

Sparks Companies, Inc.

**Advanced Meat Recovery Systems -
An Economic Analysis of
Proposed USDA Regulations**

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Advanced Meat Recovery Systems

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Advanced Meat Recovery Systems An Economic Analysis of Proposed USDA Regulations

Preface

This report presents the results of an examination of the potential economic impacts of a proposed USDA rule of considerable importance to the livestock and meat industry. The technology involved is relatively new, and there is little published information available concerning its use. Thus, the analysis of impacts requires gathering first-hand information from various industry sources. We acknowledge with thanks the following individuals for taking time to discuss various matters with us:

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Advanced Meat Recovery Systems An Economic Analysis of Proposed USDA Regulations

Executive Summary

In 1994, meat processors began using a new technology, Advanced Meat Recovery (AMR) systems, to help increase yields and profitability. These systems were developed to more effectively remove the skeletal muscle tissue from bones during processing. They proved to be more cost-effective than the hand-held, high-speed automated knives, and also increased the meat yield through better retrieval from the bone surface. Also in 1994, USDA issued a rule determining that the meat derived from these systems is comparable in composition and content to meat obtained from hand deboning. Rapid adoption of this system followed throughout the industry.

In April 1998, FSIS issued a proposed rule to reduce the maximum allowable calcium and iron content levels for the meat obtained from AMR systems. Unable to adjust fully to meet these proposed criteria, the AMR systems would be abandoned and processors would be forced to return to the hand-held knives formerly used. Many processors have made large capital investments in these systems since 1994 and face significant economic costs if their use is no longer allowed as a result of the FSIS proposed regulation. And, the amount of meat obtained for the food supply would be reduced to the former levels.

The various adjustments required by implementation of the proposed rule across much of the industry would be substantial. The economic impacts would be most directly felt by meat processors, but could be more widespread, even significantly affecting livestock producers. The information developed in this analysis provides a snapshot of the economic effects in 1998 from the proposed regulation with the following estimates:

- **Loss of the equipment value** of the AMR systems meat processors have purchased. The loss of this one-time investment totals \$40 million.
- **Retro-fitting and plant reconfiguration costs** likely will be substantial for most meat processors. For the entire industry, the introduction of the AMR system and removal of the auto-knives involved considerable reconfiguration of equipment already in place and reallocation of the plant floor space. Removal of the AMR systems likewise will require significant capital costs for removal and retrofitting for mechanized knives, as well as for purchase of the knives - totaling \$32.5 million.
- **Additional labor required** to operate the replacement auto-knives. In an already labor-short industry, this would require the addition of 1,970 workers in an occupation

highly susceptible to the effects of Cumulative Trauma Disorders. The net additional labor costs could reach nearly \$53 million.

- **Product revenue losses** from the additional yield that is gained with the AMR system over the auto-knives. An estimated additional 45.3 million pounds of beef (both fed cattle and cows) and 141.4 million pounds of additional pork were produced in 1998 using the AMR system. These quantities would be lost yield with a return to the auto-knife system, ultimately causing the industry a product revenue loss of \$74.1 million.
- **Medical expenses** processors must pay associated with worker injuries (particularly cumulative trauma disorders) from auto-knife operation could total \$10.4 million.
- **Lower prices for livestock producers** likely will result, as meat processors, searching for offsets in an effort to maintain margins, would be unable to pass much of the cost on to consumers.

The analysis indicates that even using conservative assumptions about impacts, the total economic loss in the first year could well exceed \$209 million. In subsequent years, the recurring loss would amount to more than \$137 million annually and would affect not only meat processors, but also company workers, livestock producers and consumers.

Advanced Meat Recovery Systems

An Economic Analysis of Proposed USDA Regulations

The US food and agriculture system is widely heralded as one of the most efficient and dynamic in the world today. It long has provided American consumers-and more recently consumers around the globe-with a safe and affordable food supply. The livestock, meat and poultry sector is an integral component of this system, and has contributed significantly to its performance. The sector has undergone considerable evolution over time, rapidly adopting new technologies, expanding capital investments, and developing new products, all directed toward meeting the requirements of the consumer marketplace.

1. The Issue

In 1994, meat processors began using a new technology, Advanced Meat Recovery (AMR) systems, to help increase yields and profitability. These systems were developed to more effectively remove the skeletal muscle tissue from bones during processing. They proved to be more cost-effective than the hand-held, high-speed automated knives, and also increased the meat yield through better retrieval from the bone surface. By reducing the need for knife operators, they also made a positive contribution to improving worker safety since this position is one associated with a high incident rate of cumulative trauma disorders.

The advent of the new system was facilitated by USDA's issuance in 1994 of a rule determining that the meat derived from AMR systems is comparable in composition and content to meat obtained from hand deboning. Rapid adoption of this system followed the ruling, and today some 69 AMR systems are in use throughout the industry.

In April of 1998, the Food Safety and Inspections Service (FSIS) proposed to change the existing rules to reduce the maximum allowable calcium and iron content levels for the meat obtained from AMR systems. While available AMR systems likely could be adjusted (in terms of pressure and dwell time) to meet the newly proposed calcium standards, they could not meet the new iron levels, thus requiring abandonment of the system and return to the hand-held knives formerly used. Many processors have made large capital investments in these systems since 1994 and face significant economic costs if their use is no longer allowed as a result of the FSIS proposed regulation. And, the amount of meat obtained for the food supply would be reduced to the former levels.

This report presents the results of an examination of the economic costs of the newly proposed regulation and consequent elimination of AMR systems in meat processing facilities across the United States. It reviews conditions that gave rise to the proposed regulation and addresses the

potential impacts on meat processors, company workers, livestock producers and consumers. Following the introduction, the report proceeds in four major sections, as follows:

- Section I provides a brief overview of the AMR system in use today and the factors that led to its development. It describes the system, its characteristics, and the product obtained.
- Section II examines the proposed USDA regulation, the chronology of events leading to its issuance, the key points, and possible consequences.
- Section III then identifies and provides estimates of the economic benefits and costs of the proposed regulation, focusing on meat processors, plant workers, consumers and livestock producers. This section also suggests other cost considerations not easily quantifiable, including indirect social costs.
- Section IV concludes the report with a summary of the economic consequences associated with the proposed regulation and provides an estimate of the total impact.

II. The System In Use Today

Meat processing is a large component of the food system today. Last year some 136.5 million head of livestock and 7.8 billion chickens were slaughtered and processed in the United States. Today meat and poultry processing is highly technological and sophisticated, depending on advanced technology to efficiently utilize farm products to provide safe and wholesome foods to consumers worldwide.

Obtaining all of the edible portions of the animal always has been a technological challenge. Before the introduction of the AMR system, vibratory, hand-held (e.g., Whizzard) knives were used to remove some remaining meat from the bone. This typically is high quality lean meat used in ground meat products (such as hamburgers) and in manufactured food products. Even with skilled operators, however, the knives still were unable to recover valuable meat from bones which, prior to AMR, were further processed into bone meal.

Besides its relatively low meat yield, the vibratory, auto-knife approach also is labor intensive and has an unusually high incidence of ergonomic-related injuries. This results in the relatively low-skilled workforce being typically characterized by high turnover, requiring constant training and replacement of workers.

The management and the economic aspects of the auto-knife system both stimulated adoption of the new technology of the AMR system once it became available. Although a significant capital outlay and plant reconfiguration were required for the system, it produced a much higher meat yield (an increase of at least 15% over the auto-knife yield was guaranteed by a manufacturer) coupled with reduced labor and management inputs. The resulting meat could be either incorporated with other meat (e.g., ground meat) for a variety of uses or sold as a lean amendment to other fatty meat.

The AMR technology was approved to remove high-quality lean meat left on bones with irregular and difficult conformities by costly and tedious hand deboning. The AMR process removes this lean and nutritious meat by bone interaction under pressure utilizing differing viscosities in the system's screened separation chamber. The resulting lean meat is then passed through a soft tissue (belt and screen) separator to remove connective tissue and micro-sized bone particles, if any.

This technology has provided several benefits to meat processors. It helps eliminate the crippling effects of cumulative trauma disorders (CTDs) experienced by hand deboners and also enhances the supply of a safe source of lean meat. The increased meat recovery adds to the total economic value of the carcass and recently has assumed an added significance as the livestock market system increasingly compensates producers on carcass quality and yield, rather than the traditional price per head.

The proposed USDA rule sets calcium and iron limits which the system can not meet and still justify its cost. Even if the AMR system could be technically adjusted to meet the proposed content limits, the loss in meat yield would be so large to the industry that the system's capital cost cannot be justified. Additionally, the return to the auto-knives, which generate lower yield would create substantial plant reconfiguration costs. Thus, the proposed rule, if adopted, would impose substantial capital redirection throughout the industry and would require a very considerable economic cost.

III. The Proposed USDA Regulation

Background

The USDA, through FSIS, under authority of the Federal Meat Inspection Act, is charged with protecting consumer health and welfare by ensuring that meat and meat products are not "unwholesome, adulterated or misbranded." Under this authority FSIS in 1994 amended its regulations to recognize that products coming from advanced meat separation machinery and recovery systems fall within the definition of meat.¹

The modification of the 1994 regulations reflected advances in meat recovery technology. The ability of machines to do the same work as hand-held, vibratory automatic knives, while achieving higher meat yields and still leaving the animal bones intact, led FSIS to conclude that meat derived from these systems should be classified as meat rather than as "mechanically separated livestock product."

In response to compliance concerns raised after the amendments took effect (January 1995), FSIS surveyed federally inspected establishments known to be using AMR and other machinery (Fall 1995), met with industry members, and issued a directive to inspection program personnel to increase consistency in the application of regulatory requirements. FSIS then published a notice in November 1996 that summarized the survey results, discussed various issues, and solicited additional data and information from the public. Comments were received from various industry members, trade associations, equipment manufacturers and others, but no new data were submitted. FSIS then issued a directive to ensure that product which contained spinal cord was not treated as meat.

FSIS later announced (in April 1998) that after considering all of the information obtained, it would propose to amend the regulations regarding meat produced from AMR systems.²

The Proposed Rule

The Agency's stated objective for this rulemaking is to assure that the regulations provide clear standards for industry members in order to prevent misbranding and economic adulteration. The Agency intends to set regulatory requirements that include adequate criteria for bone-related components at greater than unavoidable defect levels (levels consistent with defects anticipated when meat is separated from bone by hand).

¹ At this time, the Commercial Agriculture Division of USDA/ERS performed an economic impact analysis of the FSIS rule - *Meat Produced by Advances in Meat/Bone Separation Machinery and Meat Recovery Systems*, November 30, 1994.

² FSIS notes the proposed rule is primarily intended to establish a "standard-setting approach under which industry members are responsible for compliance." The agency also states in the proposed regulation it is "not intended as a response to concerns some have expressed about spongiform encephalopathies.- See Proposed Rule on *Meat Produced by Advanced Meat/Bone Separation Machinery and Recovery Systems*, FSIS Docket No, 96-027P, 63 Fed. Reg. 19959, April 13, 1998.

In 1994, the Agency expected that the exclusion of meat/bone separation machinery which "crush, grind, or pulverize bones" meant that the calcium content limit and the requirement that "the bones emerge comparable to those resulting from hand-deboning (i.e., essentially intact and in natural physical conformation such that they are recognizable," would be sufficient to ensure that the production process is in control and the characteristics and composition of the resulting product are consistent with those of hand deboned meat.

FSIS cites evaluations it has conducted on product composition since the issuance of the 1994 final rule as reason for the new rulemaking. It argues that the new rule is necessary to accomplish the intended purpose of the amendments adopted in 1994: ensuring control of the production process to prevent the recovery of soft as well as hard bone tissues and providing adequate bases for verifying the exclusion of bone-related components and, thus, the production of meat.

Hard Bone Criteria

Calcium is used as the measurement for presence of hard bone materials in AMR produced meat. In the current proposed rule, FSIS suggests an alteration in the present criteria as determined by a calcium limit of no more than 0.15% or 150 mg/100g of product, within a tolerance of 0.03%, to an absolute limit of no more than 130 mg/100g. Discussions with industry leaders regarding samples taken for calcium content indicate that pork product will unlikely meet this criteria.

Soft Bone Criteria

FSIS also has established new iron/protein ratios to serve as a criterion for soft bone inclusion. It proposes that if the difference between the product's iron content and its protein content multiplied by a given factor is more than 1.80 mg/100g, that product does not meet required standards. The multiplication factors used in the calculation of iron/protein ratios are 0.067 for beef and 0.034 for pork. Industry leaders again expressed that given their test samples, it is doubtful that beef product will conform with this criteria based upon its iron content.

IV. Economic Impacts of the Proposed Regulation

The Potential Consequences

The requirement that a significant part of the meat processing system now in use throughout much of the industry be modified to meet a new regulation obviously has significant economic consequences. This section develops estimates of those impacts, by examining the likely impacts in 1998 on the various participants in the food system, including meat packers and processors, plant workers, consumers and livestock producers.

The analysis presented in this study is based upon the assumption that implementation of the proposed regulation would end use of AMR systems since they cannot be adjusted to meet the proposed iron and calcium content levels. The further assumption is that processing plants would return to the previously widely-used system of auto-knives.

This section will examine the economic costs associated with the proposed regulation for four groups: (1) meat processors; (2) workers; (3) consumers; and (4) livestock producers. All of these cost estimates are then aggregated to provide a total cost of the proposed regulation.

Meat Processors

Meat processors are most directly affected by the proposed regulation. They not only lose the value of their investment in the AMR machines, but also would be required to restructure their plant facilities to accommodate the replacement of AMR with mechanized knives, to purchase the knives, and to hire additional labor to operate the knives. And, they also would incur a substantial revenue loss from the reduced meat yield from the auto-knife system.

The initial decision to purchase and install the AMR equipment required a significant one-time capital cost. AMR systems cost \$480,000 regardless of the type of meat processed. Across the industry, there are 34 systems in use for processing fed cattle, 18 for cows and 17 for hogs, a total of 69 machines now in operation.³ (All of the machines are the same capacity - 4500 pounds of bones processed per hour - except four, two that process 7,000 lb per hour and two that process 9,000 lb per hour). The typical installation cost is a minimum of \$100,000, placing the total system cost at \$580,000. These estimates then suggest that the industry has invested at least \$40 million in AMR systems since their introduction in 1994 (Table 1).

³ Machine purchase and installation cost information provided by machine manufacturer/distributor Better Food Development (BFD), Aurora, Colorado, and verified by industry members.

Table 1. AMR System Investment

Value of Equipment	Fed Cattle	Cows	Pork	Total
Number of machines	34	18	17	69
Cost per machine	\$ 480,000	\$ 480,000	\$ 480,000	
Total System Cost	\$16,320,000	\$ 8,640,000	\$ 8,160,000	\$ 33,120,000
Installation cost per machine	\$ 100,000	\$ 100,000	\$ 100,000	
Total Installation Costs	\$ 3,400,000	\$ 1,800,000	\$ 1,700,000	\$ 6,900,000
	\$19,720,000	\$10,440,009	\$9,860,000	\$40,020,000

All across the industry in both small and large plants, the introduction of the AMR system and removal of the auto-knives involved considerable reconfiguration of equipment already in place and reallocation of the plant floor space. Removal of the AMR systems likewise will require significant capital costs for removal and retrofitting for mechanized knives, as well as for purchase of the knives.

Industry sources estimate approximately 20 auto-knives would be required to replace the machines in each plant used to process fed cattle, 10 for cows and 10 for hogs—a total of 1,030 auto-knives to replace all the AMR systems. The purchase price of each knife is estimated to be \$2,000. These knives require considerable maintenance and replacement of parts. Industry sources suggest that parts and labor to properly maintain the knives would cost at least \$1,200 per knife per year.

Reconfiguration costs will vary from plant to plant and by meat type. The American Meat Institute (AMI) last year estimated these costs to be \$500,000 per plant for fed cattle and \$350,000 per plant processing both cows and hogs.⁴ This would result in a total capital outlay of \$32.5 million (Table 2).

Table 2. Operating System Reconfiguration Costs

Retrofitting To Implement Knife Positions	Fed Cattle	Cows	Pork	Total
Number of machines	34	18	17	
New auto-knives required per machine	20	10	10	
Purchase costs @ \$2,000 per knife)	\$1,360,000	\$360,000	\$340,000	\$ 2,060,000
Knife maintenance - parts and labor (\$1,200 per knife per year)	\$816,000	\$216,000	\$204,000	\$ 1,236,000
Plant retrofit costs each	\$500,000	\$350,000	\$350,000	
Total Retrofit Costs	\$17,000,000	\$6,300,000	\$5,950,000	\$29,250,000
Total Costs	\$19,176,000	\$6,876,000	\$6,494,000	\$32,546,000

⁴ American Meat Institute memorandum submitted to FSIS regarding "Proposed Rule on Meat Produced by Advanced Meat/Bone Separation Machinery and Recovery Systems, FSIS Docket No. 96-027P, 63 Fed. Reg. 19959, April 13, 1998" dated June 12, 1998.

A return to the auto-knife system will require hiring additional labor—one worker per knife position for each shift operated. In an already labor-short industry, this would result in the addition of 1,970 workers employed in an occupation highly susceptible to the effects of CTDs. According to industry sources, these are relatively low skill positions with wage rates near the low end of the range for the industry. A base wage rate of \$11.00 per hour was assumed, which with average benefits would entail a total annual wage cost of \$28,600. Total additional labor costs are obtained by multiplying the annual wage per position by the number of net new hires (\$56.3 million) (Table 3).

Table 3. Net Additional Labor Costs

Additional Labor	Fed Cattle	Cows	Hogs	Total
Shift Hours	8	8	8	
Annual Operating Days	250	250	250	
New Hire AutoKnife Positions	20	10	10	
Number of shifts	68	30	31	
Number of new net hires	1360	300	310	1,970
Estimated wages (\$/hr)	11.00	11.00	11.00	
Wages paid per position	\$22,000	\$22,000	\$22,000	
Benefits per position	\$6,600	\$6,600	\$6,600	
Total Wages and Benefits Per Position	\$28,600	\$28,600	\$28,600	
Total New Hire Costs	\$38,896,000	\$8,580,000	\$8,866,000	\$56,342,000
Offset From Reduced AMR Labor	\$1,944,800	\$858,000	\$886,600	\$3,689,400
Net Additional Costs	\$36,951,200	\$7,722,000	\$7,979,400	\$52,652,600

There is some operator labor associated with AMR system use which would be displaced, so the net addition to labor cost would be reduced by this amount. One operator per AMR machine is assumed, and the cost of \$3.7 million is deducted from the total. This reduces the net additional labor costs to \$52.7 million.

There also are other cost considerations in returning to the auto-knife system. Industry experience indicates that these are "high turnover" positions, requiring constant recruiting efforts to obtain a steady supply of new workers in the extremely tight labor market that exists today and is expected for the foreseeable future. Recruiting suitable employees is especially difficult and costly for these relatively low-wage and demanding positions in this labor market environment. And, there is considerable training required for each new hire to be able to perform efficiently. Thus, there are additional costs of training associated with the return to the knife system.

A primary economic incentive for use of the AMR system is that it yields more meat than the auto-knife system. Industry reports indicate this additional yield typically ranges from 15% to 25%, with the amount depending upon several factors. The yields assumed for these estimates are conservative by industry experience: 1.5 lbs/head for fed cattle, 4 lbs/head for cows, and 2 lbs/head for hogs. Approximately 70% of the total fed cattle and hogs and 60% of the cows

killed in 1998 were processed through the AMR system. These percentages likely would be higher were it not for the uncertainty surrounding the AMR systems as a result of the FSIS proposed rule.

There is a wide variety of uses for the additional meat products which affects its value. However, a high proportion of the product (beef) is blended with other meat while a smaller portion is sold as stand alone product for uses such as jerky, taco meat or pizza toppings. The product used for blending purposes typically is valued in reference to boneless 90% domestic lean fresh trimmings. The 1998 average price for this meat reported by USDA was \$0.8921 per pound.⁵ While the amount of the discount varies, industry sources indicate a 20 cent differential is typical, thus suggesting an annual average value of \$0.70 per pound for beef. Industry sources also suggest that a \$0.30 per pound value for pork is realistic.

These calculations indicate that an additional 45.3 million pounds of beef (both fed cattle and cows) and 141.4 million pounds of pork were produced in 1998 using the AMR system. These quantities, at the prices noted above, would result in total revenue loss to the industry of \$74.1 million (Table 4).

Table 4. Product Revenue Loss Impact

Product Revenue Losses	Fed Cattle	Cows	Pork	Total
Added meat yield per head	1.5	4.0	2.0	
Total head slaughtered 1998	29,486,000	5,979,000	101,029,000	
% processed through AMR	70	60	70	
Number through AMR	20,640,200	3,587,400	70,720,300	
Additional meat yield total (lbs)	30,960,300	14,349,600	141,440,600	186,750,500
Average Market Price (\$/lb)	0.70	0.70	0.30	
Total Value of Yield Loss	\$21,672,210	\$10,044,720	\$42,432,180	\$74,149,110

In addition to the impacts on processors noted above, there likely would be a differential impact depending on size. The burden for most major changes and adjustments in business typically is greater for small business operators. One-third of the AMR systems in use today are in small plants (500 employees or less). Retrofitting the plant, acquiring labor, handling the worker turnover (reportedly 50% or more for small processors), significant training costs, etc. are additional burdens especially difficult for the smaller processor.

⁵ 1998 National Carlot Meat Trade Review: Meat, Livestock and Slaughter Data. USDA/AMS Livestock and Grain Market News Service, Des Moines, Iowa.

Plant Workers

There has been an increased emphasis on worker safety in all types of industry over the past several years. The Occupational Safety and Health Administration (OSHA) has focused in the meat industry on reduction of cumulative trauma disorders (CTDs) associated with jobs requiring repetitive motions. This includes the use of mechanical knives that tend to result in instances of carpal tunnel syndrome and tendonitis.

While there is frequently no external sign of a disorder (as with cuts, contusions, etc.), CTDs can be crippling, adversely affecting both the occupational and personal life of the person exposed. Moreover, since they are cumulative disorders, if the task characteristics remain unchanged, the cumulative deterioration of the affected body part may continue until irreversible damage is done.

The introduction of AMR technology came at a time when public policy debate was focusing on increasing injuries and medical expenses. The industry's adoption of the AMR systems reduced the number of jobs having the highest incidence of such repetitive injuries. However, a return to vibratory auto-knives would require returning 1,970 new employees to these positions.

There is no official documentation available as to injury incidence rates for the specific job of "auto-knife operator." The US Department of Labor does provide a rate for a "butchers and meat cutters," but the job of auto-knife operator is much more demanding and the injury rate much higher. Industry estimates of injury incidence range from 20% to almost 40% annually. In its 1998 analysis, AMI (see footnote 3) assumed a 38% incidence rate. Given this range of estimates, a relatively conservative rate of 20% annually is assumed for this analysis (Table 5). This would generate 394 cases of injury-272 cases in fed cattle plants, 60 in cow slaughter plants, and 62 in hog slaughter plants - among the new hires.

Table 5. Estimated Medical Expenses

Medical Expenses	Fed Cattle	Cows	Pork	Total
Number of Positions	1,360	300	310	1,970
Injury Rate (%)	20	20	20	
Total Incidents Per Year	272	60	62	394
Medical Costs Per Incident	\$26,500	\$26,500	\$26,500	
Total Medical Expenses	\$7,208,000	\$1,590,000	\$1,643,000	\$10,441,000

There also is little documented evidence of the medical costs associated with such injuries. AMI in 1998 assumed \$26,500 per injury, and that amount is used here. This would lead to total medical expenses each year of \$10.4 million.

Consumers

While the reduction in the total supply of meat of 187 million pounds due to the reduced yield from eliminating the AMR system might be expected to have some price impact, it is unlikely this would be reflected in prices to consumers. The current competitive environment suggests packers/processors would be unable to pass added costs forward to consumers, implying that they likely would be passed back to producers in lower cattle and hog prices.

Livestock Producers

Meat processors incurring the new costs and facing lost revenues can be expected to find offsets in an effort to maintain margins. Unable to pass costs to consumers, this likely means reducing raw material cost, i.e., paying lower prices for livestock.

The loss to processors on an ongoing basis is the lost revenue from the additional meat produced, plus any higher operating cost for meat obtained from the auto-knife system. Considering only the lost revenue from the additional meat yield (\$74 million) and assuming it could be shifted to livestock producers, this would amount to reductions of \$1.05 per head for fed cattle, \$2.78 per head for cows, and \$0.60 per head for hogs (Table 6). If the full extent of processor losses is shifted backward, the adverse effect on producers would be even greater.

Table 6. Potential Livestock Producer Impact

	Fed Cattle	Cows	Hogs
Million head slaughtered (1998)	29.5	6.0	101.0
Processed through AMRS (%)	70	60	70
Processed through AMRS (mil head)	20.6	3.6	70.7
Additional meat revenue loss (mil \$)	\$21.7	\$10.0	\$42.4
Lost Revenue Per Head	\$1.05	\$2.78	\$0.60

Summary

The estimates of the total potential costs of the proposed new regulation are shown in Table 7. Using conservative assumptions throughout, the total costs to the industry are seen to exceed \$209 million.

Table 7. Summary Impacts

	Fed Cattle	Cows	Pork	Total
<i>Meat Packer Impacts:</i>				
<i>Total Value of Equipment Loss</i>	\$19,720,000	\$10,440,000	\$9,860,000	\$40,020,000
<i>Plant Restructuring Costs</i>				
<i>New System Added Costs</i>				
Total Retrofit Costs	\$19,176,000	\$6,876,000	\$6,494,000	\$32,546,000
Total Net New Hire Costs	\$36,951,200	\$7,722,000	\$7,979,400	\$52,652,600
Product Revenue Losses	\$21,672,210	\$10,044,720	\$42,432,180	\$74,149,110
<i>Worker Impacts:</i>				
Total Medical Expenses	\$7,208,000	\$1,590,000	\$1,643,000	\$10,441,000
TOTAL ESTIMATED COSTS	\$104,727,410	\$36,672,720	\$68,408,580	\$209,808,710

V. Summary and Conclusions

The meat processing industry continues to evolve and adapt in response to the ever-changing consumer marketplace. A new processing technology emerged in 1994 that enabled obtaining greater quantities of meat from each carcass and reducing the labor required for jobs subject to high frequency injuries. When USDA/FSIS clarified the designation of the meat from the new technology, it was rapidly employed and now is used widely throughout the processing industry. Some 70% of all fed cattle, 60% of cows, and 70% of hogs are processed using the system.

USDA/FSIS now proposes a new regulation that would substantially reduce the allowable levels of calcium and iron in the meat product. Industry sources indicate that the AMR systems can not meet the proposed standards and be operated economically. The practical effect of the proposed regulation would be to render the systems useless. Moreover, in that event, industry sources suggest there are few or no viable alternatives to returning to the previously used system of auto-knives.

A return to the auto-knife system will require significant new investment to restructure the physical facility in the plant and to hire new workers as auto-knife operators, positions with a high frequency of ergonomic-related injuries.

The adjustment required by implementation of the proposed rule across much of the industry would be substantial. The economic impacts would be most directly felt by meat processors, but could be more widespread, perhaps even significantly affecting livestock producers. The information developed in this analysis provides a snapshot of the economic effects in 1998 from the proposed regulation with the following estimates:

Meat Processor Impacts	Cost
<i>Value of Equipment Loss</i>	\$40,020,000
<i>New System Added Costs</i>	
Total Retrofit Costs	\$32,546,000
Net New Labor Costs	\$52,652,600
<i>Product Revenue Losses</i>	\$74,149,110
Worker Impacts	
<i>Total Medical Expenses</i>	<u>\$10,441,000</u>
TOTAL ESTIMATED COSTS	\$209,808,710

The analysis indicates that even using conservative assumptions about impacts, the total economic loss in the first year could well exceed \$209 million. In subsequent years, the recurring loss would amount to more than \$137 million annually. Over a period of five years, given the recurring losses (additional labor, product revenue losses and medical expenses) and the one-time

fixed cost of the equipment and plant restructuring, the accumulated economic impact could reach nearly \$759 million. Over a period of ten years, that amount could exceed \$1.4 billion.

This analysis does not factor in wage and other labor cost increases that likely would occur in following years adding to the total economic losses. While the incidence would be most direct on meat processors, some shifting could occur with impacts then extended directly to livestock producers. Given the higher economic costs that are likely in subsequent years, livestock producers could face even greater losses in the future.