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## Waste management in the production dairy industry

### Abstract

The impact of environmental regulation on livestock production enterprises is, inevitably, an increase in production costs. Producers should recognize that these are the costs of doing business and will probably have to be incurred by all producers who stay in business and remain viable. With proper input to the regulation process and implementation of practical and effective methods of manure management, most producers should be able to maintain viable enterprises.; Dairy Day, 1992, Kansas State University, Manhattan, KS, 1992;

### Keywords

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# WASTE MANAGEMENT IN THE PRODUCTION DAIRY INDUSTRY

*C. Fulhage<sup>1</sup>*

## Summary

The impact of environmental regulation on livestock production enterprises is, inevitably, an increase in production costs. Producers should recognize that these are the costs of doing business and will probably have to be incurred by all producers who stay in business and remain viable. With proper input to the regulation process and implementation of practical and effective methods of manure management, most producers should be able to maintain viable enterprises.

## Introduction

The late 1960's and early 1970's marked the beginning of significant changes and developments in the manner in which wastes were handled and managed in production operations involving livestock. Prior to that time, most livestock operations (other than a few, large cases) did not need to be greatly concerned about the path taken by manure or manure nutrients after it was voided by the animal. Most waste management activities were implemented for the convenience of the operator or animal/human health and sanitation reasons, rather than concern for surface and/or groundwater contamination. As long as nobody complained, manure "going to the creek" was generally ignored or simply not addressed by the regulatory agencies.

With the advent of the National Pollutant Discharge Elimination System, state and federal regulatory agencies became much more involved in scrutinizing sources and potential sources of pollution in agriculture as

well as other industries. This increased attention from the regulatory sector coincided with an era of generally increasing size of individual operations. The 20-cow dairy that father or grandfather started grew into the 100-cow or larger dairy of today, often in the same location and utilizing many of the same facilities that were in use years ago. This increasing growth/manure production and increased regulatory activity have caused difficulty for many livestock producers as they attempt to comply with environmental requirements, while maintaining a viable production enterprise.

Review and analysis of the livestock waste/regulatory developments of the past 20 years identifies three factors that determine the degree of difficulty a particular livestock operation may perceive regulations as causing.

1. **Compliance.** Livestock producers, traditionally and characteristically independent types, must accept that compliance with environmental regulations is in their best interests and will be required by public perception and scrutiny. Experience suggests that attempts to delay, circumvent, or seek political relief from compliance requirements are nonproductive and, in many cases, ultimately make compliance more painful and difficult, because the regulatory agency perceives an attitude of noncooperation and disregard for the environment. Hence, a positive attitude toward compliance and recognition that public perception and scrutiny require all waste generators (agricultural as well as industrial, municipal, etc.) to comply with

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environmental regulations are important to the dairy producer in maintaining a viable production enterprise.

2. **Regulatory Input.** Although environmental regulations and their associated impact appear to be (and probably are) inevitable, livestock producers should take an active role in shaping and influencing the nature of those regulations. Most regulation development is conducted in a manner designed to allow input from those that the regulation impacts. This input may be accomplished in a variety of ways, including public hearings, written commentary, review of a proposed regulation in a public register, writing your congressman, etc. Agricultural commodity and issue organizations (Farm Bureau, Cattleman's Association, etc.) can and should be active participants in regulatory development. The objective in supplying input to regulations should not be to seek exempt or "special favored" status, but rather to find reasonable and practical methods of reaching the goal and intent of the regulation.
3. **Cost.** Waste management is, and probably always will be, a net cost item in the production enterprise. Although utilization of nutrients in manure may offset some costs, compliance-management of manure, in most cases, will result in a net cost to the operation. Because this cost does not usually contribute to or increase production (as does feed cost, for example), there is a strong tendency to attempt to "sidestep" this cost in order to enhance the capital cost/cash flow picture. Given that compliance-management of manure, sooner or later, will be required in all operations, it is extremely important that the producer view the cost of compliance as a cost of doing business. This cost should be viewed as valid and necessary as feed cost, facility costs, and other commonly accepted operating expenses. If a production enterprise cannot operate "in the black" with those costs accounted for, then that enterprise probably does not have

a long-term, viable future. The contention that "compliance-waste management costs will put me out of business" generally elicits little sympathy or relaxation from the regulatory agencies. And indeed, the record shows that very few operations go out of business solely because of waste management costs. In such cases, other factors generally contribute to the nonviability of the operation.

### **Problems of Waste Management**

Experience suggests that certain circumstances and conditions are often present in cases in which the regulatory agency initiates action regarding producer compliance with environmental regulations. Some of these circumstances are as follows:

1. **Dirt Lots/No Runoff Control.** In these cases, manure-laden runoff often enters a dry, intermittent, or losing stream or a flowing stream. Most regulatory agencies will regard this as a discharge of contaminants to waters of the state and, hence, a violation. Runoff discharges to other areas such as a pond or lake, sinkhole, neighbor's property (with or without associated complaints), and public rights-of-way such as road ditches also may be considered violations.
2. **Manure Storage Facilities Overflowing.** Overflow and subsequent runoff from manure storage facilities, as with runoff from dirt lots, can draw the attention of the regulatory agency. Movement of manure nutrients from a storage facility to any of the receiving areas described above will probably be perceived as a violation.
3. **Odor/Emissions.** Up to now, most regulatory agencies have played a rather passive role in regulating or addressing odors of agricultural origin. However, odors have, in recent years, been sources of many controversies and litigation in the courts. Agricultural odor cases generally are not initiated and pursued by the regulatory agency. Many cases are initiated by citizen

- plaintiffs, usually citing nuisance law as a basis for the complaint. However, the regulatory agency usually does become involved, even though it has not documented or even addressed the possibility of an odor violation or nuisance. The involvement usually is a result of one side or the other attempting to show that the plaintiff is negligent, or conversely, exemplary in his other waste management practices. In the past, regulatory activity in the livestock waste area has focused primarily on water pollution. With the passage of the Clean Air Act, focus also will be directed toward atmospheric emissions (carbon dioxide, methane, ammonia, dust, particulates, etc.) as well. Because livestock waste systems are significant generators of these materials, future system designs must be developed with such regulatory impacts in mind.
4. **Manure Spreading.** Experience has shown that manure spreading activities can be a source of problems because of odor as well as being potential sources of surface or groundwater contamination. Odor problems often arise when untreated manure is surface spread in an area in which potential odor receptors live too close to the spreading site. Runoff problems can arise when too much manure is spread on too little ground. This often happens as the operator attempts to reduce the amount of time spent hauling manure. Manure stockpiled on a field for subsequent spreading also can cause nutrient runoff problems, if significant rainfall leaches material from the stockpile. Irrigation equipment used to distribute dilute lagoon effluent can suffer malfunctions such as pipe disconnection/breakage, or gun/sprinkler malfunction (i.e., traveling gun stopping or upsetting on uneven terrain or stationary sprinklers left operating in one place too long). These types of failures typically result in high rates of runoff to the nearest stream, pond, or lake with associated fish kills, water quality degradation, etc.
  5. **Neighbor Complaints.** Poor relationships or antagonistic feelings among neighbors are often expressed as complaints about the livestock waste management system or its operation. The root of the problem may actually lie elsewhere, but, for whatever reasons, waste management is used as a vehicle for expression. Most regulatory agencies are required by law to investigate complaints alleging the occurrence of water pollution. In such complaint cases, the regulatory agency becomes involved when it might not have otherwise had the complaint not been made.
  6. **Dead Animal Management.** As livestock operations become larger, management of the mortalities that inevitably occur becomes more of a problem. Many states have enacted legislation to prohibit traditional methods of dead animal disposal. Such traditional methods may include burial, dragging, or hauling off to an isolated (or not so isolated) area to "feed the coyotes", improper (brushpile) burning, dumping into a sinkhole, or floating in a lagoon. Any of these practices, often reported by a neighbor's complaint, may result in regulatory action, depending upon the laws and statutes in place and their degree of enforcement.

### Solutions to Problems

Solutions to waste management problems are many and varied, limited only by the ingenuity of the problem solver and, perhaps, by the regulation structure/framework itself. Experience indicates that only a very small percentage of waste management problems may not be solved within the economic framework of the production enterprise. However, in a few cases, operators may elect to cease production rather than pay costs of compliance that are required in their individual cases.

The single, most important factor that can prevent, reduce, or eliminate livestock waste management problems is site selection. Successful prevention or resolution of nearly all the problems discussed above can be

enhanced by good site selection. Unfortunately, many livestock operations are located on sites where little consideration was given to waste management, usually because the site was selected in an earlier era when the operation was small and environmental concerns were minimal. Years ago, livestock operations were sometimes located on or near streams to take advantage of the "natural flushing" associated with such a location. On such sites, especially when the operation has significantly increased in size over the years, it can be very expensive and difficult to protect the stream that was the original waste-receiving area. The operator is then faced with the dilemma of moving to a new, more acceptable site, with the associated costs, or taking costly preventative measures on the original site, which may not support expansion into the future.

The most important factor to consider in site selection is maximization of distance to sensitive or critical features. These features can include streams (dry or flowing), ponds, lakes, sinkhole areas, public roads, property lines, and nonowned dwellings. Providing maximum distance between the facility site (manure source) and a sensitive feature, such as a stream, reduces the possibility of manure nutrients degrading that stream. This distance, in addition to providing a grassed filter area, allows room for the construction of runoff control structures, manure storages, lagoons, etc.

Traditional site selection criteria include access (close to the public road), utilities (locate or expand where water and electricity are already available), and existing support facilities (i.e., the hay barn or feed storage is already there). In the present era of environmental concern, these traditional criteria should be considered secondary to the question, "Can the livestock waste produced be successfully managed on this site?"

Some site selection criteria to be considered ahead of the traditional criteria of access/utilities/support facilities include the following.

1. Room for a grassed buffer area between the manure source and a sensitive receiving area (stream, etc.). Such an area also provides needed room to construct waste storage/treatment facilities, solids separation devices, runoff control structures, filter strips, and any other components needed to maintain compliance.
2. Adequate land for spreading manure. Most regulatory agencies require that manure be spread on land at agronomic rates. Hence, it is extremely important that a site be selected in which sufficient land is available to receive the amount of manure expected to be produced in the facility.
3. Proper soil material for constructing the needed waste management components. Many waste management systems can be most economically developed utilizing earthen storage for waste. However, it is very critical that the soil material available for constructing these components have sufficient clay content to attain the degree of impermeability required by an applicable regulation.
4. Odor movement. Any production unit involving livestock will produce some odor. In selecting a site, consideration should be given to the direction odors will travel from the facility. Prevailing wind direction and distance to downwind receptors should be noted. Of equal or greater importance is the travel of odors during damp, humid conditions with little or no wind. In these cases, odors travel, essentially undiluted by wind, in a "drainage" path similar to that water would follow. In such conditions, odors can travel relatively long distances, while retaining most of their original concentration. Separation distance to property lines and nonowned dwellings should be maximized to reduce the possibility of odor complaints by neighbors.

When a site is to be selected for a livestock production facility, an orderly procedure of addressing and evaluating the above factors

and/or any other applicable factors should be followed and documented. In addition to ensuring that the best possible site is selected, this documented procedure will be evidence that all available recommendations and regulations were considered should the site location ever be challenged in legal proceedings.

Possible solutions to the specific problems outlined above are as follows.

1. **Dirt Lots/No Runoff Control.** As noted above, the impact of runoff from dirt lots can often be reduced by selecting a site further away (uphill or upslope) from the affected stream. On small operations, a simple solids separation device such as a porous (picket) dam can hold and store solids, and the liquid runoff can be received by a filter strip or grassed buffer area. Grassed terraces or waterways can be used to intercept runoff and provide sufficient flow distance to absorb manure nutrients in some cases. Lagoons and holding ponds are also effective means of interrupting and storing waste flows for subsequent land application. Sometimes dirt lots can be rotated and "farmed" to maintain a vegetative cover most of the time. Regulatory agencies usually consider livestock on a vegetated area to be a "nonpoint" source and, thus, not subject to the usual "feedlot" regulations.
2. **Manure Storage Facilities Overflowing.** Again, selecting a site away from streams, ponds, property lines, public roads, etc., can reduce the impact of a manure storage facility overflowing. However, it is obviously more ideal to prevent the overflow in the first place through good management. This usually involves pumping or hauling manure from storage facilities as needed and preferably in the summer/fall season, so storage volume is available for the cold and wet winter and spring months. Storage facilities should be designed with a realistic storage period in mind, so that the operator can manage the system in accordance with climatic conditions,

tillage/planting/harvesting schedules, and his own time constraints. The operator must have the resources to dedicate the required equipment, labor, and management to manure land application needs. As noted initially, the operator must consider waste management a cost of doing business.

3. **Odor/Emissions.** As always, site selection can play an important part in preventing or reducing odor problems. Adequate separation distance from property lines and nonowned dwellings allows dilution of odors before they reach receptors who might be offended. Consideration of prevailing winds and air drainage patterns in relation to the location of neighbors' houses can prevent odor problems from developing. Good housekeeping and sanitation measures are important in minimizing odor generation. Waste management systems should be designed to minimize contact of raw manure with the atmosphere. Systems employing frequent collection and transport of manure to storage/treatment facilities (such as flushing systems) generally have significantly lower odor production than systems in which manure is collected infrequently.
4. **Manure Spreading.** Again, good site selection can be instrumental in reducing or eliminating manure spreading problems. Selecting a site where adequate land area is available within a reasonable distance from the manure source will allow the operator to apply nutrients at an agronomic rate within a time frame that he can manage. Spreading sites should be selected to minimize impact on streams, lakes, property lines, and non-owned dwellings. Manure storage facilities should be designed so that manure does not have to be spread when soil and/or climatic conditions are unfavorable (i.e., wet or freezing conditions). Spreading or irrigating equipment should be properly maintained and continuously monitored to ensure proper operation.

5. **Neighbor Complaints.** It is very important to eliminate reasons for neighbor complaints before they start. Once complaints are generated, they are very seldom resolved to the satisfaction of both parties. Again, site selection is instrumental in reducing the possibility of neighbor complaints. Remote locations that reduce visual and "smell" exposure help minimize the impact on neighbors. Vegetative screening such as tree lines can be effective. Practicing good public relations; donating commodity products to neighbors, charity, schools, and public functions; and generally being a good neighbor by following the golden rule are methods of reducing complaint probabilities.
  
6. **Dead Animal Management.** Most states require that animal carcasses be disposed of within 24 hours of time of death. Producers should become familiar with and follow the applicable laws and statutes regarding dead animal disposal. Acceptable methods may include rendering, incineration, sanitary landfill, burial, and composting. Rendering plants are becoming increasingly isolated, and transport of carcasses over long distances is expensive. Hence, rendering is not an attractive option to many producers. Incineration or burning of carcasses is usually regulated by air quality laws or statutes. Equipment and fuel costs are generally quite high to incinerate carcasses in compliance with air quality statutes. Landfills licensed to receive dead animals may refuse to accept them for their own reasons. Additionally, landfills are becoming increasingly filled,

and it is difficult to locate and start new landfills. Hence, landfills are not alternatives of dead animal disposal for most producers. Burial may be an accepted method of dead animal disposal, if certain conditions are met. These conditions might include a limit on the number that may be buried per acre per year, requiring burial in a certain soil type, and specifying acceptable burial depth and soil cover requirements. Composting with subsequent land spreading of the compost is a relatively new practice in dead animal disposal. However, this practice has proven to be highly effective and attractive in the poultry industry, because it allows ultimate disposal in a manner similar to that used for handling the poultry litter. With this technique, poultry carcasses are layered with straw and poultry litter in a bin and allowed to compost in a two-stage process. After about a month of composting, the material can be spread on the land with little evidence of the original poultry carcasses detectable. Experiments are being conducted to determine the applicability of composting to other animal species.

Environmental regulations will be an integral factor in livestock operations in the future. Livestock operations must operate in compliance with regulations. Costs of production will increase, but it is imperative that waste management costs be considered as valid and necessary to doing business. This approach will be essential for long-term viability of the operation as a production unit.