

October 2007

LWDR 07-01



Livestock and Wildlife Disease Report



Department of Agricultural and Resource Economics, Fort Collins, CO 80523-1172
<http://dare.colostate.edu/pubs>

SUMMARY OF A REGIONAL ECONOMIC IMPACT OF A HYPOTHETICAL FOOT-AND-MOUTH DISEASE OUTBREAK IN SOUTHWESTERN KANSAS

D.L. Pendell,¹ T.C. Schroeder,² J. Leatherman,² and G.S. Alward³

Introduction

Concerns regarding foreign animal diseases have escalated substantially in recent years. Terrorist attacks on the United States in September 2001 greatly increased awareness of vulnerability of U.S. agriculture to bioterrorism. In addition to heightened bioterrorism concerns, increased globalization and world travel make transmission of foreign animal diseases more probable.⁴

Discovery of an infected dairy cow with BSE in the United States in 2003 and the subsequent loss of world beef markets for the U.S. demonstrate the economic impact animal health can have on the livestock and related industries. The BSE incident resulted in immediate closure of major U.S. beef export markets (including Japan and Korea). Coffey et al. estimated that the U.S. beef industry losses resulting from export restrictions during 2004, ranged from \$3.2 billion to \$4.7 billion.

The United Kingdom has experienced two recent FMD outbreaks, 2001 and 2007. Because the most recent outbreak (which was first confirmed on August 3rd) is still ongoing, the severity is not fully known. The other recent FMD outbreak was confirmed in cull sows at an abattoir in Great Britain on February 20, 2001. At least 57 premises were infected by the time the first case was identified (Scudamore and Harris, 2002). By September 30, 2001 when the outbreak was eradicated, 221 days after the initial outbreak, 2,026 cases of FMD had been confirmed, approximately 6.5 million animals were destroyed, and the disease had spread to Ireland, France, and the Netherlands. It took an additional 114 days (until January 22, 2002) for the UK to gain "FMD-free without vaccination" by the Office International des Epizooties (Scudamore and Harris, 2002). Thompson et al. (2002) estimated losses from FMD in the UK at £5.8 to £6.3 billion (\$10.7 to \$11.7 billion U.S.). This illustrates the economic impact such a disease outbreak can have and the need to understand probable economic impacts of a highly contagious disease to develop effective public policy.

¹ Department of Ag. & Res. Econ., Colorado State University. Dustin.Pendell@ColoState.EDU.

² Department of Ag. Econ., Kansas State University.

³ Minnesota IMPLAN Group, Inc. (MIG).

⁴ The Office of Travel and Tourism Industries reports that from 1995 to 2005 international inbound visitors into the U.S. increased by 13% from 43.4 million to 49.2 million visitors. Likewise, outbound visitors from U.S. to other countries increased from 51.2 million to 63.5 million (24% increase) over the same time frame. http://tinet.ita.doc.gov/outreachpages/inbound.total_intl_travel_volume_1995-2005.html

Colorado State University and U.S. Department of Agriculture cooperating. Cooperative Extension programs are available to all without discrimination.

The purpose of the research summarized here was to determine economic impacts of a hypothetical FMD outbreak in a specific local region in southwest Kansas under three different disease introduction scenarios.⁵ This region was selected because of its relatively high concentration of large cattle feeding operations as well as other livestock enterprises and a large beef processing presence. As a result, the local economy is highly dependent on the livestock industry which amplifies the importance of such a disease outbreak.

Procedures

To accomplish the objective, an epidemiological disease spread model was used to determine the probable spread of a hypothetical FMD outbreak under three different disease introduction scenarios in southwest Kansas. These scenarios included disease introduction at a single cow-calf operation, introduction at a single medium-sized feedlot (feedlot with between 10,000–20,000 head of cattle one-time feeding capacity), and introduction simultaneously at five large feedlots (feedlots with greater than 40,000 head one-time feeding capacity). The first two scenarios would be indicative of an accidental introduction. Whereas, the latter scenario represents what could characterize a purposeful simultaneous introduction of the disease. Results from the disease spread model were integrated into an economic model that consists of supply and demand equations for beef, pork, and poultry sectors that provides both horizontal and vertical linkages within the farm-to-retail marketing chain. The results from the economic model were then incorporated into a multiregional input-output model that estimated the local economic impact. Specifically, the regions are specified as the 14-county southwestern Kansas economy, and the 91-county rest of Kansas economy. Separate input-output models were built for each region plus the combined region using the IMPLAN modeling system. One general enhancement incorporated into this study was the use of IMPLAN's new national trade flow model.

Results and Discussion

Two things, total number of infected animals and the length of disease outbreak, are among the most important epidemiological factors that affect economic impact. As the size of the index herd increases, the number of animals destroyed, associated costs, and length of outbreak increases (Figures 1 & 2). If the

index case for a FMD outbreak begins within a cow-calf herd, an expected 126,000 head of livestock are destroyed and the outbreak would last 29 days in length. If the index case for a FMD outbreak begins within a medium-sized feedlot, the expected number of livestock destroyed would be 407,000 head and the disease would endure for 39 days. For FMD that is simultaneously introduced at five large feedlots, an expected 1.7 million head would be destroyed in southwest Kansas and the outbreak would last 89 days.

Total impacts estimated to accrue to southwestern Kansas are shown for the three FMD incidence scenarios in Table 1. The input-output model indicates the losses to southwestern Kansas associated with a FMD outbreak originating in a cow-calf, medium-size feedlot, and five large feedlots scenarios were estimated to be \$24 million, \$141 million, and \$686 million, respectively. The combined overall impact for the State of Kansas for the cow-calf, medium-size feedlot, and five large feedlots scenarios were estimated to be losses of \$36 million, \$200 million, and 946 million, respectively (Table 1).

Results from this research demonstrate how widely different the epidemiological and economic implications could be with such a disease. As such, disease surveillance, management strategies, mitigation investment, and ways to deal with the disease, if it were to occur, are much different depending upon the nature of the disease incidence.

References

- Coffey, B., J. Mintert, J. Fox, T. Schroeder, and L. Valentin. *The Economic Impact of BSE on the U.S. Beef Industry: Product Value Losses, Regulatory Costs, and Consumer Reactions*. Kansas State University Agricultural Experiment Station and Cooperative Extension Service, MF-2678, April 2005.
- Pendell, D.L., J. Leatherman, T.C. Schroeder, and G.S. Alward. 2007. "The Economic Impacts of a Foot-and-Mouth Disease Outbreak: A Regional Analysis." *J. Agriculture and Applied Economics*, 39 (Special Issue):19-33.
- Scudamore, J.M., and D.M. Harris. 2002. "Control of Foot-and-mouth Disease: Lessons from the Experience of the Outbreak in Great Britain in 2001."

⁵ The published journal article providing more technical details of this research is Pendell et al. (2007).

Acknowledgement

The authors gratefully acknowledge funding provided by the Economic Research Service-USDA Cooperative Agreement 43-3AEU-5-80067 through ERS' Program of Research on the Economics of Invasive Species Management (PREISM).

Thompson, D., P. Muriel, D. Russell, P. Osborne, A. Bromley, M. Rowland, S. Creigh-Tyte, and C. Brown. 2002. "Economic Costs of the Foot and Mouth Disease Outbreak in the United Kingdom in 2001." *Revue Scientifique et Technique de l'Office International des Epizooties* 21(3):675-687.

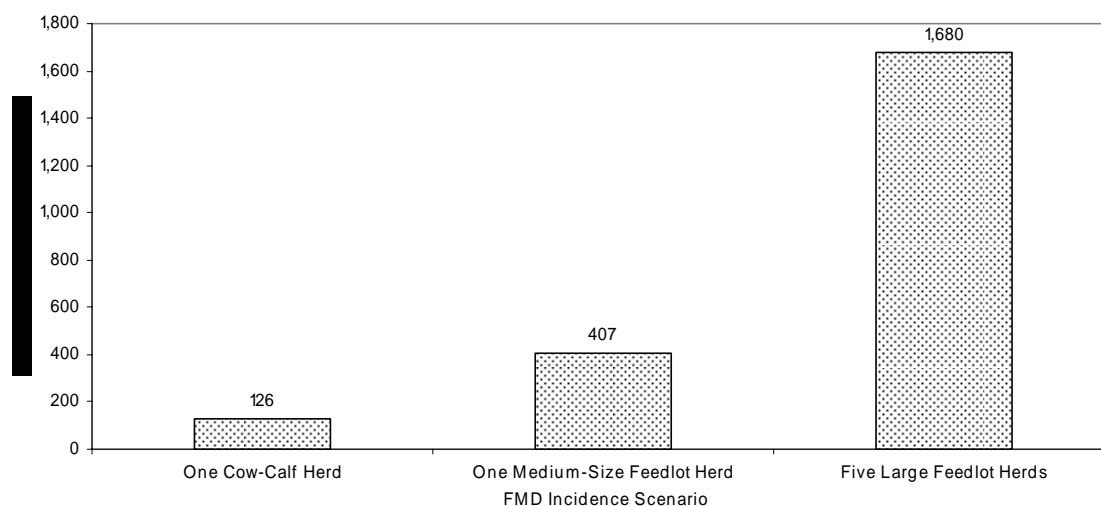


Figure 1. Cumulative Number of Animals Destroyed in a Hypothetical FMD Outbreak in Southwest Kansas Associated with Three Different Hypothetical FMD Incidence Scenarios.

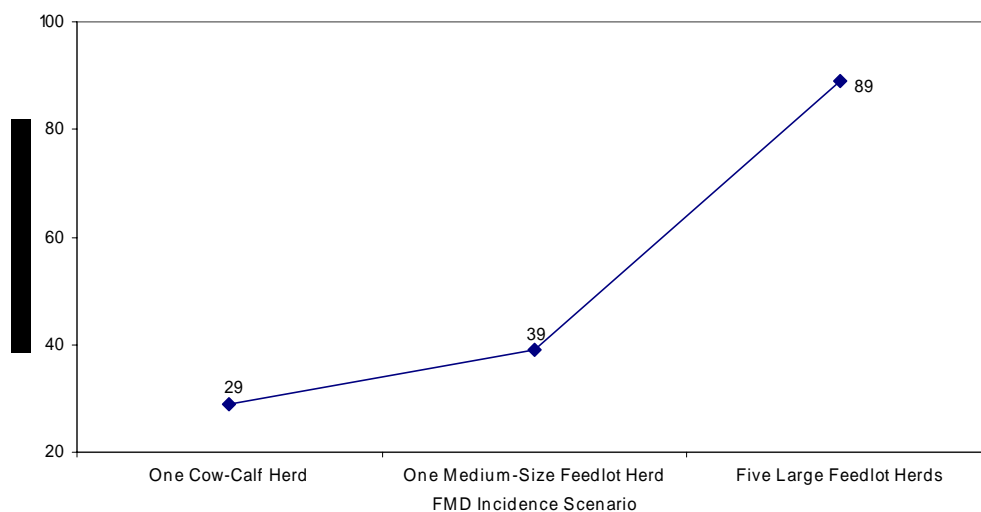


Figure 2. Length of a Hypothetical FMD Outbreak in Southwest Kansas Associated with Three Different Hypothetical FMD Incidence Scenarios.

Table 1. Estimated Economic Impact to Kansas Associated with Alternative Hypothetical FMD Outbreak Scenarios, (2004\$ millions)

	Total Economic Impact (2004\$ millions)		
	One Cow	One Medium-Size	Five Large
	Calf Herd	Feedlot Herd	Feedlots Herds
Southwest Kansas ¹	-23.72	-140.68	-685.65
All of Kansas ²	-36.00	-199.73	-945.75

¹ Southwest Kansas refers to the 14 counties in southwestern Kansas.

² All of Kansas refers to the remaining 91 counties in Kansas plus the 14 counties in southwestern Kansas.