SUMMARY AND CONCLUSIONS

Background

The use of water as a dust suppressant was allowed by the Federal Grain Inspection Service (FGIS) in an amendment to the Weighing Provisions and Procedures of the United States Grain Standards Act "permitting the application of additives to grain for the purpose of controlling fungi, suppressing dust, and identifying grain." [Federal Register, 1987b] The final rule, published in the Federal Register March 4, 1987, provided grain handlers with a partial exemption from the ruling by the Federal Food and Drug Administration (FDA) that grain was deemed to be adulterated "if any substance has been added thereto or mixed or packed therewith so as to increase its bulk or weight, or reduce its quality or strength, or make it appear better or of greater quality than it is." [Food and Drug Administration, 1979] Research and commercial tests had demonstrated that the application of water was effective in controlling dust. However, the ruling created the potential for abuse because it relied on motive, and motive could not be clearly ascertained. The use of water for dust control raised objections from many sources and eventually led to an FGIS ruling that prohibited the use of water on grain.

The FGIS ruling which permitted elevators to use water and oil additives as a means for dust control was based on a concern over the increased number of dust explosions in grain handling facilities in the late 1970s. While the technology of liquid additives was adopted by several elevators, objections from foreign buyers encouraged several export elevators to seek alternate methods of dust control, and by October, 1993 only a few firms were still using the practice. FGIS, Office of Inspector General (OIG), and the grain industry requested hearings and a reevaluation of the FGIS ruling of 1987. The conclusions from the hearings and comments to the Federal Register were inconclusive.

Grain dust control at a grain handling facility refers to equipment and operating techniques used to reduce the generation of airborne dust during receiving, shipping, drying, and transfer operations. It may include aspiration equipment, enclosed conveyors, direct spouting, the use of liquid additives, loading spouts that entrap dust, etc. The justifications for installing dust control systems are: (1) safety --prevention of grain dust explosions, (2) housekeeping -- reducing labor required to sweep up dust settling on surfaces, and (3) regulatory -- complying with air pollution regulations.

The 1987 ruling by FGIS created controversy from the beginning. Following investigations by the OIG into possible misuse of water as a dust control measure in April 1992, FGIS was persuaded to reopen the debate on the use of water as a dust suppressant. Congressional hearings were held in 1993 to receive testimony by industry, USDA, and researchers on the need to prohibit the use of water as a dust suppressant. Following complaints from several members of the industry, including foreign buyers, about the effects of added water on grain quality, the misrepresentation of weight and moisture content, and the problems of quality deterioration, FGIS issued a preliminary ruling prohibiting the application of water to grain, requesting comments prior to final rule making. Comments received by FGIS and the congressional hearings failed to resolve the issue to the satisfaction of several members of the

agricultural committees of the House and Senate. In June of 1994, Congress requested OTA to conduct an investigation of the technology, the potential abuses, FGIS' ability to monitor water addition under licensing, the impact on grain quality and the alternative methods of implementing a prohibition of water on grain. On October 14, 1994 FGIS issued a final ruling in the Federal Register, prohibiting the application of water to grain, except for milling, malting or similar processing operations. [Federal Register, 1994]. Given the long history of the debates about adding water to grain it is appropriate that a fundamental and thorough study be made available, to resolve the issue for future generations as well as to resolve the continuing debate in legislative and regulatory bodies.

The objective of this report is to summarize the factual information on the use of water as a means of controlling dust, improving grain quality, meeting Occupational Safety and Health Administration (OSHA) concerns and Environmental Protection Agency (EPA) regulations, and reducing the danger of dust explosions in the grain marketing channel. The results of this study provide a factual basis for evaluating the beneficial as well as the detrimental consequences of the FGIS ruling.

Conclusions

The primary technologies for controlling grain dust in handling and storage facilities are pneumatic dust collection, housekeeping, enclosing of equipment, and liquid additives, with several variations on each. All of the methods are effective, to various degrees and under appropriate conditions and designs, in reducing dust concentrations at grain transfer points. None of the methods guarantee safety from dust explosions.

The application of water to grain through misting or fogging, has been demonstrated to be an effective method for dust control. Under most conditions water application is the least costly method for reducing grain dust entrainment in the air at grain transfer points. Improper, repeated or excessive water application could lead to grain spoilage and higher cost. Pneumatic dust control is an effective method of lowering the concentration of dust at grain transfer points [29 CFR: parts 1910 and 1917] although only a small fraction of the dust in the grain stream is captured and removed. The level of dust in grain will likely not be affected by this control method in that additional handling will create additional dust with breakage prone corn. Any of several methods for dust suppression, including the use of water, can reduce the probability of a dust explosion in a grain handling facility. However, there is no statistical evidence that any one method, including water, has reduced the frequency of dust explosions in the industry. Reducing the danger of explosion requires a systems-wide approach that incorporates housekeeping practices, reduction in breakage during handling, more gentle handling techniques, and an application of one or several strategies for reducing or suppressing dust at grain transfer points, loadout points, in the air, on the floor, and on the walls of the facility.

Cost calculations for the different alternatives must be based on so many assumptions about the size and type of facility and operating conditions, as well as the local, state, and federal regulations, that cost comparisons can have little relevance in evaluating the FGIS prohibition. A

wide range of costs exist for any one technology, depending on the installation and operation at a given facility. Estimating an aggregate, economic cost to the industry from a prohibition of water for dust control does not provide definitive conclusions. Very few elevators were still using water as a means of dust suppression when the prohibition rule was made effective on February 11, 1995. This suggests that the prohibition of water would impact a few firms but would have little economic impact on the total industry. In addition, prohibiting the application of water will have little impact on the ability of farmers, country elevators, and exporters to deliver grain close to the base or contract moisture. Grain handlers and producers will continue to alter the moisture content of grain through drying, blending, aeration, and other methods to meet requirements for storage, shipment, and market driven incentives.

The direct effect on quality as a result of adding 0.3 percent water to grain is very small. Grain at moisture levels on the borderline for safe storage may develop additional mold and fungi and an uneven distribution of moisture within the grain mass can potentially create storage problems; however, when applied at 0.3% or less the likelihood of significant quality problems is small. The problems communicated by foreign buyers and flour millers are based more on their perception of a problem than on scientific evidence of quality changes. Customer's perceptions are important marketing considerations. Regardless of the economic costs and benefits in the application of water for dust suppression, foreign buyers' perceptions will probably require certification that "no water has been added". Therefore, few export elevators will be willing to use water for dust suppression, regardless of the status of the regulation. Even many domestic processors (particularly flour millers) have requested a statement in the contract specifying that no water has been added.

The economic impact on the industry from prohibiting the use of water on grain will be relatively small for two reasons:

a) few firms in the market channel, other than port locations, have used water as a dust suppression technique (8.2% of the country elevators reported using water for dust control),

b) objections from foreign buyers have already required many exporters to find alternative strategies for dust control or suppression.

The strongest argument against the use of water for dust control has been the potential for abuse where grain handlers have added water to increase the weight of the grain, its moisture content or its value on the justification of controlling dust. Incentives for abuse are strong when the added water can be sold at the full price of grain. The licensing, monitoring, and supervision of the application of water would be extremely difficult at farms and country elevators. There may be cost effective strategies for controlling water application in large terminal or export elevators where FGIS personnel are frequently present.

Regulating the use of water based on motives will be extremely difficult and expensive, and inequitably applied. Given the many alternative ways in which the moisture content of grain

can be changed, uniform enforcement throughout the market channel, based on the FDA's definition of adulteration, is economically, if not technologically, impossible.

Metering devices, licensing requirements, and supervision by regulatory agencies do not address the problem created by the numerous techniques by which the moisture content of grain is changed. Absorption from humid air, blending wet and dry grain together, harvesting shortly after a rain storm or on very humid days, and normal aeration of grain in storage result in the same end product as properly applied misting or fogging. Adulteration under FDA regulations and the FGIS ruling is based on motive and procedure, not on the end result of the various practices.

The most effective method of preventing the illegal application of water on grain is to remove the incentives and the opportunity for economic gains from the addition of moisture. As long as the weight of grain sold can be increased, without decreasing the sale price per pound or ton, farmers and grain handlers will have a strong incentive to add water by any of several means. Enforcement of a prohibition against mechanical devices for water addition will not prevent the use of any of several other strategies. The use of an equivalent bushel based on the dry matter contained in the grain could effectively remove any opportunity for shippers to gain from the addition of water by any means. The equivalent bushel method has disadvantages as well as advantages, but it is the only purchasing strategy that eliminates the incentive for rewetting. Objections to the practice of adjusting grain weight on the basis of dry matter content, are more economic than technological. Conversion tables and adjustment factors are widely used by country elevators for grain with excess moisture. Applying the mathematical adjustment to grain below the base moisture has been resisted by most grain handlers and will be difficult to implement by regulation. Base moisture and adjustments in price are determined in the market place. Competition and information will be more effective than regulatory prohibitions in regulating the use of water on grain.