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Riley, Kendra; Cartmell, Dwayne; and Naile, Traci (2012) "Kansas Beef Feedlot Managers' Trusted Sources of Information Concerning an Agroterrorism Event," *Journal of Applied Communications*: Vol. 96: Iss. 2. <https://doi.org/10.4148/1051-0834.1152>

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Keywords

agroterrorism, feedlot, biosecurity, beef cattle, innovation, law enforcement, information sources

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Managers of Kansas beef feedlots were surveyed to determine managers' preferred sources of information about agroterrorism as a foundation for law enforcement programs to disseminate information about protecting American animal agriculture. Developing producers' awareness of and support for proposed law enforcement initiatives is vital to successfully implementing those strategies. Effective communication with producers depends on identification of producers' preferred and trusted sources of information related to agrosecurity and agroterrorism. In this study, Kansas beef feedlot managers' preferences for obtaining agrosecurity and agroterrorism information were described through a descriptive telephone survey. Feedlot managers' preferences for veterinarians as sources of information were consistent with the results of previous studies (Ashlock, 2006; Extension Disaster Education Network, 2002) and indicated the importance of veterinarians as channels for dissemination of information from law enforcement agencies. Managers' preferences for veterinarians as a source of information also reflected behaviors associated with the persuasion stage of the innovation-decision process. Inclusion of veterinarians and other preferred sources of information in county Extension meetings and county Extension publications could add value to these channels for dissemination of agroterrorism information to Kansas beef feedlot managers. Feedlot managers' adoption of agroterrorism preparedness programs may be enhanced by educational programs about preventive protocols.

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Introduction

"The deliberate introduction of an animal or plant disease with the goal of generating fear over the safety of food, causing economic losses, and/or undermining social stability" is how agroterrorism has been defined for members of the United States Congress (Monke, 2007, p. CRS-1). Since 1912, 12 acts against agriculture involving biological agents have been reported and confirmed, including two acts that fit within the definition of agroterrorism (Carus, 2002). One of those acts, the poisoning of steers by a Kenyan independence movement group in the 1950s, resulted in the death of eight of 33 affected animals and was an attack on the British government in colonial Kenya (Carus;

This paper was presented at the 2008 meeting of the Southern Association of Agricultural Scientists — Agricultural Communications Section.

Kohnen, 2000). The second attack was an attempt by the Rajneeshee Cult to influence county commission election results in 1984 by poisoning customers of public restaurants in Dalles, OR, resulting in 751 voters becoming ill after the county election (Carus). Other acts of bio- and agroterrorism have been reported, including acts by interest groups that have been estimated to cost industries more than \$200 million (Animal Agriculture Alliance, 2006).

Characteristics of U.S. agriculture that contribute to its susceptibility to agroterrorism incidents include geographical disbursement in unsecured environments, concentration of livestock in confined locations, the number of biological agents that may pose a threat to animals and plants, transportation and blending of agricultural inputs and products, the influence of disease-free status on international trade, and veterinarians' lack of direct experience with foreign diseases (Monke, 2007). Despite these vulnerabilities, agriculture largely was ignored by various government entities in plans to ensure homeland security, until recently. As agriculture has been increasingly included in homeland security initiatives, research, and response plans, biological weapons have received much attention as they are considered to be more significant threats to agriculture than chemical weapons (Monke). In animal agriculture, foot-and-mouth disease has been identified as the most serious biological threat to animals, followed by bovine spongiform encephalopathy (Kohnen, 2000).

An intentionally introduced disease resulting in a nationwide outbreak could cost from \$750,000 to \$1 million per minute of each operating business hour (Kosal & Anderson, 2004). The livestock industry may be particularly susceptible to costly interruptions in operations as farms, feedlots, and fields often are exposed. Beef cattle feedlots have been identified as probable agroterrorism targets (Knowles et al., 2005) along with feed mills that serve as point sources for distribution of products to large numbers of livestock (Kosal & Anderson). As the second-ranked state in U.S. cattle production (USDA, 2007a), Kansas could be impacted heavily by an act of agroterrorism. Cattle and calves are the leading livestock commodity in Kansas (USDA, 2007b), with 2.4 million cattle on feed—or about 17% of cattle on feed in the U.S. (USDA, 2011).

Knowles et al. (2005) defined five categories of agroterrorism threats: international terrorists, such as al-Qaeda; domestic terrorists; militant animal rights groups; economic opportunists who would benefit from changes in market prices; and disgruntled employees. Of these five types of threats, international terrorists pose the most likely threat for introduction of a foreign animal disease to the United States (Knowles et al.). Three levels of socioeconomic costs could result from an agroterrorism event of any type. These costs include direct revenue losses from the elimination of diseased animals, indirect revenue losses sustained by other industries following quarantines, and losses in exported agricultural products from protective embargoes imposed by other countries (Chalk, 2004).

In response to the potential for agroterrorism events and subsequent impacts, four preventive levels for countering agroterrorism have been identified: organism, such as resistance of animals or plants to diseases; farm, including facility management techniques and security measures to prevent introduction or transmission of disease; sector, including disease detection and response procedures of government agencies such as the United States Department of Agriculture or the National Institute of Justice; and national, such as policies to minimize the social and economic costs of potentially catastrophic disease outbreaks (Kohnen, 2000). In this study, attention was focused on improving the role of law enforcement in prevention of and response to agroterrorism events at the farm level.

The typical response of law enforcement agencies to criminal activities is reactive, occurring after the crime and encompassing follow-up investigations, arrests, and prosecutions of the person or people who conducted the crime (Knowles et al., 2005). During the response to an introduction

of a foreign animal disease, law enforcement agencies also would play a major role in the quarantine of the infected area and as on-site security for an average of 60 days (Knowles et al.). However, law enforcement's role may be increased and criminal activities such as agroterrorism events may be prevented in part through the distribution of information about community policing programs and local partnerships with law enforcement (Knowles et al.).

To help meet this need, the National Institute of Justice has developed preventive strategies and initiatives for law enforcement officials to strengthen defenses against agroterrorism threats, although implementation of these strategies has been impeded by a lack of financial resources and manpower available to law enforcement agencies (Knowles et al., 2005). The strategies proposed by the National Institute of Justice include Agro-Guard, which is a partnership between law enforcement and livestock producers to identify suspicious activities and threats to agriculture; establish specialized regional response teams; provide training to local law enforcement officers in the identification and seizure of illegally imported food products; establish interaction between state and federal intelligence databases to assist in managing potential threats; and develop baseline data to increase law enforcement's readiness capabilities in Kansas (Knowles et al.).

Developing producers' awareness of and support for the proposed strategies for amplifying law enforcement's role in agroterrorism prevention and response is a key step in the successful implementation of those strategies, and reaching producers effectively is dependent on identification of producers' preferred and trusted sources of information related to agrosecurity and agroterrorism. Previous studies (Ashlock, 2006; Extension Disaster Education Network, 2002) have shown that producers prefer to receive information about agrosecurity, agroterrorism and disasters that impact animals through veterinarians. In addition, producers previously have identified county Extension educators as preferred and reliable sources of information (Extension Disaster Education Network; Miller, Israelsen, & Jensen, 2008). Knowledge of producers' preferred and trusted sources of information also reflects the stage of the innovation–decision process in which producers may be, and the innovation–decision process then may be used to determine which communication channels will best serve in distributing information to producers to advance law enforcement programs.

According to Rogers (2003), an innovation is an idea, practice, or object perceived as new by an individual (p. 12). For example, the innovation of interest in this study is preventive protocols to be used by feedlot managers and law enforcement officials. Such innovations are communicated through social systems by diffusion through specified channels, and four elements play a role in diffusion: the innovation, communication channels, time, and the social system (Rogers, p. 11). The innovation–decision process is a series of stages through which an individual determines whether an innovation should be adopted (Rogers, p. 167). The five modern stages of the process are: knowledge, which includes an individual's first exposure to an innovation and understanding of how it functions; persuasion, which occurs when an individual forms a favorable or unfavorable attitude toward the innovation; decision, which occurs when a choice is made to adopt or reject the innovation; implementation, which occurs when the innovation begins to be used; and confirmation, during which the decision is reinforced and may be reversed (Rogers, p. 169).

Adoption decisions are influenced by numerous factors, including perceived advantages of the innovation; perception of the consistency of the innovation with existing values or needs; and complexity of the innovation, which varies inversely with adoption rate (Oskam, 1992; Rogers, 2003, pp. 168-179). In the case of agriculture and potential tragedies, people involved in agriculture may believe tragedy will not happen to them and disregard the necessity of preventive protocols (Oskam,

1992), resulting in rejection of programs and strategies such as those proposed by the National Institute of Justice. In addition, the channels through which information about the innovation is received and personal preferences for information channels influence decisions about whether to adopt agricultural innovations (Rogers, 2004).

This study sought to determine Kansas feedlot managers' preferred sources of information about agroterrorism events, which will be used as a foundation for law enforcement programs to disseminate timely information about protecting American animal agriculture from agroterrorism events. The study was guided by three research questions:

1. What sources of information do feedlot managers use to seek information regarding security issues?
2. How do the managers' preferred sources of information differ based on location and capacity of the feedlot?
3. What are the demographic characteristics of Kansas beef feedlots and feedlot managers?

Methods

All managers or owners of beef feedlots registered with the Kansas Department of Health and Environment were selected for this study. The population included 259 registered beef feedlots, 228 of which had working telephone numbers. Feedlot managers without telephone information or with disconnected numbers were excluded from the study.

Descriptive survey methodology was used to determine feedlot managers' preferred sources of information about agroterrorism. Survey responses were gathered via telephone survey. The questionnaire included 24 multiple-choice, scaled, and ranked items. All scales were five-point Likert scales. Questions about sources of information about agroterrorism and demographic characteristics of feedlot managers were adapted from Ashlock (2006) and a literature review of agroterrorism preparedness and information sources. The survey was reviewed by a panel of experts to establish face and content validity. A post-hoc reliability analysis performed on the scaled items in the instrument produced a Cronbach's alpha of 0.895.

The telephone surveys were conducted during a one-week period by one interviewer. Responses were obtained from 175 feedlot managers, resulting in a response rate of 76.8%.

Quantitative data were analyzed using the Statistical Package for Social Sciences. Descriptive data, including frequencies, ages, means, and standard deviations, were used to interpret the data and to describe feedlot managers' responses.

Findings

Preferred sources of information about feedlot security

Feedlot managers indicated from which sources they would seek information when reacting to a feedlot animal health issues (Table 1) and in what format they would prefer to receive information about preventive measures for agroterrorism events (Table 2). A majority (69%) of managers reported they would prefer to receive information from a consulting veterinarian or nutritionist. Additional preferred information sources included state authorities (10.7%), livestock association (9.5%), university researchers (7.1%), and word of mouth (1.2%). About 2% of managers did not indicate a preferred information source. Managers were asked to indicate their first, second, and third choices of information formats. Overall, e-mail was preferred by 61.9% of managers, followed by 52.4% who

preferred association meetings, 44% who preferred newsletters, 39.4% who preferred county Extension meetings, and 25% who preferred standard mail.

Table 1
Feedlot Managers' Preferred Sources of Information about Animal Health Issues

Information source	%	n
Consulting veterinarian/nutritionist	69.0	58
State authorities	10.7	9
Livestock association	9.5	8
University researchers	7.1	6
Word-of-mouth	1.2	1
No answer	2.4	2

Feedlot managers were asked to indicate their perceptions of reliability of (Table 3) and levels of trust in (Table 4) specified information sources using 5-point Likert scales. Managers viewed local/consulting veterinarians as most reliable, followed by university specialists, livestock associations, magazines, the USDA, periodicals, the Internet, radio, agricultural Extension agents, and local daily newspapers. Managers reported having the highest level of trust in local/consulting veterinarians, followed by the USDA, university specialists, livestock associations, area law enforcement, magazines, agricultural Extension agents, periodicals, the Internet, radio, and local daily newspapers.

Managers were asked to indicate their first, second, and third choices for information source they trusted the most (Table 5). Overall, local/consulting veterinarians were trusted the most, followed by university specialists, livestock associations, the USDA, area law enforcement, agricultural Extension agents, the Internet, magazines, periodicals, local daily newspapers, and radio.

Table 2
Feedlot Managers' Preferred Formats of Information about Preventive Measures for Agroterrorism Events

Format	First (%)	n	Second (%)	n	Third (%)	n	Total %	Total n
E-mail	47.6	40	3.6	3	10.7	9	61.9	52
Association meetings	11.9	10	23.8	20	16.7	14	52.4	44
Newsletter	6.0	5	17.9	15	20.2	17	44.0	37
County Extension meetings	14.3	12	15.5	13	9.5	8	39.4	33
Mail	4.8	4	9.5	8	10.7	9	25.0	21
Other	1.2	1	2.4	2	21.5	18	15.0	21
Internet	4.8	4	14.3	12	4.8	4	23.8	20
Magazine articles	4.8	4	4.8	4	2.4	2	11.9	10
County Extension publications	3.6	3	4.8	4	2.4	2	10.7	9
Daily newspaper	0.0	0	3.6	3	1.2	1	4.8	4

Table 3
Feedlot Managers' Perceptions of Reliability of Information Sources

Source	Not reliable (%)	Slightly reliable (%)	Neutral (%)	Reliable (%)	Very reliable (%)	M
Local or consulting veterinarian	0.0	6.0	3.6	19.0	71.4	4.56
University specialists	1.2	0.0	25.0	45.2	27.4	3.99
Livestock association	1.2	3.6	21.4	44.0	29.8	3.98
Magazine	2.4	4.8	38.1	40.5	14.3	3.60
USDA	3.6	13.1	34.5	31.0	17.9	3.46
Periodicals	3.6	9.5	42.9	35.7	8.3	3.36
Internet	2.4	17.9	42.9	21.4	14.3	3.28
Radio	8.3	22.6	39.3	23.8	6.0	2.96
Agricultural Extension agent	13.1	20.2	33.3	23.8	8.3	2.94
Local daily newspaper	25.0	35.7	23.8	11.9	3.6	2.33

Note. Perceptions were reported on a 5-point scale (1 = not reliable, 2 = slightly reliable, 3 = neutral, 4 = reliable, 5 = very reliable).

Table 4
Feedlot Managers' Perceptions of Trustworthiness of Information Sources

Source	Not trustworthy (%)	Slightly trustworthy (%)	Neutral (%)	Trustworthy (%)	Very trustworthy (%)	M
Local or consulting veterinarian	0.0	1.2	4.8	25.0	69.0	4.62
USDA	0.0	8.3	28.6	42.9	20.2	4.46
University specialists	1.2	1.2	13.1	53.6	28.6	4.21
Livestock association	0.0	3.6	13.1	52.4	31.0	4.11
Area law enforcement	1.2	8.3	34.5	40.5	15.5	3.61
Magazine	1.2	11.9	54.8	23.8	8.3	3.26
Agricultural Extension agent	10.7	14.3	28.6	32.1	13.1	3.23
Periodicals	3.6	15.5	45.2	33.3	2.4	3.15
Internet	3.6	21.4	41.7	22.6	9.5	3.13
Radio	4.8	28.6	51.2	11.9	3.6	2.81
Local daily newspaper	14.3	39.3	34.5	9.5	2.4	2.46

Note. Perceptions were reported on a 5-point scale (1 = not trustworthy, 2 = slightly trustworthy, 3 = neutral, 4 = trustworthy, 5 = very trustworthy).

Table 5
Feedlot Managers' Rankings of Preferred Information Sources

Format	First choice (%)	n	Second choice (%)	n	Third choice (%)	n	Total %	Total n
Local or consulting veterinarian	66.7	56	13.1	11	4.8	4	84.5	71
University specialists	4.8	4	36.9	31	17.9	15	59.5	50
Livestock association	14.3	12	26.2	22	16.7	14	57.1	48
USDA	3.6	3	3.6	3	16.7	14	23.8	20
Area law enforcement	4.8	4	7.1	6	8.3	7	20.2	17
Agricultural Extension agent	0.0	0	4.8	4	10.7	9	14.3	12
Internet	0.0	0	1.2	1	6	5	7.1	6
Magazine	0.0	0	1.2	1	6	5	7.1	6
Periodicals	3.6	3	1.2	1	1.2	1	6	5
Local daily newspaper	0.0	0	1.2	1	1.2	1	2.4	2
Radio	0.0	0	0	0	1.2	1	1.2	1

Relationship between preferred sources of information and capacity and location of feedlots

Feedlot managers' preferred sources of information about preventive measures for agroterrorism events were compared to the capacities and locations of the feedlots they managed. For all capacities and locations of feedlots, managers indicated preferring local/consulting veterinarians as a source of information, followed by state authorities, livestock associations, and university specialists. All managers also reported the local/consulting veterinarian to be the most trusted source of information. Managers of small (1 to 2,000 cattle) and medium (2,000 to 40,000 cattle) feedlots indicated university specialists were their second-most trusted source of information, while managers of large (40,000 to 150,000 cattle) feedlots ranked livestock associations second. For the third-most trusted

source of information, managers of small and medium feedlots selected livestock associations, while managers of large feedlots selected university specialists.

Demographics of feedlot managers

Demographic characteristics of the feedlots and managers were collected, including the number of cattle represented, ownership of feedlot, location of feedlot, gender, ages, levels of education, affiliations with beef industry organizations, computer access, and Internet access.

The total number of cattle represented by the respondents was 1,554,450, with an average feedlot capacity of 18,700 and a range of 300 to 120,000. The types of ownership of the feedlots included family owned (51.2%), incorporated (40.5%), corporately owned (26.2%), and privately owned (22.6%). The most feedlots and cattle were located in southwest Kansas, followed by south-central, northwest, north-central, northeast, and southeast.

The managers were 91.7% male, with an average age of 51 years. All managers had completed high school, while 19% had completed two years of college, 46.4% held bachelor's degrees, 13.1% held master's degrees, and 3.6% were veterinarians. About 89% of the managers reported affiliations with at least one beef industry organization.

Of the managers reporting organizational affiliations, 98.6% were members of the Kansas Livestock Association or Kansas Cattlemen's Association. The one respondent who did not report involvement with one of those two organizations was a member of the American Association of Beef Practitioners. Other organizational affiliations reported included the National Cattlemen's Beef Association, Ranchers-Cattlemen's Action Legal Fund, Red Angus Association of America, Oklahoma Cattlemen's Association, Oklahoma Club Calf Association, Texas Cattle Feeders' Association, United States Cattlemen's Association, and Cattlemen's Beef Council.

All managers except one reported owning a computer. Of those managers who reported having access to the Internet at home (89.3%), 97.3% had a high-speed Internet connection and the remaining managers did not know what type of Internet connection they had. In addition, 87.8% of managers had office computers with Internet access, with the majority (83.8%) having high-speed Internet connections.

Discussion

The preference of feedlot managers for local/consulting veterinarians as sources of information is consistent with surveys of producers conducted by the Extension Disaster Education Network [EDEN] (2002) and Ashlock (2006), indicating veterinarians are vital channels for disseminating law enforcement agency information about preventive measures for agroterrorism events. The preference for veterinarians as a source of information also is consistent with behaviors associated with the persuasion stage of the innovation-decision process. In the persuasion stage, individuals form a favorable or unfavorable attitude about an innovation (Rogers, 2003, p. 169), such as preventive protocols to be used by feedlot managers and law enforcement officials. During this stage, producers actively will seek information about the protocols, determine if the information received is credible, and interpret the information, all of which require more detailed information that may be better provided by interpersonal sources than channels of mass communication (Rogers, p. 175).

Respondents in this study did not rank county Extension educators highly among their most preferred, reliable, or trusted sources, which disagrees with producers surveyed by EDEN (2002) and Utah producers (Miller et al., 2008). However, county Extension meetings were listed among the

top five information formats preferred by Kansas beef feedlot managers, which is consistent with the recommendation of Miller et al. (2008) to use educational events to address characteristics of highly transmissible diseases. Including veterinarians and other preferred sources of information in county Extension meetings and county Extension publications to provide information about preventive measures for agroterrorism events could add value to these formats for Kansas beef feedlot managers.

Additionally, the preventive protocols at the center of this study fit within Rogers' (2003) definition of preventive innovations: "a new idea that an individual adopts in order to avoid the possible occurrence of some unwanted event in the future" (p. 176). As the desired consequences of preventive innovations are uncertain, a slower rate of adoption may be expected than for nonpreventive innovations (Rogers, p. 176). Oskam (1992) pointed out that the implications of potential tragedies in agriculture may be disregarded by producers, creating a need that may be filled by cues-to-action from an agency (Rogers, p. 176), such as educational programs about preventive protocols. Such programs may be particularly needed in southwest Kansas, where the highest concentration of beef feedlots is located.

Recommendations

To better provide agroterrorism information to feedlot managers, law enforcement agencies and other agencies providing educational information should focus on meeting feedlot managers' preferences for information sources and formats. Specifically, law enforcement officials should use managers' preferred interpersonal sources, such as local/consulting veterinarians, to disseminate agroterrorism information to feedlot managers. In addition, law enforcement officials should use peer sources, such as the Kansas Livestock Association and the Kansas Cattlemen's Association to disseminate information about policies and procedures. Information dissemination also could be improved through the use of managers' preferred sources of information in conjunction with their preferred formats of information.

To expand this study, an assessment should be conducted to determine veterinarians' sources of agroterrorism information and preferred formats for receiving agroterrorism information. In addition, a replication of this study with a larger base of producers to determine preferred source of agroterrorism information should be completed, with consideration for the effects of seasonal demands on managers' availabilities to respond.

Implications

Educating managers of feedlots about protection from agroterrorism could result in evolution of those managers to change agents in the community regarding adoption of preventive measures for agroterrorism. However, veterinarians, as the primary sources of information for feedlot managers and other producers, must be informed about agroterrorism issues. In addition, industry organizations should be cognizant of their roles in disseminating information and educating producers about agroterrorism, particularly best practices and policies for preventing agroterrorism events.

About the Authors

Kendra Riley earned a Master of Science in agricultural communications at Oklahoma State University in 2007. Dwayne Cartmell is a professor of agricultural communications at Oklahoma State University, and Traci Naile is an assistant professor of agricultural communications at Oklahoma State University.

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