Breached Bio-Security at the Farm Gate: A Minnesota Dairy Case Study of Criminal Activity

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Abstract

Considerable public attention has recently focused on agro-security, especially from the perspective of national security and aggregate production. This article reviews a series of bio-security breaches stemming from criminal activity affecting a Minnesota dairy. Present and future economic losses sustained by the dairy operation exceed $272,598 and will last until operation ceases.

Greater emphasis on bio-security, including concerns about criminal activities, has occurred at all levels of the food chain, especially after the tragedies of September 11, 2001. Widely publicized outbreaks of food-borne illnesses, traceable to such sources as *E.coli* 0157:h7 in hamburger, *Listeria Monocytogenes* in hot dogs, and *Salmonella* in poultry and eggs, initially raised concern among the general public in the latter years of the 1990s. Concerns heightened in 2001 as contagious animal diseases, including foot-and-mouth and mad cow, spread across Europe and Canada. Regional U.S. outbreaks of West Nile disease, anthrax, and other contagious livestock diseases posing transmission risks to humans have created additional anxiety.

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The U.S. Department of Agriculture recently stated, "These and other events have underscored the need for protection from plant and animal disease and pests, new research on testing, more widespread monitoring, research to maintain and improve competitiveness in world markets, buttressing the foundation for phytosanitary measures in trade agreements, and generating more attention to food safety and *the integrity of the entire food system*" (USDA, 2001).

Several aggregate studies have examined the vulnerability and economic costs associated with protecting the integrity of various aspects of the food system beyond the farm gate (Casagrande, Madden, and Wheelis; Gutterman; Huff, Meilke, and Turvey; Runyon).

However, protecting the entire food system requires the development of bio-security measures within the farm gate as well. Runge notes that despite recent attention, agro-bioterrorism is an ancient tradition and has included salting enemies' fields, burning crops, killing livestock, and flooding irrigation systems.

Confinement livestock operations have long restricted public access or, at a minimum, required a boot bath of people entering their facilities. Amass notes that boot bath maintenance in most facilities is poor and little research is available to support common policies restricting people movement, showering times, and policies setting up time limits to be away from livestock before entering another facility. At most, Amass notes, "Implementation of bio-security protocols sensitizes production personnel to bio-security issues."

Few studies have examined the on-farm costs of maintaining bio-security at the farm gate. A recent court case involving a Minnesota dairy producer who experienced a number of bio-security breaches arising from on-farm criminal sabotage provides insight to the economic losses associated with bio-security breaches and on-going costs of protection. The case also illustrates the numerous complexities and agreements required for vertical integration and/or coordination of farm production units.

Background

A southwestern Minnesota farmer purchased a 350-head dairy from a neighbor farmer in December 1997. The farmer purchased the facilities, existing cow herd, 80 acres of surrounding land, and miscellaneous equipment. The facility is configured as a double eight herringbone milk parlor. The farmer operated the dairy with the assistance of a full-time herdsman, another full-time employee, and several part-time employees.

When the facility was purchased, the farmer negotiated several written agreements with the previous owner. The first was an agreement for manure service whereby the neighbor would receive the manure and each party would split the costs involved. Under the second agreement, the neighbor retained ownership of all young stock, and the farmer agreed to buy back any replacements for their herd. Finally, under the third agreement for feed service, the neighbor provided most of the feedstuffs consumed by the dairy, and the farmer agreed to pay market prices for the feed on a monthly basis. As part of this last agreement, the farmer paid yardage to the neighbor for housing and feeding dry cows in his facilities across the road.

This arrangement worked well until September 2000. Although the farmer and his lender felt the dairy operation was paying premium feed prices, they acknowledged the feed was high quality and the arrangement was very convenient for both parties.

In September 2000, the farmer noticed a significant drop in milk production and reduced feed intake. After consulting with several individuals, including his nutritional consultant, it was determined that the haylage being delivered by the neighbor contained high levels of butyric acid, indicating a clostridial fermentation.

As a result of these problems and perceived high prices, the farmer terminated the feed service agreement, brought his dry cows home, found a new feedstuff supplier, and engaged a new independent nutrition consultant. Feed intake and milk production gradually returned to normal. The farmer also terminated the manure service and youngstock agreements with the neighbor.

Following termination of these agreements, the farmer observed several unusual changes in the herd and in production. These included slits in silage bags on the farmstead, an increased frequency of hardware problems in the cows, lower herd conception rates, and two loads of contaminated milk rejected by the local cheese factory. Suspecting foul play, the farmer installed a video security system and recorded a bio-security breach on tape. The neighbor was seen wandering through the dairy complex. The farmer and neighbor settled the matter out of court in 2003 for an undisclosed amount.

The damaged feed and bio-security breaches occurring on the farmer's dairy have significantly altered the income generating potential of the operation and impacted the reputation of the farmer as a reliable supplier of high quality milk products.

Loss of Milk Production from Damaged Haylage

The presence of butyric acid in the haylage caused a significant drop in milk production and income losses to the dairy. Prior to September 27, 2000, daily milk production for the herd averaged 20,000 pounds. When new feed was supplied on October 25, 2000, milk production rebounded, but herd milk production did not completely recover until November 2000. The value of lost milk production was determined by deducting actual milk production per day during this timeframe from the dairy's production goal of 20,000 pounds/day that was achieved both prior and after the production downfall. The value of lost milk production was determined by multiplying pounds of lost milk by actual prices he would have received for each of the daily shipments. Total economic losses from lost milk production are calculated to be $9,186.

Loss of Milk Production and Calves from Reproduction Problems

Even after replacement feed was arranged, milk production still lagged expectations, primarily due to herd reproductive problems. The farmer alleged the neighbor tampered with the semen tank, thawing and replacing semen straws, thereby reducing potency. Not suspecting sabotage, the farmer used the tainted straws to breed open cows in his herd. As a result, the farmer experienced both milk production and calving losses.

Milk production suffered because unbred cows continued to produce milk, but at a lower level (milk production declines as cows near the end of their lactation period). The farmer indicated herd average days in milk (DIM) increased by six days. The milk loss associated with this was determined to be .2 lbs. per extended DIM. Multiplying this by the number of milking cows in the herd, the value of milk received over the time period and 560 days since problems of sabotage arose, total milk production losses from reproductive problems are calculated to be $28,224.

The herd also suffered extensive calf losses due to reproductive problems. Due to lower fertility, 29.5 calves were expected but not conceived or born. Assuming equal probability of male and female offspring and calf prices of $120 and $500, respectively, annual calf losses from reproductive problems are calculated to be $9,143. Multiplying this annual loss by the duration period of sabotage, results in total losses of $15,270.

Loss from Dairy Cattle Deaths

As a result of hardware problems, bloat, and other sudden illnesses due to sabotage of feed supplies, nine cows unexpectedly died in the herd. The value of these animals was $1,700 each for a total loss of $15,300.

Other Losses of Income from Bio-Security Breaches

The dairy incurred numerous other expenses as it strived to maintain bio-security of the facility. Surveillance cameras were purchased and installed for $11,570. An additional one-half hour of time is now required daily to view these tapes. Multiplying the value of this time ($20/hour) by the number of days since the equipment was installed yields a loss of $2,790. The $20/hour rate may appear high but it was documented with his farm financial statements.

After the feeding relationship with the neighbor was terminated, approximately 50 hours was devoted to finding a replacement supplier. Multiplying these hours by the farmer's management return of $55/hour results in a loss of $2,750. Additional managerial time has also been required to monitor and maintain herd health. Assuming an additional hour daily since the incident, a loss of $29,700 was determined. The dairy has also incurred additional vet charges of $1,500.

Finally, the neighbor adulterated two bulk tanks of milk. The first tank was not found until it was delivered with milk from other producers to the local cheese factory. The second adulteration was found before it left the farm gate. The two loads of contaminated milk were valued at $3,850. The dairy also incurred additional insurance surcharges of $3,000. The farmer lost his reputation as a reliable supplier of high quality milk and was prohibited from selling milk in the state. Following implementation of a 10-point quality assurance program, his license was reinstated. The dairy now must routinely test all milk before leaving the farm gate.

Future Bio-Security Losses

The final component of loss is the cost associated with maintaining bio-security in the future. Until the farmer retires or ceases operation, security tapes will have to continue to be reviewed daily. Over the remaining 27 years of his career, the present value of this loss component is $98,550, assuming a three percent real interest rate. In addition, video surveillance equipment will have to be periodically replaced. Assuming a 5-year replacement cycle, this equipment will have to be replaced 4.4 times for a total cost of $50,908.

Conclusion

Considerable public attention has recently focused on agro-security, especially from the perspective of national security and aggregate production. However, security at the firm level is an ancient practice and manifests itself many forms. This article reviews a series of bio-security breaches stemming from criminal activity affecting a Minnesota dairy. Present and future economic losses likely sustained by the dairy operation are quantified and exceed $272,598. Results indicate that future economic consequences of the bio-security breach are large and will last until the operator ceases operation or retires. The case study also illustrates complications that can occur as agricultural production units become more specialized and coordinated.

The losses presented are sensitive to prevailing economic conditions. Alternative levels of dairy profitability will likely impact loss calculations. Moreover, industry-wide measures of loss are difficult to determine because of the inelasticity of milk prices and capitalization of deterrence measures into asset prices.

This study reveals the magnitude of cost that may be incurred if production agriculture implements farm-level strategies to assure integrity of the nation's food industry against criminal activity. Such preventive measures will have economic impacts at the firm level. For example, this case study reveals the cost a farm business would incur to secure its production facilities against criminal activity (e.g., surveillance equipment, time to monitor tapes). It also reveals the costs incurred as a consequence of criminal activity (e.g., lost milk production, cow deaths, lost calves, added vet costs, insurance surcharges, on-farm quality assurance program, and routine on-farm product tests). This second category of costs, alternatively, could be considered a measure of the benefit of implementing a security program that effectively prevents criminal activity.

In terms of public policy, this incident provides decision makers an opportunity to consider the implications of alternative strategies to protect the food system at the farm level. For example, the cost of mandating protective strategies can be weighed against the cost of remedying a problem after it arises. Alternatively, the case provides one observation if policy makers were to consider offering incentives for producers to implement a preventive strategy for their farm. Similarly, this case study provides insight into the producer's cost of doing nothing, but it does not estimate the probability of criminal activity at the farm level.

Additional research on the issue of farm-level security is needed. This study, for example, does not provide any insight into the impact a criminal activity would have on the dairy or food industry, or society; nor does it provide any insight into the impact adopting preventive practices would have on the industry, whether those practices are initiated in response to regulatory mandates, government or market incentives, or the producer's desire to manage risk. Further studies are needed to address these broader concerns.

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