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Keywords

Agroterrorism, Agricultural Crisis, Beef Producer Risk Perception, Crisis Planning

Research

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Introduction/Purpose

Prior to September 11, 2001, the United States had been a potential target for acts of terrorism targeting agriculture. Horn (1999) maintains the awareness of this threat, to plant and animal commodities, has increased within the intelligence and counterterrorism communities during the past two years; the USDA has worked with these communities to position agriculture to anticipate and respond to such a threat.

After September 11, 2001, the possibility of intentional threats to agricultural safety became a reality. Former Secretary of Agriculture Ann Veneman (2002) stated:

> The intentional threats to agricultural products and our food supply have required us to do much more; we have been working closely with other federal agencies, state agriculture departments, academia, and the agriculture sector on many fronts to secure and strengthen planning and preparedness (p. 1).

This paper was presented at the 55th Annual Southern Association of Agricultural Scientists Convention in Mobile, AL.

Correct and helpful information is crucial for the public to navigate their way through an agriculturally related crisis situation. Studies assessing public relation practices show the importance of openness and forthright communication (Newsom, Scott & Turk, 1989; Pinsdorf, 1987; Seeger & Ulmer, 2001). Effective crisis management relies on the foundation of effective planning and communication before, during and after the incident (Fink, 1986; Henry, 2000; Seeger, Sellnow & Ulmer, 2003).

Henry (2000) maintained being prepared is the first step. "Anticipate every possible crisis. Then develop a communications plan for each potential crisis. Be prepared to respond immediately; this is essential if one hopes to avoid a crisis or be able to manage one if the inevitable happens" (p. 22). Seeger et al. (2003) maintained the inability to move through effective recovery after a crisis could be brought on by poor communication. For agroterrorism response and prevention, Lane (2002) maintains there is a need for a community understanding of local and regional industry hazards and, more importantly, that reduction of confusion or miscommunications will require a national strategy.

Seeger et al. (2003) further maintained organizations might inhibit the public's ability to effectively assess the potential harm and risk of a situation if the organization has failed to supply or support a healthy exchange of information. "A fundamental goal of crisis management is to try to reduce the uncertainty of potential harm for both the organization and the stakeholders" (Seeger et al., 2003, p. 139).

Risk Perception

Past research regarding risk perception has focused on hazards and their different perceptions within society (Fischhoff, et al., 1978; Slovic, Fischhoff & Lichtenstein 1980; Slovic, 1987), as well as the association between trust and hazard assessment risk indexes (Cvetkovich, 1999; Greenburg & Williams, 1999). The depth of knowledge by the general public is relatively low regarding hazards and new technologies (Siegrist, Gutscher, & Earle, 2005). Luhman (1989) and Earle and Cvetkovich (1995) maintain when there is an absence of knowledge, the importance of trust is paramount, and the public will cope with the lack of knowledge by relying on social trust (trusting in specific entities) to reduce the uncertainty they face (Siegrist & Cvetkovich, 2000).

Studies show that public misconception of risk can lead to decisions to oppose such advancements as agricultural-food biotechnologies (Lichtenstein, Slovic, Fischhoff, Layman, & Combs, 1978), and this misconception can be attributed in part to a media-manipulated public opinion (Renn, Burns, Kasperson, Kasperson, & Slovic, 1992). The solution, according to Gaskell, et al., (2004), is to provide the public with an accurate account of risk or hazard information through trustworthy and credible sources.

Purpose and Objectives

The purpose of this study was to add to the knowledge base regarding the risk perceptions of Oklahoma's beef producers when considering the susceptibility of the state's beef industry to a terrorist attack. Specifically, this study addressed the following research questions:

1. What are Oklahoma beef producers' perceptions of the susceptibility of the state's beef industry to an agroterrorism event?
2. Did Oklahoma beef producers' perceptions toward the susceptibility of the state's beef industry to agroterrorism differ based upon the demographic variables of age, farm size, and education level?

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Methods/Procedures

For this study, a beef producer was operationally defined as any individual owning at least one animal of any beef cattle breed. Descriptive research was chosen as the research method because the study dealt with beef producers' perceptions regarding potential agroterrorism events causing an agriculturally related crisis.

The target population of this study was all beef producers in Oklahoma. The population, according to the Oklahoma Agricultural Statistics Service (OASS), was approximately 48,000 beef producers. The sample frame of beef producers in the state was updated each year through property assessment records. The number was fluid and approximated because of the fluctuation of citizens investing in the ownership of cattle or selling off their cattle and divesting in the beef industry. Krejcie and Morgan (1970) suggest a minimum of 381 respondents for a 95% confidence level and a sampling error of +/- 5% for a population of this size. To ensure the minimum number of respondents was met, a random sample of 2,000 names from the target population was selected by using a computerized random selection process.

The original questionnaire was divided into three parts, each part coinciding with the three objectives of the study. Only the first objective is reported on in this paper. Questions 1-4 ascertained attitudinal perceptions of risk by using categorical questions, and question 5 was a five-point Likert-type question assessing level of threat with the U.S. Department of Homeland Security's threat levels: 1 = Low, 2 = Guarded, 3 = Elevated, 4 = High, and 5 = Severe (Ashlock, 2006). At the end of the survey, demographic information was collected about the responding beef producers. Questions in this area were closed-ended or partially closed-ended.

To minimize measurement error, construction of the questionnaire was completed under the guidance of a panel of experts in both the academic and beef cattle production fields. Data were collected by the OASS by using in-house computer-aided telephone interviewing procedures. Conducting a formal interviewer training session to familiarize the interviewers with the instrument controlled data collection error. The OASS used seasoned interviewers to ensure ease of use with the computer system. A comparison of early and late respondents was examined to control for nonresponse error based on guidelines set forth by Lindner, Murphy and Briers (2001). By using a *t*-test, no significant difference between early and late respondents was shown to exist. The instrument was found to be reliable with a Cronbach's alpha of .84. Data were analyzed and interpreted with frequencies, percentages, means, modes, standard deviations, and cross tabulations.

Results/Findings

Data were collected over a period of 12, nonconsecutive days. A random sample (n = 2,000) was drawn from the overall target population of beef producers in Oklahoma (N = 48,000). Of the sample population, 678 completed calls were made providing the researcher with 470 usable responses.

Demographics of Oklahoma Beef Producers

The typical Oklahoma beef producer was male (69.72%) and had at least some high school education (59.80%). The average age of the typical beef producer was 59.5, with a range from 24 to 90 years of age; and the producer owns a computer with access to the Internet (62.3%).

Beef producers are primarily employed within the beef industry (57.90%) owning a cow-calf operation (87.45%) with a herd size from 1 to 49 head of cattle (35.12%). Other operation sizes included 31.06% of respondents owning from 100 to 499 head, 23.83% of respondents owning 50 to 99 head, 5.96% owning 500 to 999 head, and 2.13% owning 1,000 or more head of cattle.

Beef Producers' Perceived Risk

Research Question 1 sought to determine beef producers' perceived level of susceptible risk regarding the Oklahoma beef industry. Survey Questions 1 through 5 were designed to answer this research question.

Survey Question 1 asked respondents to rate their level of agreement with a statement regarding Oklahoma's susceptibility to an agroterrorism event using a five-point Likert-type scale (1 = Disagree, 2 = Somewhat Disagree, 3 = Neither Agree nor Disagree, 4 = Somewhat Agree, 5 = Agree). When asked to describe their level of agreement with the statement: "The Oklahoma cattle industry is susceptible to an agroterrorism event," a majority (63%) of the state's beef producers agreed with the statement.

Table 1
Beef Producers' Perceptions of Beef Industry Susceptibility to Agroterrorism

	%	*M*	*SD*
Disagree	12.3	3.62	1.33
Somewhat Disagree	8.1		
Neither Agree/Disagree	16.6		
Somewhat Agree	31.5		
Agree	31.5		

Note: Scale: *M* = 4.20 or higher = agree, 3.40 – 4.19 = somewhat agree, 2.60 – 3.39 = neutral, 1.80 – 2.59 = somewhat disagree; and 1 – 1.79 = disagree.

After examining this question through cross-tabulation by age, farm size and education level, the data revealed no trend based on this demographic analysis within each group. Mean scores for each age decade showed no change in the trend of the means, and all scores remained in the "somewhat agree" range (Table 2). This trend was prevalent when looking at the age decade and removing the group with only one respondent, producers age 90 years and above.

When analyzing the same question in terms of farm size and its affect on perceptions relating to each beef producers' agreement level of beef industry susceptibility, the trend remained in the "somewhat agree" range until it dropped to the "neutral" range for beef producers with 1,000 head of cattle or greater (Table 2). Finally, when analyzing this same question in terms educational level, the trend remained in the "somewhat agree" range. (Table 2).

Survey Question 2 asked respondents to rate their perception of the level of threat with multiple types of beef cattle operations by using a five-point Likert-type scale (1 = Low, 2 = Guarded, 3 = Elevated, 4 = High, 5 = Severe), corresponding to the threat levels identified by the U.S. Department of Homeland Security. Oklahoma beef producers reported "Ranches" to have a "Low" threat level; "Livestock Exhibitions," "Local Marketing Facilities," "Regional Marketing Facilities," "Background Operations," and "Stocker Operations" were reported to have a "Low to Guarded" threat level; and "Feedlots" were reported to have an "Elevated" threat level (Table 3).

Survey Question 3 asked respondents to state whether they felt their own operation was susceptible to an agroterrorism event. The majority of the respondents (62.8%) disagreed with the possibility, 26.8% agreed, and 10.4% answered "don't know" to the question.

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Table 2
Beef Producers' Perception of Susceptibility and Confidence Cross-Tabulated by Age, Farm Size, and Education Level

	Susceptibility	Confidence	
Age Decade	*M*	*M*	(*n*)
20s	3.60	3.00	5
30s	3.62	3.21	29
40s	3.50	3.58	66
50s	3.67	3.62	97
60s	3.64	3.42	135
70s	3.61	3.68	107
80s	3.57	3.48	23
90s	4.00	3.00	1
Farm Size			
1 to 49 head	3.54	3.63	158
50 to 99 head	3.55	3.48	112
100 to 499 head	3.79	3.44	146
500 to 999 head	3.82	3.57	20
1000 + head	2.80	2.80	10
Education Level			
No formal education	3.70	3.75	57
High school	3.54	3.62	224
Associate's degree	3.66	3.35	77
Bachelor's degree	3.71	3.39	62
Master's degree	3.51	3.37	35
Education specialist	4.00	1.00	1
Professional	5.00	4.00	1
Doctorate	3.80	3.00	5

Note: Scale for both Susceptibility and Confidence: *M* = 4.20 or higher = agree/very confident, 3.40 – 4.19 = somewhat agree/confident, 2.60 – 3.39 = neutral, 1.80 – 2.59 = somewhat disagree/slightly confident, and 1 – 1.79 = disagree/not very confident.

Table 3
Beef Producers' Perceptions Regarding Level of Threat to Multiple Operation Types

	Threat Level %						
Operation Type	Low	Guarded	Elevated	High	Severe	*M*	*SD*
Ranches	52.60	26.80	12.80	4.90	2.60	1.78	1.02
Livestock exhibitions	37.20	31.50	16.40	12.80	1.70	2.51	6.41
Local marketing Facility	38.70	28.30	18.70	11.70	2.60	2.11	1.12
Regional marketing Facility	26.60	31.30	24.70	13.80	3.40	2.57	4.59
Background operation	48.10	26.40	16.80	6.40	1.90	2.29	6.41
Stocker operation	41.30	30.40	17.20	7.40	3.40	2.22	4.60
Feedlots	18.50	23.00	30.40	19.40	8.30	3.17	6.38

Note: Scale: *M* = 4.20 or higher = severe, 3.40 – 4.19 = high, 2.60 – 3.39 = elevated, 1.80 – 2.59 = guarded, and 1 – 1.79 = low.

Survey Question 4 asked respondents to answer "Yes" or "No" to: "Do you believe you have enough information about protection if a terrorist act was directed to the beef industry in Oklahoma?" The majority of the respondents said "No" (58.7%), 27.2% said "yes," and 14% answered "Don't Know" to the question.

Survey Question 5 sought to determine the perceptions of beef producers regarding bio-security measures. When asked "How confident are you in your own bio-security measures?" 60.2% of respondents reported being confident in their biosecurity measures; of those, 38.7% were confident, and 21.5% were very confident (Table 4).

Table 4
Level of Confidence in Their Own Bio-Security Measures

Confidence Level	%	*M*	*SD*
Not confident	9.40	3.53	1.21
Slightly confident	10.40		
Neutral	20.00		
Confident	38.70		
Very confident	21.50		

Note: Scale: *M* = 4.20 or higher = very confident, 3.40 – 4.19 = confident, 2.60 – 3.39 = neutral, 1.80 – 2.59 = slightly confident, and 1 – 1.79 = not confident.

Examining this question further by age, farm size, and education level, revealed no trend based on the demographics within each group. Mean scores for each age decade showed a slight increase in the trend of the means, but all scores remained in the neutral range (Table 2).

When analyzing the same question in terms of farm size and its effect on perceptions relating to each beef producers' own confidence level of bio-security, the trend remained somewhat constant in the "somewhat confident" range until it reached beef producers with 1,000 or more head of cattle where it dropped into the "neutral" range (Table 2).

Finally, educational level was inversely related with beef producers' biosecurity confidence level; levels of confidence generally decreased as the educational level of beef producers increased. This trend was prevalent in all groups except the two groups with only one respondent, education specialist and professional.

Overall Findings Related to Oklahoma Beef Producers' Perceptions of Agroterrorism Risk

The typical beef producer believes the Oklahoma beef industry is susceptible to an agroterrorism event (63.0%). Typical beef producers also believe feedlot operations (*M* = 3.17) and local marketing facilities (*M* = 2.57) to be the most threatened types of operations, at an elevated and guarded level of threat, respectively. The typical beef producer is confident in their own operation's bio-security measures (60.2%), believes their own operation is not susceptible to an agroterrorism event (62.8%), but does not believe they have enough information about protection from terrorism to the beef industry (58.7%).

When comparing cross-tabulated mean scores of the demographic variables of age, farm size, and education level, no mean trend was shown to influence the level of agreement beef producers' reported when asked about the susceptibility of Oklahoma's beef industry to agroterrorism. When examining the variable of farm size, beef producers with herd sizes of 1,000 or more head reported a decline in the mean to a "neutral" agreement level regarding susceptibility.

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The same trend was found when beef producers were asked to indicate their level of confidence in their own operation's bio-security measures. Beef producers' confidence level did not change based on age, farm size, or education level. Only in the case beef producers with herd size greater than 1,000 head was there any movement in agreement level. As with susceptibility, these beef producers reported a decline in confidence to the "neutral" level, whereas the other producer's answers remained in the "somewhat confident" level.

Discussion/Conclusions

The typical Oklahoma beef producer perceives the state's cattle industry is susceptible to terrorist activities targeting the beef industry. Specifically, operations with large numbers of cattle and public access are perceived to be more susceptible to an agroterrorism event than smaller, private cattle operations.

Although the typical beef producer in Oklahoma feels confident in his or her own operation's bio-security measures, this feeling may be overconfidence due to producers' self-reported lack of information about protection from terrorism to the beef industry. These findings suggest there is a gap in the pertinent agroterrorism information communicated to the typical Oklahoma beef producer regarding biohazard safety and protection. This lack of information may have affected the producers' varying perceptions of risk between personal farms and statewide industry. This conclusion supports previous research by Fink (1986), Henry (2000), Seeger et al. (2003), and Lane (2002) which implores the need for pre-crisis communication efforts to effectively plan and recover from a crisis event.

Does this lack of information about protection imply the typical beef producer is overconfident in his or her own ability to prepare for an agroterrorism event? Or, does the lack of information imply a producer's inability to assess or predict the level of threat to the beef industry as a whole? It is unclear at this early level of inquiry whether the typical beef producer is more certain about their own operation and uncertain about larger operations.

Regardless, there are different levels of uncertainty. The producer may simply not have a level of knowledge of agroterrorism protection that allows for an informed opinion. In either situation, more information regarding agroterrorism and crisis planning must be provided at the producer level. Therefore, it is imperative to further explore this knowledge level gap and its effect on producers' ability to effectively negotiate the different stages of a crisis. This implication is supported by Seeger et al. (2003) who suggested poor communication can influence the ability to move through effective crisis recovery efforts.

Recommendations for Future Research

Pre-crisis dissemination of information is vital as effective preparation levels depend on accurate, timely information. The researchers recommend assessing the level of preparedness of larger, publicly accessed marketing facilities and feedlots, which were identified by Oklahoma beef producers as being at a higher risk agroterrorism. This assessment will allow for determination of the type of information needed to provide feedlots and marketing facilities opportunities to create a more effective crisis plan based upon current preparedness levels. Future research should be conducted to determine additional, in-depth perceptions of feedlot and marketing facility owners and managers in regard to perceived preparation levels as well as their perceptions of risk to their operations.

Once the knowledge gap regarding preparedness is assessed on the large, public operation level, private beef producers in Oklahoma should participate in the assessment of their own operation

to determine the local level knowledge gap. Once these gaps are identified, information needed to increase the level of knowledge can be disseminated, thereby reducing any uncertainty the lack of information creates.

Neuliep and Grohskopf (2000) maintain communication competence includes communication satisfaction and those considered to be competent communicators may be effective in reducing uncertainty. Future research should seek to determine how communication competence affects the communication satisfaction and uncertainty reduction of beef producers when they seek information about possible crisis events. This type of study may be used to correlate levels of communication competency with levels of perceived uncertainty or lack of information.

About the Authors

Marcus A. Ashlock is a former assistant professor of agricultural communications & journalism at Kansas State University and is currently the owner/editor of a weekly newspaper, The Syracuse Journal. D. Dwayne Cartmell II is a professor of agricultural communications at Oklahoma State University. James Leising is a professor of agricultural education at the University of Minnesota.

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