResComt variable offer a clue as to how such change may be accomplished. As farmers become more involved in collaborative research, they are better able to utilize information provided by extension, even it is not a complete answer to a problem. Extensionists in the West region often become research partners with organic farmers, and tend to receive better institutional support for these activities. Expanding this emphasis in other regions could improve readiness of extension agents to address complicated environmental-agricultural problems, and improve ratings of extension advisors by organic farmers.

Mechanisms are already in place to support this change. The USDA's SARE program offers structural and financial support for regional research priorities, usually with requirements that outreach be a main component of funded research. The SARE Professional Development Program is designed to support on-farm research by farmers in collaboration with university extension and research personnel and to train extensionists in sustainable agriculture methods.

Conclusions

This study benchmarks the nonmanagerial factors that influence external performance ratings of university extension by organic farmers. By identifying these contingent factors, we can test claims about the reasons for relatively low ratings by this sector. We show that extension agents are rated higher by farmers who have less time to implement extension advice, are more familiar with extension approaches, or are earning sufficient revenue to supplement extension advice with private consultants. Farmers in the West SARE region are more likely to approve of extension advice.

These results suggest that organic farmers may express systematic bias unrelated to actual performance in their ratings of extension agents. Farmers facing more severe production constraints are likely to rate extension lower, supporting the assertion that more complicated questions bias external ratings. Managers should account for these sources of potential bias when assessing individual performance of extension agents who deal with organic farmers. Additionally, the evolving complementary role of extension with respect to private information sources in the organic sector should be explicitly recognized. Managers should not penalize extension agents who offer interpretations of private sector information rather than attempting to compete with farmers, consultants, periodicals, and conferences that specialize in organic information delivery.

From a programmatic perspective, greater investment in agent training and more emphasis on university-farmer research collaboration will improve performance ratings and performance efficiency. Extension agents who lead in efficiency ratings should document their approaches and assist in training the laggards in effective methods.

Performance efficiency is enhanced when extension agents are confronted with difficult production problems, but ratings will only improve if institutional change through increased research and training is implemented.

Footnotes

1. In the ordered response model, the main focus of attention is on the response probabilities such as the probability that the extension providers achieve rating of "very useful." The expected outcome or rating provided by the organic farmers is not focus of the ordered response model. The linear model does provide a clear and readily interpreted indicator of performance inefficiency and is preferred in this context. Wooldridge noted the predicted response from the ordered response model is not an interesting outcome as the underlying measure is typically an abstract measure. In addition, coefficients from ordered response models are often of limited interest. We did estimate an ordered probit model and the results, which align exactly with those reported here, are available.

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Table 1. Variable Descriptions and Summary Statistics

Variable	Description	Mean	Standard Deviation	Survey Question[a]
ExtRate	Farmer rating of extension advisor usefulness	2.66	0.84	2.2A
	Share of farmers across rating categories			
	1 Never useful	0.06		
	2 Sometimes useful	0.40		
	3 Useful	0.36		
	4 Very useful	0.18		
PartTime	Operator is part-time farmer, 1 if yes	0.37	0.48	8.3
YrsOrg	Years as an organic farmer, from 0 to 45 years	9.63	7.19	8.10
TranMixd	Farmer originally a conventional producer, now farms 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	144.62	414.14	8.6A
OrgInc	Total gross organic farming income, integer variables for 5 categories	4.27	2.10	8.8
	Share of all farmers by income category			
	1 if less than $5,000	0.24		
	2 if $5,000 to $14,999	0.22		
	3 if $15,000 to $99,999	0.36		
	4 if $100,000 to $249,999	0.10		
	5 if at least $250,000	0.08		
PrivRate	Effectiveness rating for private sources, rating (1 to 4) multiplied by number used (1 to 4), from 1 to 16	8.43	2.97	2.2A
ResComt	Resources provided for research efforts (0 to 7 resources)	1.51	2.67	2.5
ProdProb	Index of organic production problems rating of 5 problems (1 to 5) multiplied	14.15	5.18	6.3

	by severity (1 to 5), from 1 to 25			
West	Farm is in SARE Region 1, 1 if yes	0.36	0.48	8.12
NorCent	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	0.08	0.27	8.12
NorEast	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. Descriptive statistics based on 569 observations.

Table 2. Stochastic Frontier for Performance Evaluation of Extension Providers

Variable	Coefficient	T-ratio[a]
Constant	2.251*	11.554
PartTime	0.241*	3.061
TranMixd	0.270*	2.441
YrsOrg	-0.025	-1.739
YrsOrg*YrsOrg	0.0006	1.322
OrgAcre	-0.00001	-0.157
OrgInc	0.075*	2.143
PrivRate	0.027*	2.302
ResComt	0.0009	0.062
ProdProb	-0.013*	-1.974
West	0.182*	3.457
NorCent	-0.143*	-3.612
South	0.026	0.197
NorEast	0.076	1.130
Inefficiency Determinants		
ResComt	-0.006	-1.730
ProdProb	-0.005*	-2.492

[a] Asterisk indicates asymptotic t-values with significance at $\alpha = 0.05$ level. Model estimated with 569 observations.

Table 3. Performance Efficiency Ratings and Decompositions

	Observations	Mean	Standard Deviation	Minimum	Maximum
Overall Efficiency	569	0.923	0.027	0.876	1.000
By Involvement in On-Farm Research					
Positive Involvement	156	0.946 [a]	0.026	0.888	1.000
No Involvement	413	0.916	0.022	0.878	0.962
By Severity of Production Problems [b]					
Producers with High Severity	95	0.958 [a]	0.018	0.940	1.000
Producer with Low Severity	70	0.883	0.005	0.878	0.898

[a] Within category comparison is statistically different at the 0.05 significance level.

[b] The five production problems are difficulties related to achieving the desired production level, finding organic inputs, costs of organic inputs, distance and transport of organic inputs, and the effectiveness of organic inputs and methods. High severity is when the observed index exceeds the mean by one standard deviation. Low severity occurs when the observed index is below the mean by one standard deviation.