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Livestock Farmers' Use of Animal or Herd Health Information Sources

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Abstract: Dissemination of animal or herd health information is of potential importance not only to management of a farm business, but may also be critical to animal welfare and public health. Understanding the types of sources of animal/herd health information that farmers use and how farm and farmer characteristics may influence their use is of importance. The objectives of the study reported here were to ascertain the use animal/herd health information sources by livestock producers and the effects of farm and farmer demographic characteristics on use of these information sources. Survey results from 1,737 Tennessee livestock producers are used in the analysis.

Introduction

Recently, incidents such as the U.S. and Canadian cases of bovine spongiform encephalopathy (BSE) and the cases of avian flu (H5N1) in Asia, along with biosecurity issues, have brought public health concerns about food animal and herd health management to the forefront. Coupled with these concerns are the concerns within the veterinary profession regarding potential future shortages of food supply veterinarians, with a forecasted shortfall of 4 to 5% per year between now and 2016 (Andrus, Gwinner, & Prince, 2006; Prince, Andrus, & Gwinner, 2006). Compounding these issues are heavily strained resources among public information providers, including Extension Services, colleges, and universities across the United States.

Because animal or herd health information is of potential importance not only to the farm business but potentially also to animal welfare and public health, understanding the types of sources of animal/herd health information that farmers can utilize is important. Furthermore, understanding how farm and farmer demographic characteristics influence use of various sources may provide insights into the client base for

animal/herd health information. The objectives of the study reported here were to ascertain the use animal/herd health information sources by livestock producers and the effects of their farm and demographic characteristics on use of these information sources.

Prior Research

Several studies have examined overall preferences for or use of information sources by farmers. Gloy, Akridge, and Whipker (2000) examined preferences for information sources used by crop and livestock farmers. The two most useful sources were crop/livestock-specific publications and general farm publications. They also found that livestock farmers were more likely to prefer livestock/commodity-specific publications over general farm publications compared with crop farmers. Vergot, Israel, and Mayo (2005) found that the most commonly used sources of information regarding beef cattle production used by farmers were other beef producers, county Extension agents, and veterinarians.

Jordan and Fourdraine (1993) studied information sources used by farmers operating the top milk producing herd in the United States as identified by the Dairy Herd Improvement Association. They found that veterinarians were the most highly rated and frequently used source of information, followed by farm magazines. Lazarus and Smith (1988), for a group of New York dairy farmers, found that education level and farm size, as measured by herd size, were positively related to use of veterinarian services.

Other studies have examined the effects of farm or farmer demographic characteristics on use of information for farming. Jones, Batte, and Schnitkey (1989) concluded that farm size, off-farm employment, and farm enterprise type affected the demand for information by farmers. Mishra and Williams (2006) suggested that adoption of computers with Internet access is positively influenced by age of farmer, educational level, off-farm business income, and regional location of the farm. They also found that larger farms were more likely to adopt computers with Internet access. Gloy, Akridge, and Whipker (2000) found that the significant farm and farm characteristics that explained preferences for sources depended upon the type of information source. They did find that farmers producing a larger number of commodities were more likely to have positive attitudes toward a variety of information sources than those producing few commodities.

Methods

The probability of a farmer using a given type of animal/herd health information source is hypothesized to be influenced by farm and farmer demographic characteristics. The farm characteristics include farm income, whether farming was full time, type of livestock operations on the farm, and number of livestock enterprises. Farmer demographic characteristics include age and education level of the farmer. In addition, rurality of their location is measured by county population. The probability of using more than one type of animal/herd health information source is also hypothesized to be influenced by farm and farmer demographic characteristics. Definitions and means for the variables representing use of information sources and farm and farmer demographic characteristics are shown in Table 1.

To obtain the needed information, a survey was mailed to farms in Tennessee with livestock in late 2006. A random sample of 10,000 farms from the 51,000 total farms across the state with cattle, horses, and other livestock were mailed a survey by the Tennessee Agricultural Statistics Service (TASS). A reminder postcard was mailed to all subjects a week after the first mailing. A second mailing was sent to all non-respondents after four weeks. The survey contained questions regarding the sources of animal and herd health information used and farm and farmer characteristics. The data were summarized using means and percents. A total of 2,191 usable responses were received, with 1,737 responding to all questions needed for the analysis in this article. Throughout the article, the letter "n" is used to represent the number of responses to a question.

Table 1.
Variable Names, Definitions, and Means

Variable Name	Definition	Mean (n=1,737)
Sources of Animal/Herd Health Information:		
Local Veterinarian	1 if used local veterinarian as a source, 0 otherwise	.62
College of Veterinary Medicine	1 if used College of Veterinary Medicine as a source, 0 otherwise	.07
Extension Service	1 if used Extension Service, 0 otherwise	.42
Media	1 if used livestock magazines or other media, 0 otherwise	.54
Internet	1 if used Internet as a source, 0 otherwise	.19
Companies	1 if used animal health company representatives or materials, 0 otherwise	.25
Multiple Sources of Information Used:		
Multiple Sources	1 if more than one type of source of animal/herd health information sources used, 0 otherwise	.62
Demographic and Farm Characteristics:		
Age	Age of farmer	59.19
College Graduate	1 if college graduate, 0 otherwise	.34
Income 1	1 if net farm income less than $1,000, 0 otherwise	.23
Income 2	1 if net farm income $1,000-$4,999, 0 otherwise	.25
Income 3	1 if net farm income $5,000 to $9,999, 0 otherwise	.18
Income 4	1 if net farm income $10,000 to $24,999, 0 otherwise	.21
Income 5 (omitted category)	1 if net farm income > $25,000, 0 otherwise	.13
Full Time	1 if greater than 50% of income from farming, 0 otherwise	.71
Dairy	1 if have dairy cattle, 0 otherwise	.03
Beef	1 if have beef cattle, 0 otherwise	.94

Hogs	1 if have hogs, 0 otherwise	.03
Horses	1 if have horses, 0 otherwise	.08
Poultry	1 if have poultry, 0 otherwise	.08
Number Enterprises	Number of types of livestock enterprises	1.39
County Population	Population of county in which farmer resides	57,856.40

Because the dependent variables (use of a specific information source or use of more than more information source) took on values of 1 for yes or 0 for no, logit models were used to estimate the effects explanatory variables, farm and farmer characteristics, on the probability of a yes response (Greene, 2000). Unlike a linear regression model, the magnitudes of the estimated coefficients on the explanatory variables cannot be interpreted directly as slopes. However, the signs of the estimated coefficients for each of the farm and farmer characteristic variables can be. The statistical significance of the estimated coefficients can also be interpreted directly.

Results

The mean values for the farm and farmer demographic characteristics in Table 1 can be compared with those from the 2002 Census of Agriculture for Tennessee. The average age among the respondents was 59.2, while according to the 2002 Census of Agriculture the average age among all farmers in Tennessee was 56 years old. The net cash farm income according to the Census was $4,185. For the respondents in the study reported here, about 48% of the farmers had net farm income less $5,000. From the Census, about 50.3% listed farming as their primary occupation. Among the survey respondents, about 71% stated that at least 50% of their income came from farming. Therefore, the age of the respondents was slightly older, the farm income was similar, and the percent considered full time was higher than among all farmers in the Census.

According to the Census, among farms with livestock sales, about 2% had sales from milk cows, 82% from beef cows, 2% from hogs, 5% from poultry, and 13% from horses. Among the survey respondents, about 3% had dairy cattle, 94% had beef cows, 3% had hogs, 8% had poultry, and 27.5% had horses. However, these proportions may be somewhat different from the Census, because these represent having a type of livestock in inventory on the farm versus sales from livestock.

The most commonly used source of animal or herd health information was the local veterinarian, followed by media sources, such as magazines, and the Extension Service. About one in four farmers used information from animal health companies and one in 14 used the College of Veterinary Medicine. From the survey results, about 19% used the Internet as a source of animal/herd health information. This can be compared to the nearly 41% stating they had Internet access in the 2002 Census of Agriculture for Tennessee. Over 60% of the farmers used more than one information source.

Models of Probability of Using Information Sources

The estimated logit models of probability of using a given information source are presented in Table 2. The likelihood ratio tests (LR) showed each of the models to be significant overall at the 95% confidence level. The models for local veterinarian and livestock magazines/media correctly classify about 58% of the observations, while the models for the rest of the information sources all correctly classify 61% or greater of the observations. The model for the Internet as a source of information classifies the greatest proportion of the observations, 68.4%.

The estimated coefficient on age is not significantly different from zero in the model for local veterinarian or animal health products companies. However, the estimated coefficient is negative and significant in the rest of the models for information sources used. The estimated coefficient on being a college graduate is significant and positive in each of the models for information sources except use of a local veterinarian.

Table 2.
Models of Sources of Animal/Herd Health Information Used by Livestock Producers[a]

Explanatory Variable	Local Veterinarian	College Vet. Medicine	Extension Service	Media	Internet	Companies
Intercept	1.4741**	-1.3550**	.0585	.6786*	1.9665**	-.2065
	(12.6950)	(4.3793)	(.0224)	(3.2789)	(18.6349)	(.2312)
Age	-.0065	-.0175**	-.0169**	-.0096**	-.0478**	-.00459
	(2.3701)	(4.6856)	(15.7545)	(5.3492)	(72.0460)	(.9043)
College Graduate	.1666	.5632**	.6769**	.2505**	.3945**	.2404**
	(2.3378)	(8.5825)	(40.2165)	(5.6575)	(9.1870)	(3.9968)
Income 1	.0014	-.4983*	-.2661	-.2780*	-.0398	-1.1503**
	(.0001)	(2.7560)	(2.3748)	(2.6931)	(.0360)	(38.2080)
Income 2	-.1688	-.4555	-.2821*	-.1374	-.0723	-1.0996**
	(.9400)	(2.3400)	(2.7139)	(.6692)	(.1180)	(36.1250)
Income 3	-.2083	-.3489	-.1014	-.1055	-.1841	-1.1013**
	(1.2832)	(1.2236)	(.3151)	(.3511)	(.6561)	(31.1500)
Income 4	-.1816	-.5537*	.0617	.1293	-.2038	-.7734**
	(1.0427)	(3.2772)	(.1272)	(.5621)	(.8976)	(18.4827)
Full Time	.1647	.2478	.0695	.2539**	.2565*	.2929**
	(2.1536)	(1.2388)	(.3785)	(5.3652)	(3.0503)	(4.8961)
Dairy	.0998	.0334	-1.1166**	-.4942	-1.0189**	.6443
	(.0376)	(.0027)	(6.9423)	(1.3233)	(3.9953)	(1.8348)
Beef	-1.4960**	-.7001	-.1159	-.8351**	-1.0850**	.2114
	(11.5734)	(1.5625)	(.1019)	(4.9745)	(7.2852)	(.2379)
Hogs	-.9267*	.3830	-.8553*	.0140	-.9184	.2062
	(3.3302)	(.2842)	(3.4049)	(.0009)	(2.4878)	(.1420)
Poultry	-1.0786**	-.1658	-.7610**	-.5946	.2654	.1524

	(6.1943)	(.0722)	(3.9857)	(2.2905)	(.3682)	(.1115)
Horses	-.5635	-.2659	-1.1390**	-.5065	-0.0439	.0297
	(2.0966)	(.2484)	(11.8495)	(2.1664)	(.0133)	(.0055)
Number Enterprises	.7663**	.1933	.8107**	.5740*	0.1705	-.2515
	(4.3154)	(.1592)	(6.9350)	(3.1239)	(.2305)	(.4427)
County Population	-.0000	.0000**	-.0000**	.0000*	-.0000	.0000
	(.1391)	(17.4648)	(6.7718)	(2.8910)	(2.3445)	(.0474)
LR Test[b]	48.1329**	46.0307**	100.4075**	45.5789**	125.3399**	71.4095**
% Correct[c]	57.9	66.4	63.6	58.2	68.4	61.4

[a] Significance of the individual parameter estimates are tested with Wald tests, where Wald=$(ß/S_ß)^2$ and is distributed as X^2 value with 1 degree of freedom. The values in parentheses are the estimated Wald statistics. The symbol X*'=significance at the 90% confidence level and '**'= significance at the 95% confidence level.

[b] Statistical significance of the overall model is evaluated with the Likelihood Ratio test (LR). The test statistic distributed as X^2 with *k* degrees of freedom.

[c] To calculated % Correct, the predicted values are compared with the actual values and then put into percent form.

The patterns of sign and significance on estimated coefficients on the net farm income categories vary across the information sources. None of the income category variables are significantly different from zero in the models for local veterinarian or the Internet. This result suggests that relative to the highest income category (Income 5-$25,000 or greater), farmers with lower incomes were no more or less likely to use these sources. The coefficient on Income 2 is negative and significant in the model for Extension Service. The coefficients on Income 1 and Income 4 categories are significant in the model for College of Veterinary medicine. In the model for livestock magazines/media, the coefficient on the lowest income category is negative and significant, suggesting the lowest income farmers were less likely to use this source. In the model for information from animal health products companies, the coefficients on all the income categories are negative and significant, indicating that relative to farmers with the highest income category, farmers with lower net farm incomes are less likely to use this source of information.

The coefficients on the variable representing whether the farmer received at least 50% of their income from farm sources are positive and significant in the models for livestock magazines/media, the Internet, and animal health products companies. The coefficients are not significant in the models for local veterinarian, College of Veterinary Medicine, and Extension Service.

Having dairy cattle has no significant effect using information sources except that it has a negative effect on use of information from the Internet. Having beef cattle has a negative effect on use of a local veterinarian, livestock magazines/media, and the Internet. Having hogs or poultry has a negative effect on use of local veterinarian and Extension Service. Having horses has a negative effect on using Extension Service for animal/herd health information. The number of livestock enterprises has a positive effect on use of a local veterinarian, Extension Service, and livestock magazines/media.

County population has a positive influence on probability of use of information from the College of Veterinary Medicine and livestock magazines/media. However, county population has a negative influence on probability of use information from the Extension Service, suggesting farmers in rural areas are likely more reliant on Extension Service. The coefficient on population is not statistically significant in the models for local veterinarian, the Internet, or animal health products companies.

Model of Probability of Using Multiple Information Sources

The estimated logit model of probability of using multiple sources of information for animal/herd health information is shown in Table 3. As indicated by the LR test, the model is significant overall and correctly classifies 66.4% of the observations.

Table 3.
Model of Use of Multiple Sources of Animal/Herd Health Information by Livestock Producers[a]

Explanatory Variable	
Intercept	2.8494**
	(45.8896)
Age	-.0296**
	(44.0637)
College Graduate	.5684**
	(24.9059)
Income 1	-.6361**
	(11.6009)
Income 2	-.7039**
	(14.5436)
Income 3	-.4521**
	(5.3551)
Income 4	-.3059
	(2.5542)
Full Time	.3082**
	(7.1461)
Dairy	-1.2445*
	(5.4725)
Beef	-1.8282**
	(14.3899)

Hogs	-.9277
	(2.6884)
Poultry	-1.5372**
	(9.9558)
Horses	-1.2483**
	(7.9520)
Number Enterprises	1.2912**
	(9.2199)
County Population	0.0000
	(1.2686)
LR Test [b]	146.3409**
% Correctly Classified [c]	66.4

[a] Significance of the individual parameter estimates are tested with Wald tests, where Wald=$(ß/S_ß)^2$ and is distributed as X^2 value with 1 degree of freedom. The values in parentheses are the estimated Wald statistics. The symbol '*'=significance at the 90% confidence level and '**'= significance at the 95% confidence level.

[b] Statistical significance of the overall model is evaluated with the Likelihood Ratio test (LR). The test statistic distributed as X^2 with *k* degrees of freedom.

[c] To calculated % Correct, the predicted values are compared with the actual values and then put into percent form.

As can be seen in the results, age has a negative influence on probability of using multiple sources, while having a college education has a positive influence. The coefficients on the lowest three farm income categories are negative, suggesting that farmers with lower farm incomes are less likely to use multiple sources of information. Having the majority of income derived from farm sources has a positive influence on using multiple sources. Having dairy or beef cattle, poultry, or horses has a negative influence. However, having multiple livestock enterprises has a positive influence. County population does not have a statistically significant influence on using multiple sources.

Conclusions

As with results from prior studies, such as those by Gloy, Akridge, and Whipker (2000), Jones, Batte, and Schnitkey (1989), Lazarus and Smith (1988), and Mishra and Williams (2006), farm and farm characteristics are found to influence use of information sources. In addition, paralleling the findings by Gloy, Akridge, and Whipker (2000), the characteristics that influence information use vary across the information source used. It is important to note that these results are strictly from a survey of Tennessee farmers. Results could differ if this same study was conducted in another state.

Access to information about animal and herd health is not only important from a farm management financial perspective, but it is also important from an animal welfare and a public health perspective. As such, access to and use of information across farm income levels and rural areas are of particular interest. The results from the study reported here suggest that farmers with lower farm incomes are as likely as those with higher farm incomes to use veterinary sources, Extension Service, or the Internet. However, farmers with lower farm income tended to be less likely to use livestock magazines/media and animal health products company sources. Also, these farmers are less likely to use multiple sources of information. The results from the study suggest that the Extension Service may be a more important source for farmers in more rural areas. Being in a rural area, however, does not appear to influence use of multiple sources of information.

Older farmers are less likely to use most of the information sources examined. This may reflect the expertise the farmer has developed over years of farming. In addition, older farmers are less likely to use multiple sources of information. Interestingly, however, more highly educated farmers are willing to use a variety of information sources. These results together suggest that more highly educated younger farmers are more likely to use a variety of animal/herd health information sources.

The results from the study reported here suggest that the types of information source used may be particular to the type of livestock enterprise under consideration. However, diversification of the farm into multiple livestock enterprises appears to have a positive influence on use of information from several of the sources. This indicates that as farmers are managing more types of livestock they are willing to turn to multiple sources for information.

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