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Legislation to Abate Pollution from Manure: The Dutch Approach

Wim Brussaard
Margaret Rosso Grossman

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### Legislation to Abate Pollution from Manure: The Dutch Approach

*Wim Brussaard*  
*and Margaret Rosso Grossman*

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Introduction</td>
<td>86</td>
</tr>
<tr>
<td>A. The Dutch Manure Problem</td>
<td>88</td>
</tr>
<tr>
<td>B. Early Legislation with Respect to Fertilizers and Manure</td>
<td>90</td>
</tr>
<tr>
<td>II. New Laws and Regulations to Control Pollution from Animal Manure in the Netherlands</td>
<td>91</td>
</tr>
<tr>
<td>A. The Scope of the New Manure Legislation</td>
<td>92</td>
</tr>
<tr>
<td>B. Application of Animal Manure</td>
<td>93</td>
</tr>
<tr>
<td>C. Production of Manure</td>
<td>95</td>
</tr>
<tr>
<td>D. Transport of Surplus Manure</td>
<td>98</td>
</tr>
<tr>
<td>E. Regulations for Fertilizer Trade</td>
<td>100</td>
</tr>
<tr>
<td>III. Regulating Animal Wastes in the United States</td>
<td>100</td>
</tr>
<tr>
<td>A. Water Pollution Control</td>
<td>101</td>
</tr>
<tr>
<td>1. Point Source Pollution</td>
<td>102</td>
</tr>
<tr>
<td>2. Nonpoint Source Pollution</td>
<td>105</td>
</tr>
<tr>
<td>B. Air Pollution</td>
<td>106</td>
</tr>
<tr>
<td>C. State Regulation Connected with Animal Manure</td>
<td>108</td>
</tr>
<tr>
<td>1. Field Application of Livestock Waste</td>
<td>108</td>
</tr>
<tr>
<td>2. Operational Rules for Livestock Facilities</td>
<td>110</td>
</tr>
<tr>
<td>IV. Conclusion</td>
<td>110</td>
</tr>
</tbody>
</table>

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* Professor of Agrarian Law, Environmental Law, and Physical Planning Law, in the Department of Agrarian Law, Wageningen Agricultural University, the Netherlands. Masters Degree in Dutch Law, University of Leyden, the Netherlands, 1965. From 1965 to 1981, Professor Brussaard was a member of the Law Department in the Dutch National Physical Planning Agency, The Hague.

* Associate Professor, Agricultural Law, Department of Agricultural Economics, University of Illinois at Urbana-Champaign. B. Mus., University of Illinois, 1969; A.M., Stanford University, 1970; Ph. D., University of Illinois, 1977; J.D., University of Illinois, 1979.

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I. Introduction

The deteriorating condition of the natural environment has claimed increasing attention in recent years. In Europe and in the United States, air and water suffer the effects of humankind's failure to safeguard the natural elements on which life depends. Both flora and fauna fail to thrive in an environment fouled by waste from human activities.

Agricultural production depends directly on natural elements (soil, air, and water) and is thus threatened by environmental degradation. In addition, however, agriculture itself is often a source of pollution, especially water pollution. Pollution caused by agricultural activities has two major components: erosion-transported pollutants, such as pesticide and fertilizer residues, and livestock waste, often resulting from intensive animal feeding operations. Significant quantities of nitrogen, phosphorus, and other pollutants from these agricultural operations find their way into water sources. Although pollution from agricultural chemicals attracts more attention, livestock waste—that is, animal manure—continues to contribute to the pollution of both surface water and groundwater. Indeed, in some instances (for example, in the Netherlands, the chief focus of this article), animal manure is an extremely serious pollutant.

In days when animals were maintained under range or pasture

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1 See Montgomery, Control of Agricultural Water Pollution: A Continuing Regulatory Dilemma, 1976 U. Ill. L.F. 533, 533-34. Large numbers of animals on a farm may cause a pollution load equivalent to a city of two million people. Id. at 535.


Agricultural activities are yet another source of groundwater contamination. Irrigation can cause dissolved salts and agricultural chemicals to leach into groundwater. Chemical fertilizer and pesticide application can result in the direct percolation of contaminants from cultivated fields into the water table. Precipitation can also cause leaching of chemical fertilizers applied in quantities exceeding the amounts required by crops. Midwestern states in particular face nitrate contamination problems stemming from fertilizer application. Runoff from concentrated livestock feeding operations has led to pollution by nitrates, phosphates, and pathogens.


4 Links between land use and surface water quality are well understood, but links between agricultural land use and groundwater quality are not so well understood. B. Crowder & C. Young, Managing Farm Nutrients: Tradeoffs for Surface- and Ground-Water Quality 2 (Economic Research Service, U.S. Dep't Agric., Agricultural Economic Report No. 583, 1988).
conditions, manure was deposited over relatively large land areas that could accommodate the wastes without undue environmental stress. Now, however, as significant numbers of animals are raised in confinement, large amounts of manure are produced in relatively small areas; that manure may accumulate in large quantities when there is inadequate land on which to distribute the wastes. To exacerbate the problem, animals fed in confinement may actually produce more manure than those grazing on a range. The accumulated manure attracts insects and carries odors, sometimes creating a nuisance in the locality of the livestock operation. In addition to the annoyance of a local nuisance, the harmful effects of manure pollution move beyond the immediate locality.

Animal wastes contain high levels of nutrients, specifically nitrogen, phosphorus, and other chemicals. When these pollutants are carried into bodies of water, eutrophication (the process by which water becomes nutrient rich and, often, oxygen poor) and nitrate contamination may result. Pathogenic organisms in manure may contaminate drinking and recreational waters. Dissolved organic matter from manure results in runoff with low dissolved oxygen content. Oxygen depletion in water receiving feedlot runoff poses real threats to aquatic wildlife. Moreover, ammonia from animal wastes contributes to increasing threats from acid rain.

Pollution from animal manure has more severe consequences in some nations (and in some states in the United States) than in others. As a result, legal structures intended to control or eliminate pollution from manure have developed in different ways. In the United States, where other types of pollution have claimed more legislative and regulatory attention, farmers who raise livestock are generally subject to only a moderately stringent level of regulation. In contrast, in the Netherlands, where excess manure poses a severe threat to water and air quality, a comprehensive system of laws and regulations governs the production, application, transport, and trade in manure. That regulatory system is the main focus of this Article.

Thus, this Article first describes the crisis faced by Dutch farmers and government officials due to the extreme surplus of animal manure. It then outlines early legislative programs to regulate trade in fertilizer products and to eliminate nuisances caused by manure. The Article next discusses the comprehensive system of manure regulation enacted and implemented in the Netherlands within the past several years. That system, with its stringent and detailed require-

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7 Fish kills that result from large deposits of animal wastes attest to the potential dangers from oxygen depletion. See, e.g., Perkinson v. Pollution Control Bd., 187 Ill. App. 3d 689, 543 N.E.2d 901 (1989) (400,000 gallons of liquid swine waste killed 101,219 fish).
ments, is a model of environmental regulation designed to control a specific source of pollution. The Article then contrasts the Dutch system for controlling pollution from manure with the approaches used in the United States. Finally, the Article provides some evaluation of both the Dutch and U.S. efforts to protect the environment from manure pollution.

A. The Dutch Manure Problem

Almost daily, Dutch newspaper readers and television viewers are alarmed by new reports about serious contamination of soil and groundwater by nitrogen (among other things) and about the large-scale depletion of forests due to ammonia. The most important cause of these disturbing developments is a gigantic quantity of animal manure. For the time being, the Dutch may have won their constant battle against water; now they are in imminent danger of drowning in manure.

In past decades, the Dutch livestock industry has developed significantly as a result of mechanization, economies of scale, intensified use of the land, and especially by the wholesale import of livestock feed. These developments have helped the livestock industry to make an important contribution to the Dutch economy. In addition, however, these developments have resulted in a large surplus of manure. On a large number of farms, more manure (and sometimes much more manure) is being produced than the quantity needed for spreading on the agricultural lands belonging to those farms. As a result of regional concentration of the livestock industry, surplus manure developed first at a regional level. Later the production and the demand for manure also became unbalanced at the national level.

At present the annual production of animal manure in the Netherlands is approximately ninety-four million tons. Livestock farmers spread most of this manure on their own land, or it is spread in the immediate surroundings. Often this results in an overdosing, sometimes extreme, of minerals (nitrogen, phosphate, and potassium) and heavy metals (copper, cadmium, and zinc) found in the manure. This overdosing causes harm both to the agricultural sector and to the environment. The Dutch government has formulated the problem as follows:

Accumulation of minerals and heavy metals leads to a decline in soil

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8 Large parts of the Netherlands, including the densely populated western provinces, are below sea level and protected by an elaborate system of dikes.
9 MINISTRY OF AGRICULTURE AND FISHERIES, DUTCH AGRICULTURE IN FACTS AND FIGURES 11 (1987). The Netherlands has a surface area of 4.15 million hectares of which about half (2.01 million hectares) is used for agriculture. Id. at 5. Besides almost 15 million people, there are 14 million pigs, 4.7 million cattle, 1.2 million sheep, and 93 million chickens. Id. at 9.
fertility, a decrease in quality of crops, and health hazards for livestock. Leaching of nitrogen to the groundwater in the form of nitrate leads to a decline in the quality of the groundwater as a source for public water supplies and as drinking water for livestock. Accumulation of phosphate in the soil will lead eventually to saturation, after which leaching of phosphate into groundwater and surface water occurs. Together with the direct running off of nitrogen and phosphate, this contributes greatly to the eutrophication of surface water and, through the groundwater and surface water, to the eutrophication of natural areas containing few nutrients. Furthermore, the use of animal manure contributes to stench nuisance and to the depositing (from the air) of potentially acidifying substances.  

Today the manure problem in the Netherlands has become so serious that “manuring” (vermesting, a new word the Dutch have introduced to identify the problem) is one of the most important focal points of environmental policy. Moreover, in a relatively short time, the manure problem has engendered an entirely new system of legislation and regulation, which became effective in 1987. According to environmentalists, this regulation came far too late; according to farmers, it has been imposed much too abruptly. This Dutch legislation on manure, which attempts to handle various aspects of the problem, is the focus of analysis in following sections of this Article.

Before turning to a discussion of Dutch manure laws and regulations, however, it is useful to comment briefly on the situation in the United States. As in Holland, large numbers of farm animals produce a significant amount of manure each year. Annual total production of animal manure has been estimated to be 1.5 billion tons per year—almost enough to apply one ton per acre on each of the 1.9 billion acres of the continental United States. Although this large quantity of manure could be an effective source of nutrients (especially for crops like corn, which requires significant amounts of nitrogen) and organic matter, it is bulky and thus inconvenient to use outside areas of animal production. According to a recent study,

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10 Besluit gebruik dierlijke meststoffen, Besluit van 25 maart 1987, Nota van toelichting, Stb. 114, at 7 [hereinafter Bgdm, Nota van toelichting].
11 For a discussion of the threats to the environment currently receiving governmental focus, see Nationaal Milieubeleidsplan, Tweede Kamer, Vergaderjaar 1988-1989, 21 137, nrs. 1-2.
12 Preliminary figures for 1987 indicate that the national livestock population included 102.47 million cattle and calves, 50.96 million hogs and pigs, 10.33 million sheep and lambs, 368.68 million chickens, and 207.22 million turkeys. U.S. DEP'T AGRIC., AGRICULTURAL STATISTICS 1987, at 257, 271, 281, 347, 361 (1987). The figures for hogs and pigs, chickens, and turkeys were from 1986.
13 M. ENSMINGER, ANIMAL SCIENCE 35 (8th ed. 1983). Dry weight has been calculated at 100 million tons annually. This figure is from a 1978 source, and animal numbers have decreased somewhat since that date. The 100 million tons includes about 4 million tons of nitrogen and 1 million tons phosphorus. Duttweiler & Nicholson, Environmental Problems and Issues of Agricultural Nonpoint Source Pollution, in AGRICULTURAL MANAGEMENT AND WATER QUALITY 3, 8 (F. Schaller & G. Bailey eds. 1983).
manure was applied on sixteen percent of all surveyed corn acres but on fewer acres of other crops.\textsuperscript{14} Although manure is used on cropland, much of the federal and state regulation concerned directly with manure focuses on storage and other operational rules for livestock facilities. Moreover, regulatory programs to abate pollution from animal manure have not been particularly stringent, and thus have not been entirely successful.\textsuperscript{15}

B. Early Legislation with Respect to Fertilizers and Manure

Dutch law has been dealing with fertilizers and manure for a long time.\textsuperscript{16} As early as 1920, legal provisions were enacted to combat fraud in the fertilizer business.\textsuperscript{17} A new regulation that protected buyers of fertilizer more effectively came into effect in 1942.\textsuperscript{18} Because this measure had been enacted during the German occupation, it was replaced after the war by a Dutch statute.\textsuperscript{19} Under a regulation issued pursuant to this law, the transport or sale of fertilizers was permitted only insofar as they were included on a list established by the Minister of Agriculture and Fisheries, and provided that they satisfied requirements set by the Minister.\textsuperscript{20} The aim of this law was to prevent trade in inferior and harmful fertilizer products. Thus, it actually dealt with quality control of fertilizer products, especially artificial fertilizers.

Environmental legislation has dealt for some time with manure as well, especially with respect to the storage of manure. The Nuisance Act (\textit{Hinderwet}) has long required a permit for establishments where waste products (including manure and manure products) are stored, processed, or destroyed.\textsuperscript{21} Since 1967 livestock farms with permanent manure storage have been also required to obtain a per-

\textsuperscript{14} Vroomen, \textit{Use of Manure, Lime, Sulphur, and Micronutrients on Selected Crops, 1987}, \textit{Agricultural Resources, Inputs, Situation and Outlook Report} (Aug. 10, 1988). In Wisconsin, manure was applied on 43\% of corn acres; use was over 20\% in Iowa and Minnesota. Manure was used less often on other crops. \textit{Id}.

\textsuperscript{15} For a discussion of U.S. efforts to prevent pollution from manure, see infra Part III of this Article.

\textsuperscript{16} In the Dutch legal system, the word "fertilizers" (\textit{meststoffen}) is used for all fertilizing products, that is, artificial fertilizers as well as animal manure. The word "manure" (\textit{dierlijke meststoffen}) is used for animal manure.

\textsuperscript{17} Wet van 31 december 1920, Stb. 957.

\textsuperscript{18} Meststoffenbesluit 1942, Stcr. 163.


\textsuperscript{21} Wet van 15 mei 1952, Stb. 274, as amended, current version \textit{reprinted in} Schuurman & Jordens 30 (1988). Pursuant to the Nuisance Act, it is forbidden to set up, to operate, to expand, or to change establishments that may cause danger, damage, or nuisance, without a permit. It is also forbidden to change the working methods used in these establishments. The Nuisance Decree (\textit{Hinderbesluit}) designates the establishments that fall under the Nuisance Act. Besluit van 30 januari 1953, Stb. 36, as amended, \textit{reprinted in} Schuurman & Jordens 30, at 79 (1988).
The most important concern in this legislation is the nuisance to the surroundings caused by manure storage.\(^2\) By the beginning of the 1980s, however, the manure problem in the Netherlands had become so great that, in addition to the Nuisance Act, there was a need for specific legislation to address the serious environmental consequences of unlimited production and use of animal manure. For this purpose, a bill for a new Fertilizer Act (\textit{Meststoffenwet})\(^2\) was introduced in Parliament in 1984. Together with the previously introduced bill for a Soil Protection Act (\textit{Wet bodembescherming}),\(^2\) the Fertilizer Act should offer possibilities for controlling these problems.

In 1984, problems with manure had become so serious that Parliament temporarily froze the establishment and expansion of pig and poultry farms through the Interim Act on Limiting Pig and Poultry Farms.\(^2\) This law, which was accepted by Parliament in a remarkably short time, prohibited the establishment of new pig and poultry farms in the whole of the Netherlands. Furthermore, expansion of existing farms was also forbidden in areas with a large concentration of such farms. Outside these areas of concentration, existing pig and poultry farms were allowed to expand only to a limited extent.\(^2\) The effectiveness of the interim law was limited to two years, after which the manure problems were to have been addressed through definitive legal regulation.

### II. New Laws and Regulations to Control Pollution From Animal Manure in the Netherlands

The manure legislation, which has been effective in the Netherlands since May 1, 1987, is based on two laws. The Soil Protection Act\(^2\) applies, \textit{inter alia}, to the use of animal manure products. The

\(^{22}\) This obligation is based on a decision of the Crown in a dispute. The decision stated that if manure is stored at a farm, the entire farm falls within the scope of the Nuisance Act. Koninklijk besluit van 22 februari 1967, nr. 31, AB 1967/447, \textit{cited in Schuurman & Jordens} 30, at 352 (1988).

In 1984, this subject was placed under the Nuisance Decree, \textit{supra} note 21, by an amendment to the Decree creating separate permit obligations for manure storage facilities and livestock breeding farms. Besluit van 12 januari 1984, Stb. 7.

\(^{23}\) The Nuisance Act also provides general authority for regulation of the storage of manure. A manure storage decree is now in preparation. For a draft, see Stcr. 55, 19 maart 1987, at 10-13.


\(^{27}\) \textit{Id.}, art. 2.

\(^{28}\) Wet bodembescherming, Wet van 3 juli 1986, Stb. 374, \textit{reprinted in Schuurman & Jordens} 147-VIb (1986) [hereinafter Wet bodembescherming]. The Soil Protection Act is a "framework" law (\textit{kaderwet}), which offers the government the opportunity to make regul-
Fertilizer Act\textsuperscript{29} regulates trade in fertilizing products, removal of surplus manure and its financing, as well as the production of animal manure. Government decrees and ministerial regulations have elaborated on the subject matter of these two Acts.\textsuperscript{30}

\textit{A. The Scope of the New Manure Legislation}

To articulate the scope of the manure legislation, it is first important to consider the definition that the Fertilizer Act gives to the concept “animal manure products.” This concept includes fertilizer or other products that consist wholly or largely of excrement from the types of livestock and poultry specified by the Minister of Agriculture and Fisheries, as well as from other types of animals specified by that Minister.\textsuperscript{31} The term “livestock” in this definition is further delineated to include ruminating and solidungulate (noncloven-hoofed) animals and pigs.\textsuperscript{32} The term “poultry” includes chickens, turkeys, guinea fowls, ducks, geese, and pheasants.\textsuperscript{33} The Minister of Agriculture and Fisheries determines which types of livestock, poultry, and possibly other animals come under the operation of the Fertilizer Act. For the time being, through a regulation called the


\textsuperscript{30} The Netherlands is a constitutional monarchy with a parliamentary system. The monarch (currently the Queen) reigns but does not govern. The Queen holds executive power, exercised through ministers who must have the confidence of Parliament. This combination of Queen and ministers is referred to as “the Government.” Government powers are extensive. By law, rulemaking authority can be delegated to the government (\textit{algemene maatregelen van bestuur}—government decrees) and to the separate ministers (\textit{ministeriële regelingen}—ministerial regulations). Such delegation is frequently invoked in the Netherlands.

Some laws provide that government decrees must be sent to Parliament. If more than one-fifth of the members of the First or the Second Chamber request that a subject be regulated by law instead of decree, the Government must send Parliament a bill as soon as possible. The \textit{Meststoffenwet, supra} note 29, art. 23, contains such a provision. \textit{See infra} note 67.

The Queen (through ministers) and Parliament exercise legislative power in joint action. \textit{See generally} \textit{GRW. NED.}, \textit{reprinted in Constitution of the Kingdom of the Netherlands, 30 NETHERLANDS INT'L L. REV. 387 (1983)}. Parliament, the \textit{Staten Generaal} (States General), has two chambers. \textit{GRW. NED.}, art. 51. The First Chamber consists of 75 members elected by members of the provincial councils. \textit{Id.}, arts. 51, 55. The Second Chamber has 150 members chosen in direct elections. \textit{Id.}, arts. 51, 54. Only the Second Chamber may propose or amend bills. \textit{Id.}, art. 82. Laws must be approved by both Chambers and by the Government. \textit{Id.}, art. 81. Moreover, “[t]he constitutionality of Acts of Parliament and treaties shall not be reviewed by the courts.” \textit{Id.}, art. 120.

There are 12 Dutch Provinces, with a large degree of decentralization. The Queen appoints the provincial governor, but elected provincial councils govern the provinces. For further references, see Grossman & Brussaard, \textit{The Land Shuffle: Reallocation of Agricultural Land Under the Land Development Law in the Netherlands}, 18 \textit{CAL. W. INT'L L.J.} 209, 213 n.6 (1987-88).

\textsuperscript{31} Meststoffenwet, \textit{supra} note 29, art. 1.

\textsuperscript{32} \textit{Id.}

\textsuperscript{33} \textit{Id.}
Aanwijzingsbesluit (Allocation Decree), the Minister has decided that the law will apply to manure produced by cattle, pigs, chickens, and turkeys. These animal types produce by far the greatest part of the total animal manure in the Netherlands.\(^{34}\)

Thus, the scope of the Fertilizer Act is broader than that of the Interim Act, which affected only pigs and chickens. More importantly, the scope can be broadened in the future, if necessary, through the Minister’s power to determine the types of livestock and poultry regulated under the Act. In the explanation of the Aanwijzingsbesluit, the Minister has mentioned as possible future categories sheep, goats, ducks, rabbits, and fur-bearing animals.\(^{35}\)

Another determining factor with respect to the content of the manure legislation is that the standardization of the use and the production of animal manure is based on the quantity of phosphate found in the manure. The Minister has elaborated on this phosphate standard further by establishing the quantity of phosphate that these animals produce per animal per year in their manure. This was done, on the basis of research, for each of the four types of animals mentioned and for each category within the animal types.\(^{36}\) As the following discussion indicates, the phosphate standard is related to areas of agricultural land, with respect to both the production and the use of manure.

### B. Application of Animal Manure

The regulation of the use of animal manure on agricultural land is based on the Soil Protection Act. This Act gives the government the authority to regulate the performance of actions through which substances that may pollute or contaminate the soil are applied, with the intention of affecting the structure or the quality of the soil. Regulations pursuant to the Soil Protection Act may also govern the application of manure on or in the soil.\(^{37}\)

On the basis of this authority, the government has established a

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\(^{34}\) Regeling aanwijzing diersoorten en hun mestproduktie, Besluit van 17 december 1986, Stcrt. 246, amended by Besluit van 16 april 1987, Stcrt. 81, reprinted in Schuurman & Jordens 191, at 84-98 (1987) [hereinafter Aanwijzingsbesluit].

\(^{35}\) Id., Memorie van toelichting, at 87.

\(^{36}\) Aanwijzingsbesluit, supra note 34, art. 2 & Bijlage 1. To illustrate the detail of this system, the following are some of the existing categories. The category “cattle” is divided into milk cows (with a manure production of 41 kg. phosphate/animal/year); female calves younger than 1 year (9 kg.) and older than 1 year (18 kg.); bulls kept for breeding, younger than 1 year (12 kg.) and older than one year (22 kg.); and other subcategories. A slaughter chicken, by contrast, has a manure production of 0.24 kg. phosphate; a slaughter turkey, 0.79 kg. Id.

\(^{37}\) Since January 1, 1990, this regulation has been amended so that lower phosphate standards are valid when phosphorous-poor feed is used. Wijziging Regeling aanwijzing diersoorten en hun mestproduktie, Besluit van 22 december 1989, Stcrt. 253. This encourages environmentally sound manure production.

\(^{37}\) Wet bodembescherming, supra note 28, art. 9, leden 1, 2(b).
decrees to govern the application of animal manures on or in the soil. This decree establishes standards—based on the phosphate level of the different types of manure—for the maximum quantities of manure that may be applied on agricultural land per hectare per year. Because the extent to which phosphate is absorbed from the soil can differ with various crops, a distinction has been made between grassland, fodder cropland, and arable land. The standards developed for each of these land types will be implemented in a number of phases because implementation of a final standard on short notice would lead to enormous manure surpluses and serious consequences for the livestock industry. Thus, the Dutch Government is planning to establish the following maximum standards (expressed in kilograms of phosphate per hectare per year) for the application of animal manure in the successive phases:

**Application of Animal Manure—Maximum Standards**

(kg. phosphate/hectare/year)

<table>
<thead>
<tr>
<th>Time period</th>
<th>Grassland</th>
<th>Fodder cropland</th>
<th>Arable land</th>
</tr>
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<tbody>
<tr>
<td>1 May 87-1 Jan. 91</td>
<td>250</td>
<td>350</td>
<td>125*</td>
</tr>
<tr>
<td>1 Jan. 91-1 Jan. 95</td>
<td>200</td>
<td>250</td>
<td>125*</td>
</tr>
<tr>
<td>1 Jan. 95-</td>
<td>175**</td>
<td>175**</td>
<td>125*/**</td>
</tr>
<tr>
<td>From 2000**</td>
<td>Final</td>
<td>Final</td>
<td>Final</td>
</tr>
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* Annual average
** Approximate

For the first and second phases (that is, until 1995), the government has already established standards. Standards for the third and final (that is, from 2000) phases will be established more specifically depending on further developments. The decree includes rules that allow less phosphate to be applied on phosphate-saturated ground, and more on ground with little phosphate.

The norms have been selected so that in the first phase there will be no national manure surplus. Part of the surpluses that originate at the farm level will have to be transported over greater dis-

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39 For examples, see supra note 36. To ascertain the amount of phosphate per type of manure, the Minister has determined the number of kg. phosphate/1000 kg. manure and, conversely, the number of kg. manure/kg. phosphate. *Regeling vaststelling hoeveelheid fosfaat per 1000 kg dierlijke meststof, Regeling van 16 april 1987, Stcrt. 81, reprinted in* Schuurman & Jordens 191, at 166-72 (1987), *amended by* Besluit van 22 december 1989, Stcrt. 253.
40 See Bgdm, Nota van toelichting, supra note 10, at 9.
41 See Bgdm, supra note 38, arts. 2, 3.
42 Id., arts. 9, 10.
stances to areas with application capacity (plaatsingsruimte) for animal manure. Only in the second phase will there be an estimated national surplus of five million tons, which can be applied neither on one's own farm nor elsewhere in the country; thus, this surplus must be processed in a different way.\textsuperscript{43}

The use of animal manure in nature areas is prohibited unless the use is prescribed directly in the system of management. In that case, a maximum of seventy kilograms of phosphate per hectare per year is allowed.\textsuperscript{44}

The use of animal manure in fall and winter carries extra risks of nitrogen and phosphate leaching and running off to groundwater or surface water, because during these periods the crops take up little or no nitrogen while there is a concurrent surplus of precipitation. Therefore, the manure legislation also has provisions about manure spreading during these periods. In this case also, phased implementation has been selected, but at present only the first phase (through 1990) has been regulated. For example, it is forbidden to spread animal manure on grassland in October and November, and for snow-covered ground, spreading is also forbidden from January 1 through February 15.\textsuperscript{45} For fodder cropland and arable land, the current prohibition on manure spreading applies only to sand soils in specifically designated areas, because the leaching of nitrate is greatest in such areas. For land that will not be replanted after the harvest, the prohibition applies from harvest until November 1; for ground that will be replanted with a new crop after the harvest, the prohibition applies during the month of October.\textsuperscript{46}

In connection with the evaporation of ammonia that may occur when manure is applied, the regulation also contains a provision about the incorporation of the spread manure into the soil. On arable land and fodder cropland that is not being cultivated, it is forbidden to use animal manures unless these are worked into the soil by the next day.\textsuperscript{47} This limitation has the practical effect of making it virtually impossible to spread manure on frozen ground.

C. Production of Manure

Large manure surpluses have indicated that the production of manure in the Netherlands must be reduced. As a means to regulate production of animal manure, the maximum quantity of manure (expressed in kilograms of phosphate) that can be produced on a farm is

\textsuperscript{43} Bgdm, Nota van toelichting, \textit{supra} note 10, at 9.
\textsuperscript{44} Bgdm, \textit{supra} note 38, art. 5. Most natural areas are maintained in accordance with a system of management, which in some cases is formalized in a management plan.
\textsuperscript{45} Id., art. 8.
\textsuperscript{46} Id., art. 6.
\textsuperscript{47} Id., art. 7.
related directly to the amount of agricultural land belonging to that farm.

The main regulation is that manure production up to 125 kilograms of phosphate per hectare per year is "free"; above this limit, expansion and new establishments are forbidden.\textsuperscript{48} When the area of agricultural land on a farm is decreased, the production of manure must also be reduced by a corresponding amount.\textsuperscript{49} If the manure production on the farm, even after the decrease in size, does not exceed the norm of 125 kilograms of phosphate per hectare per year, the production remains permitted.\textsuperscript{50} In principle, "manure neutral" exchanges of animal types or categories are permitted, so long as these do not lead to an increase in the number of pigs and chickens.\textsuperscript{51} Violation of the rules connected with maximum manure production is considered a criminal offense.\textsuperscript{52}

In light of these prescriptions, it is important to establish when expansion of manure production on a farm has occurred. The Fertilizer Act refers to the data that manure producers are obligated to record or to hand over.\textsuperscript{53} These data refer both to the starting situation at the time the Act came into force and to "traffic" in manure, that is, to actions whereby manure is sold, transported to the manure bank, or otherwise transported through the country.

With respect to the starting situation, the actual conditions on farms have been registered as of the reference date of December 31, 1986.\textsuperscript{54} For this purpose, manure producers were obligated to provide to the Minister starting data with respect to three elements. First, they had to make a report of the number of animals (cattle, pigs, chickens, and turkeys) that were present on the farm on the reference date.\textsuperscript{55} The second item of information to be provided was the quantity of manure produced on the farm, both in total and for each animal type and category. This data had to be calculated on the basis of manure production per animal per year, expressed in

\textsuperscript{48} Meststoffenwet, supra note 29, art. 13, lid 4. The law prohibits expansion of manure production if a farm's annual production exceeds, or would thereby exceed, 125 kg. phosphate/hectare of the farm's area. \textit{Id.}, art. 14, lid 1. If a farm produces no manure, the law forbids establishment of manure production in a quantity greater than 125 kg. phosphate/hectare/year. \textit{Id.}, art. 14, lid 2.
\textsuperscript{49} \textit{Id.}, art. 14, lid 3.
\textsuperscript{50} \textit{Id.}, art. 14, lid 4(a).
\textsuperscript{51} \textit{Id.}, art. 14, lid 6.
\textsuperscript{52} \textit{Id.}, art. 35, lid 3.
\textsuperscript{53} \textit{Id.}, art. 14, lid 5, in conjunction with \textit{id.}, art. 6.
\textsuperscript{54} Registratiebesluit dierlijke meststoffen, Besluit van 12 december 1986, art. 2, Stb. 625, \textit{reprinted in} Schuurman & Jordens 191, at 100-09 (1987) [hereinafter Registratiebesluit]. This decree was amended by Besluit van 24 februari 1989, Stb. 50.
\textsuperscript{55} If the livestock population at the reference date did not reflect the usual number of livestock on the farm, the law allowed one to state the number of animals possessed at any other time during 1986. The manure producer had to accompany the statement with evidence, if requested. Registratiebesluit, supra note 54, art. 3.
kilograms of phosphate.\textsuperscript{56} Finally, a report had to be provided of the area of agricultural land that belonged to the farm. The registration included only the agricultural land situated in the Netherlands and either owned by the farmer or belonging to the farm pursuant to a right of use connected with the land (\textit{zakelijk gebruiksrecht}) or to a lease, approved by the Land Tenure Control Board, for at least six years.\textsuperscript{57}

By providing these data, manure producers established the actual situation on their farms at the time the new law became effective. The duty to register did not apply when the total manure production on a farm amounted to 125 kilograms or less of phosphate per year.\textsuperscript{58} When it appears that the report from a manure producer conflicts with the legal requirements (for example, when fraud has occurred), the Minister can adapt the report.\textsuperscript{59}

In addition to the initial registration of the original situation, producers of animal manure are obligated to keep manure bookkeeping up to date.\textsuperscript{60} This bookkeeping is necessary to determine whether there has been expansion of manure production on a farm. Producers must state the number of animals (itemized according to animal categories) present on the farm, as well as the area of agricultural land (and changes therein) belonging to the farm, subdivided into grassland, arable land, and fodder cropland.\textsuperscript{61} The total manure production on the farm can then be calculated from the number of livestock thus established. If the manure production of a farm proves to be more than the quantity of phosphate that may be applied on the land belonging to the farm (the \textit{plaatsingsruimte}), then

\textsuperscript{56} Id., art. 4, in conjunction with Aanwijzingsbesluit, supra note 34.
\textsuperscript{57} Meststoffenwet, supra note 29, art. 1, lid 1. The Netherlands has detailed legislation, the \textit{Pachtwet}, to protect tenants on agricultural lands. Wet van 23 januari 1958, Stb. 37, \textit{reprinted} in Schuurman & Jordens 123 (1985 & Supp. 1988). As part of this legislation, every lease must have approval of the \textit{grondkamer} (Land Tenure Control Board), a government body that supervises observance of the provisions of the \textit{Pachtwet}. Id., art. 2.
\textsuperscript{58} Registratiebesluit, supra note 54, art. 1, lid 2.
\textsuperscript{59} Id., art. 9. Moreover, no account is taken of actions of a manure producer that avoid application of the \textit{decree} or the law ("actions which . . . it must be assumed would not have been taken place if thereby the future application of this decree or the law would not have been made impossible, completely or in part."). This is determined by deciding whether an action had as its goal no essential change in the actual conditions or by considering other specified facts or circumstances. Id., art. 1, lid 4. That is, fraudulent actions undertaken to avoid application of the law will not be given effect. The explanation gives examples of such actions: keeping animals only for a few days with a view to registration rather than for normal farm management, or, with the choice of another calculation date, knowingly and willingly handing over animals to third parties for the purpose of their records. Registratiebesluit, Toelichting, Schuurman & Jordens 191, at 106 (1987).
\textsuperscript{60} Besluit mestbank en mestboekhouding (Meststoffenwet), Besluit van 25 maart 1987, art. 3, lid 1, Stb. 170, \textit{reprinted} in Schuurman & Jordens 191, at 111-22 (1987) [hereinafter Besluit mestbank]. This decree has been amended by Besluit van 17 december 1987, Stb. 684, and Besluit van 24 februari 1989, Stb. 50.
a manure surplus exists. For the manure surplus, the manure producer pays a levy.62 The proceeds of this levy are used, among other things, to create facilities for efficient transport, processing, or destruction of the manure surpluses and to finance the manure bank.63

The Fertilizer Act also restricts the transfer of manure production to another farm business (bedrijf) or to another location. Pursuant to the law, transfer is forbidden unless certain conditions established by the government are met.64 With respect to the transfer to another farm business, the government has prescribed that the transfer of manure production is possible only if the reference quantity is transferred completely and if it is accompanied by the transfer of the entire farm business to which it belongs. In addition, the farm business has to be continued at the same location as an independent unit.65 An exception is made for transfers pursuant to conjugal property rights and the law of inheritance; in those cases, the farm business need not be continued in the same location as a unit.66 In addition, the transfer of manure production to another location is permitted where the transfer occurs for the public benefit, such as in land development projects and transfers of land to nature protection organizations.67

D. Transport of Surplus Manure

The Fertilizer Act also makes it possible to establish regulations in the interest of efficient transport of surplus manure.68 In this con-

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62 Manure production up to 125 kg. phosphate/hectare/year is free of levy; up to 200 kg., the levy is 0.25 guilders/kg. phosphate/year; for more than 200 kg., 0.50 guilders. A reduction in the highest tariff is possible when, for example, a manure producer has entered a manure sales agreement with a user of animal manure. Meststoffenwet, supra note 29, art. 13, lid 4.
63 Id., art. 13, lid 1.
64 Id., art. 15.
65 Verplaatsingsbesluit Meststoffenwet, Besluit van 25 maart 1987, Stb. 171, art. 2, lid 1, reprinted in Schuurman & Jordens 191, at 125-35 (1987) [hereinafter Verplaatsingsbesluit Meststoffenwet]. The "reference quantity" is the amount of animal manure products reported for the whole farm pursuant to the Registratiebesluit. See supra note 54. The reference quantity does not include manure products of 125 kg. phosphate or less. Verplaatsingsbesluit Meststoffenwet, supra, art. 1.
66 Verplaatsingsbesluit Meststoffenwet, supra note 65, art. 2, lid 2.
68 Meststoffenwet, supra note 29, arts. 5-12.
nection, manure bookkeeping and the manure bank are especially important.

It has already been mentioned that manure producers are obligated to keep manure record keeping up to date. By means of this bookkeeping, it is possible to determine whether a farm has a manure surplus. To ascertain where this manure surplus is transported, dealers in animal manure and managers of storage places and processing facilities are also obligated to keep bookkeeping up to date. Furthermore, the sale of animal manure must always be accompanied by preparation of proofs of delivery. The proof of delivery registers the type, form, and quantity (expressed in kilograms of phosphate) of manure delivered, as well as the names and addresses of the supplier, the recipient, and the transporter. The original of this proof of delivery must be sent directly to the manure bank, even in instances in which the manure is not offered to the manure bank.

The manure bank is an aid for the efficient transfer of excess manure. It is charged with accepting surplus manure and mediating trade in excess manure. In addition, it is designated to supervise observance of the manure bookkeeping provisions by those who are members of the manure bank. The manure bank may delegate its tasks to regional departments. It is obligated to accept the quantities of manure offered by manure producers. The manure bank may not have a profit motive; it may recover from participants the costs that are involved with the acceptance of animal manure from those choosing to use the manure bank. On the other hand, it can also make financial contributions to the costs of processing, destroying, and transporting animal manure, if in its opinion an efficient processing and transport (for example, by tapping foreign manure market possibilities) is thereby stimulated. The Fertilizer Act offers the possibility of requiring manure producers to join the manure bank, but at present the government does not plan to use this possibility. Finally, the manure bank also has a regulatory function. Proofs of delivery of manure must be sent to the manure bank. This means that the manure bank gains insight into the different flows of manure and the way in which trade occurs. With respect to violations of regulations committed by members of the manure bank, the manure bank may exercise disciplinary jurisdiction.

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69 Besluit mestbank, supra note 60, art. 3, lid 1.
70 Id., art. 8.
71 Meststoffenwet, supra note 29, art. 9, lid 1.
72 Id., art. 9, lid 2. There are three regional manure banks currently in operation.
73 Id., art. 10, lid 2; Besluit mestbank, supra note 60, art. 2, lid 3.
74 Meststoffenwet, supra note 29, art. 9, lid 4.
75 Id., art. 9, lid 3.
76 Id., art. 12.
E. Regulations for Fertilizer Trade

Finally, the Fertilizer Act also has provisions regarding trade in fertilizer products. In this respect the system of the old Fertilizer Act of 1947, which states that only fertilizer products that meet certain requirements may be traded, has been maintained. A new element in the 1987 Act is that the interest of soil protection can also play a role in regulating trade. Trade in fertilizers dangerous to the soil can be regulated.77 Another new element is that, henceforth, the government will be able to impose requirements on the quality of animal feed,78 with the goal of exerting an influence on the desired quality of animal manure. A license system may be imposed for the trading, as fertilizer, of purification and harbor silt, compost, and similar products that are usable for fertilizing.79

III. Regulating Animal Wastes in the United States

Unlike the Netherlands, the United States has no comprehensive regulatory program designed to restrict the amount of animal manure that farm operations may produce, nor is there a scheme to regulate the application, transport, and trade in manure. Nonetheless, a number of separate but interrelated laws and regulations attempt to limit the harmful environmental effects of animal wastes. Because these are discussed primarily as a context for the Dutch laws already analyzed, only a brief overview is provided here.

As the discussion above indicates, manure in Holland has been regulated in part by the law that applies to the broad category of fertilizer products. In the United States, nearly all states govern the manufacture, sale, and distribution of fertilizer products. Statutory provisions focus on location of manufacturing facilities, registration of fertilizers, proper manufacture, and accurate labeling. These laws, however, generally do not regulate "unmanipulated animal manures."80 Thus, insofar as manure as an environmental pollutant is concerned, U.S. fertilizer laws function rather differently from the

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77 Id., art. 2, lid 1. This provision has not yet been implemented; for the time being, the rules are still based on the authority of the Meststoffenwet 1947, supra note 19.
78 Meststoffenwet, supra note 29, art. 2, lid 2. This provision has also not yet been implemented.
79 Id., art. 4. The Government has not yet made use of this possibility.
80 See, e.g., Groundwater Protection Act, ch. 326, 1989 Minn. Sess. Law Serv. 326 (West). The Minnesota statute, as is typical, defines "fertilizer material" as "a substance containing one or more recognized plant nutrients that is used for its plant nutrient content and designed for use . . . in promoting plant growth. Fertilizer does not include animal and vegetable manures that are not manipulated . . . ." Id., art. 6, § 2 (emphasis added). "Manipulated" fertilizers include excrement that has been treated in any manner, "including mechanical drying, grinding, pelleting, and other means, or by adding other chemicals or substances." Id., art. 6, § 2(19). See also ILL. REV. STAT. ch. 5, §§ 55.1-.23 (1987) (especially § 55.3(a), defining "fertilizer material" to exclude unmanipulated animal and vegetable manures); MICH. STAT. ANN. § 12.160(1)-(17) (Callaghan 1989) (especially § 12.160(2), defining fertilizer to exclude unmanipulated animal manures); NEB. REV. STAT. §§ 81-
Dutch fertilizer law. Instead, manure pollution is regulated by state and federal environmental protection laws, as well as by state laws focused on the operation of livestock facilities.

A. Water Pollution Control

A number of legislative and regulatory programs relevant to the control of animal waste operate at both federal and state levels, sometimes coordinated in a system of "cooperative federalism." The most significant of these laws focus on water pollution.

The first federal efforts to control water pollution placed major responsibility for implementation on the states. When this approach failed, Congress enacted the Federal Water Pollution Control Act Amendments of 1972. This law, intended "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters," enhanced the federal role in water pollution control.

Regulation under the 1972 Amendments focuses on two types of water pollution sources, point and nonpoint, with different regulatory schemes. A point source is "any discernible, confined and discrete conveyance, including . . . [a] concentrated animal feeding operation . . . from which pollutants are or may be discharged." Nonpoint sources, not defined explicitly in the statute, include other sources of pollution, particularly those that occur as a consequence of diffused land activities. A source of animal wastes that is not a

2,162.01-.27 (1987) (particularly § 81-2,162.02(3), excluding unmanipulated animal manures from the term "commercial fertilizer").


Fertilizer manufacturing is considered a point source of water pollution, and "new source" performance standards are required. 33 U.S.C.A. § 1316(b) (West 1986 & Supp. 1989). See 40 C.F.R. pt. 418 (1989) with respect to regulations for Fertilizer Manufacturing Point Source Category. For more information on federal regulation of fertilizer manufacture, see 2 F. Grad, supra note 5, § 7.02[1][b][ii][B].

In connection with the use of manure as fertilizer, the following remark is informative: "Although the groundwater contamination problem associated with feedlot wastes could be somewhat mitigated by management of this material as a fertilizer (including storage and transportation to croplands), a variety of technical and institutional barriers apparently discourage this alternative." Sivas, supra note 3, at 126.


It established as one of several national goals the elimination by 1985 of the discharge of pollutants into navigable waters. Id. § 1251(a)(1).

"concentrated animal feeding operation" would be considered a nonpoint source of water pollution. Thus, the regulatory provisions for both point and nonpoint source water pollution are relevant in connection with manure.

1. Point Source Pollution

Under the federal law, discharge of pollution from point sources into navigable waters is monitored through a system of permits, the National Pollutant Discharge Elimination System (NPDES). The NPDES permit program is based on effluent limitations for pollutants and performance standards for new sources of pollution, authorized by law and established by the federal Environmental Protection Agency (EPA).

EPA regulations set effluent limitations and performance standards for feedlots, the most significant point source of pollution from agriculture. These regulations govern feedlots for different types of animals and confinement configurations that contain a significant number of animal units. In essence, the effluent limitation regulation requires that there be no discharge of "process waste water" pollutants from a feedlot operation to navigable waters. An exception, however, permits pollutants to be discharged from overflow of water due to chronic or catastrophic rainfalls, if the facility is designed, constructed, and operated to contain all the normal waste.

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88 Id. § 1342. Individual states may be authorized to administer their own permitting programs for discharges into navigable waters within their jurisdictions. Id. § 1342(b).
89 Id. §§ 1511, 1316.
90 For a more detailed discussion about the establishment of these standards, see 2 N. Harl, supra note 6, § 14.02[2][a], [b].
91 Feedlots Point Source Category, 40 C.F.R. pt. 412 (1989). A feedlot is defined as "a concentrated, confined animal or poultry growing operation for meat, milk or egg production, or stabling, in pens or houses wherein the animals or poultry are fed at the place of confinement and crop or forage growth or production is not sustained in the area of confinement." Id. § 412.11(b); see also id. § 412.21(b).
92 Id. § 412.10. The regulations apply to various types of feedlots (e.g., open or housed lots for beef; solid or slotted floors for swine) for beef cattle, dairy cattle, swine, sheep, horses, chickens, and turkeys.
93 Id. § 412.10. Feedlot operations are regulated under part 412 if they are as large or larger than the following capacities: 1000 slaughter steers and heifers; 700 mature dairy cattle; 2500 swine weighing over 55 pounds; 10,000 sheep; 55,000 turkeys; 100,000 laying hens or broilers (with unlimited continuous flow watering system); 30,000 laying hens or broilers (liquid manure handling system); 500 horses; or 1000 nonpoultry animal units.
94 Id. § 412.13(a). Process waste water refers to water used directly or indirectly in feedlot operation that comes in contact with manure, litter, bedding, or other materials or animal products in the feedlot. Id. § 412.11(c)-(d).
AGRICULTURAL POLLUTION CONTROL

waters plus the runoff from a "25-year, 24-hour rainfall event."\(^9\)
In addition to these effluent limitations, the regulations set standards of performance for new feedlot sources of pollution. Again, the standard prohibits the discharge of process waste water pollutants to navigable waters, with an exception for the 25-year, 24-hour rainfall event.\(^9\)

Both under federal law and in state NPDES programs, concentrated animal feeding operations are point sources subject to the NPDES permits.\(^9\) An "animal feeding operation," for purposes of NPDES permit standards, is a lot or facility where animals are confined and fed for 45 days or more in any 12-month period, and where crops, vegetation, forage growth, or post-harvest residues are not sustained over any portion of the lot in the normal growing season.\(^9\)

Such an operation is "concentrated" when it meets the size criteria established by regulation, or when it is so designated after case-by-case evaluation.\(^9\) An operation is "concentrated" if it contains more than 1000 animal units,\(^10\) or if it contains more than 300 animal units and pollutants are discharged into navigable waters through a man-made device or directly into waters of the United States.\(^10\) A proviso states that no animal feeding operation is "concentrated," as defined in the regulation, if the operation discharges

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\(^9\) Id. § 412.13(b). A "25-year, 24-hour rainfall event" is "a [24-hour] rainfall event with a probable recurrence interval of once in . . . twenty-five years." Id. § 412.11(e).

This effluent limitation is the standard for the "best available technology economically achievable" (BAT). The standard for the "best practicable control technology currently available" (BPT) permits no discharge of process waste water pollutants, but allows overflow in a 10-year, 24-hour rainfall event. Id. § 412.12.

Originally, effluent limitations were to be established in two stages: BPT by July 1, 1977, and BAT by July 1, 1983. Amendments to the law in 1977 altered this scheduled compliance. Pub. L. No. 95-217, 91 Stat. 1566 (1977). After these amendments, effluent limitations for "conventional" pollutants must require "best conventional pollution control technology" (BCT), a somewhat less stringent standard, while limitations for nonconventional and toxic pollutants must generally require BAT. 33 U.S.C.A. § 1311(b) (West 1986 & Supp. 1989). Part 412 does not refer to BCT.


It has been noted that the performance standards and NPDES permit requirements for feedlots focus on protection of surface water, rather than on groundwater. The 25-year, 24-hour rainfall event standard, for example, can prevent contaminant spillover into surface waters, but does not prevent leaching of feedlot pollutants into groundwater sources. Sivas, supra note 3, at 136-37.

\(^9\) 40 C.F.R. § 122.23(a) (1989). See also id. § 123.25(a)(6).

\(^9\) Id. § 122.23(b).

\(^9\) Any animal feeding operation may be designated as concentrated if it is "a significant contributor of pollution to the waters of the United States," as determined through consideration of a number of factors. Id. § 122.24(c).

\(^10\) The number of "animal units" is calculated as follows: the number of slaughter and feeder cattle multiplied by 1.0; the number of mature dairy cattle multiplied by 1.4; the number of swine weighing over 25 kg. multiplied by 0.4; the number of sheep multiplied by 0.1; the number of horses multiplied by 2.0. Id., pt. 122, app. B.

\(^10\) See id. § 122.2 for a definition of "Waters of the United States."
only in a 25-year, 24-hour storm event.\textsuperscript{102} When an animal feeding operation is required to obtain an NPDES permit, that permit will govern the discharge of pollutants by the operation. If the operation complies with the terms and conditions of the permit, it normally will be in compliance with the Federal Water Pollution Control Act.\textsuperscript{103}

The NPDES permit provision for concentrated animal feeding operations, like other provisions, may form part of a state implementation program under the Act.\textsuperscript{104} Most states have accepted responsibility for the permit program.\textsuperscript{105} In so doing, they have recognized the importance of animal agriculture and the beneficial uses of animal manure, as well as the importance of avoiding pollution from that manure.\textsuperscript{106} Unfortunately, however, state enforcement of NPDES requirements is not always vigorous.\textsuperscript{107}

\textsuperscript{102} Id., pt. 122, app. B. State regulations incorporate this 25-year, 24-hour standard. See, e.g., 
\textsuperscript{103} Id., pt. 123, (West 1986 & Supp. 1989). Those who violate the terms and conditions of their permits are strictly liable; violators may face significant civil or criminal penalties. The EPA exercises some discretion, however, when an operator attempts in good faith to comply or violates for a reason beyond the operator's control. Herricks, Schaeffer & Kapsner, Complying with NPDES Permit Limits: When Is a Violation a Violation?, 57 J. Water Pollution Control Fed'n 109, 109 (1985).

\textsuperscript{104} Id. § 1342(b) (West 1986); 40 C.F.R. pt. 123 (1989), especially § 123.25(a)(6). State provisions need not be identical to federal provisions, but state requirements must be at least as stringent as the corresponding federal programs. Id. § 123.25(a) note.

\textsuperscript{105} See 2 F. Grad, supra note 5, § 7.02[2][b].

\textsuperscript{106} See, e.g., Minn. R. 7020.0100-.1900 (1989) (animal feedlot rules; Minnesota NPDES rules, however, are at id., ch. 7070); Wis. Admin. Code § NR 243.01 (Mar. 1984).

\textsuperscript{107} \textsuperscript{107} In Illinois, the Livestock Waste Regulations, originally adopted in 1974, were amended in 1978 to comply with the federal NPDES program and to implement the Illinois Environmental Protection Act. Ill. Admin. Code tit. 35: Environmental Protection, subtit. E: Agriculture Related Pollution, ch. I: Pollution Control Board, pt. 502 (1984). The Livestock Waste Regulations apply to all livestock feedlots in Illinois. Although the regulations contain a number of provisions for the design of feedlots and management of waste, the central provisions concern permits under NPDES. In Illinois, a significant number of feedlots pollute because they lack effective runoff control or need modifications in management. Nonetheless, an extremely small number of the state's 58,000 feedlots have obtained NPDES permits under the regulations. In 1986, for instance, only 28 feedlots obtained permits. Illinois Environmental Protection Agency, Agriculture and the Water Quality Management Plan: A Midcourse Review of the Livestock Waste Management Component 1-2, 7 & app. IV (Nov. 1986). Compliance with the NPDES program would place a heavy financial burden on feedlot operators; thus, the state EPA has not enforced these permitting regulations stringently. Instead, feedlot operators are required to comply with other aspects of the Livestock Waste Regulations. For a discussion of these regulations, see infra text accompanying notes 134-45. See Perkinson v. Pol-
2. Nonpoint Source Pollution

Livestock farms that are not "concentrated animal feeding operations" for purposes of the NPDES—and most livestock operations are not point sources—may still pollute the environment. Livestock wastes from these sources contribute to the problem of nonpoint source pollution, which comes from diffused land-use activities. These sources of pollution are not subject to effluent limitations or NPDES permits; instead, they are addressed by "section 208 planning" and state water quality planning, both mandated by the Federal Water Pollution Control Act.

Section 208 requires states to develop and implement state and areawide waste treatment management plans designed to meet water quality standards established by each state. The planning process encompasses agricultural nonpoint pollution. In addition, in the context of water quality management plans, regulations provide for the use of "best management practices" to control nonpoint source pollution. Because much of agricultural nonpoint source pollution involves soil erosion, these practices include soil conservation techniques traditionally used to control erosion. To ensure incorporation of best management practices to control nonpoint source pollution on rural land, the law authorizes a program of cost sharing and technical assistance.

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108 Only concentrated animal feeding operations are point sources, subject to the NPDES permit program. 40 C.F.R. § 122.23(a) (1989). Thus, runoff from orchards, cultivated crops, pastures, range lands, and forest lands are specifically excluded from NPDES. Id. § 122.3(e).


111 These standards are mandated by 33 U.S.C.A. § 1313(c) (West 1986 & Supp. 1989).

112 Among other things, the process must "identify, if appropriate, agriculturally related nonpoint sources of pollution, including return flows from irrigated agriculture, runoff from manure disposal areas, and from land used for livestock and crop production, and . . . set forth procedures and methods (including land use requirements) to control to the extent feasible such sources." 33 U.S.C.A. § 1288(b)(2)(F) (1986).


114 Administered by the Soil Conservation Service, the program authorizes five to ten year contracts with landowners who install and maintain best management practices and who agree to manage their farms according to a conservation plan. 33 U.S.C.A. § 1288(j)
State section 208 plans have been implemented, and federal involvement in this regulatory effort is now rather minimal. The majority of these state plans, however, do not incorporate regulatory programs for agricultural nonpoint pollution. Instead, they often rely on voluntary programs with cost-share provisions.

The focus on soil erosion, to the exclusion of other aspects of nonpoint pollution from agriculture, means that little special effort has been made to control pollution from animal manure. As one commentator noted, "[g]enerally, the effect has been that a source of pollution which evades legal definition as a point source also evades effective regulation and control."  

B. Air Pollution

Much of the attention given to animal waste in connection with air pollution has focused on odors rather than on the acidifying effects of ammonia from the manure. Even a well-managed livestock facility always causes some odor. Although the proper equipment and handling methods can often minimize offensive odors, operators do not always use these methods. The resulting interference with surrounding property may raise allegations of air pollution and common law nuisance.

In general, air pollution laws are not particularly effective in preventing or providing remedies for air pollution caused by animal manure. The Federal Clean Air Act requires federal regulation to establish national ambient air quality standards and state implementation, maintenance, and enforcement of those standards. Because the law relies on an objective measurement of pollutants, it has


116 See Davidson, supra note 86, at 10075; Keene, supra note 2, at 154. For detailed information about these state programs, see Beck, Agricultural Water Pollution Control Law, in 2 AGRICULTURAL LAW § 8.28 (J. Davidson ed. 1981 & Supp. 1989).

For example, an important component of section 208 planning in Illinois is the Erosion and Sediment Control Program, which includes state guidelines and local soil conservation district standards intended to reduce soil losses. Although a complaint system helps to identify violators, the program relies on cost-sharing incentives and voluntary cooperation of farmers.

117 Davidson, supra note 86, at 10074.

118 See, e.g., 2 N. HARL., supra note 6, § 13.01.

119 The common causes of odor complaints are "improper site location, poor facility management, and surface spreading of liquid manure." Taylor & Hutton, Resolving Odor Conflicts: Management and Legal Alternatives 1 (Ill. EPA, 1983). The livestock waste lagoon is also a source of odors.

120 42 U.S.C.A. §§ 7401-7626 (West 1986 & Supp. 1989). The Clean Air Act includes a complex legislative structure, based on cooperative federalism, designed to protect and enhance the quality of the nation's air resources. Id. § 7401(b).

121 Id. §§ 7409, 7410.
not been effective in controlling odors, which are difficult to measure objectively.\footnote{122 See Recker, Animal Feeding Factories and the Environment: A Summary of Feedlot Pollution, Federal Controls, and Oklahoma Law, 30 Sw. L.J. 556, 558 (1976).}

Some state environmental protection laws have defined air pollutants to include odorous substances,\footnote{123 E.g., Ill. Rev. Stat. ch. 111 1/2, §§ 1003.02, 1003.06 (1987); Vt. Stat. Ann. tit. 10, § 552 (1984 & Supp. 1989).} at least when the odors cause unreasonable interference with the rights of others.\footnote{124 The Illinois statute is typical. "Air pollution" is defined as "the presence in the atmosphere of one or more contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant, or animal life, to health, or to property, or to unreasonably interfere with the enjoyment of life or property." Ill. Rev. Stat. ch. 111 1/2, § 1003.02 (1987). "Contaminant" is then defined as "any solid, liquid, or gaseous matter, any odor, or any form of energy, from whatever source." Id. § 1003.06. Thus, an odor that interfered unreasonably with enjoyment of life or property would constitute air pollution under the Illinois Environmental Protection Act. For a decision finding that odors from agricultural operations violate the Act, see, e.g., EPA v. Processing & Books, Inc., 7 Ill. P.C.B. 729 (1973).}

Indeed, these laws have been used to abate odor pollution from livestock operations.\footnote{125 See generally Grossman & Fischer, supra note 125. For a recent survey of right-to-farm laws and court decisions, see Hamilton & Bolte, Nuisance Law and Livestock Production in the United States: A Fifty-State Analysis, 10 J. Agric. Tax'n & L. 99 (1988).}

Standards for determining whether an unreasonable odor exists tend to be subjective, however, and the process of analysis in these cases resembles the approach used in agricultural nuisance suits.\footnote{126 See id. at 101-05; Recker, supra note 122, at 559.}

Odor problems from animal manure have traditionally been addressed through common-law nuisance litigation. In fact, most litigation involving agricultural nuisance has focused on undesirable smells emanating from feedlots or other farming operations. A nuisance suit against an animal operation may succeed if the conduct of the operator interferes unreasonably with a neighboring landowner's use or enjoyment of property (private nuisance) or with the health, safety, and welfare of the public as a whole (public nuisance).\footnote{127 Plaintiffs have had mixed success in nuisance suits against animal operations, particularly against those located in rural areas. For a summary, see Grossman & Fischer, supra note 125, at 101-10.}

The outcome of nuisance suits is determined by a process of judicial balancing that considers a number of factors, including the type of nuisance and the land use in the surrounding area.\footnote{128 See id. at 154-56.} In recent years, however, nearly every state has enacted a right-to-farm law, which significantly limits nuisance suits against agricultural operations under certain land-use conditions.\footnote{129 See id. at 154 & n.261.} It must be concluded that...
common law nuisance actions offer little promise for abating air pollution from animal manure.

C. State Regulation Connected with Animal Manure

A number of state laws and regulations, in addition to those connected with water and air pollution, focus on animal manure. For example, some state laws and regulations govern the location of feedlot facilities and the proper storage, handling, and application of animal wastes. Several states have enacted feedlot licensing acts. The Oklahoma Feed Yards Act, for example, makes it unlawful to operate large feedlots without a license. Licensed owners and operators must take specific measures to dispose of excrement properly and to avoid water pollution.

1. Field Application of Livestock Waste

Improper application of manure can cause significant water pollution. Thus, state regulations often govern, or at least provide guidelines for, field application of livestock waste. The detailed

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130 The discussion that follows makes no attempt to provide comprehensive information about state feedlot regulation. Instead, it provides some representative examples drawn from statutes and regulations.

Some state regulation, not discussed here, focuses on refeeding of animal waste. 2 N. HARL, supra note 6, app. A, at 188.


A fee is charged for each license, id. § 9-209, and a license may be suspended or revoked for violation of the feed yards law or regulations. Id. § 9-211. Significant penalties may be assessed for violation of the law or its regulations. Id. § 9-212.

133 Id. § 9-210 (1973). Insofar as manure is concerned, the statute requires the following:

Owners and operators who are granted a feed yards license shall: (1) provide reasonable methods for the disposal of animal excrement; . . . (3) provide adequate drainage from feed yards premises of surface waters falling upon the area occupied by such feed yards; take such action as may be necessary to avoid pollution of any stream, lake, river or creek; . . . (5) have available for use at all necessary times mechanical means of scraping, cleaning, and grading feed yards premises; (6) provide weather resistant aprons adjacent to all permanently affixed feed bunks, water tanks, and feeding devices.

Id. Compliance with the law and regulations is prima facie evidence that a nuisance does not exist, provided zoning regulations are followed. Id.; see KAN. STAT. ANN. § 47-1505 (1986) for a nearly identical provision.

134 E.g., ILL. ADMIN. CODE tit. 35, subtit. E, ch. II, pt. 560 (1984). See also 2 N. HARL, supra note 6, § 14.03[3], for excerpts from Iowa field application guidelines, including provisions for timely application, placement away from waterways, and incorporation into soil.
character of this type of regulation resembles the spirit of Dutch reg-
ulation on manure application.\textsuperscript{135} The Illinois guidelines, for ex-
ample, are based on the regulatory premise that "[t]he quantity of
livestock waste applied on soils shall not exceed a practical limit as
determined by soil type, especially its permeability, the condition
(frozen or unfrozen) of the soil, the percent slope of the land, cover
mulch, proximity to surface waters and likelihood of reaching
groundwater, and other relevant considerations."\textsuperscript{136}

A basic principle in the Illinois guidelines is that livestock waste
application should not exceed the "agronomic nitrogen rate"—the
annual nitrogen application rate needed for a reasonable crop yield.
When this rate is used, phosphorus will often exceed crop require-
ments and may sometimes justify using the agronomic phosphorus
rate. Although individual farmers are encouraged to perform a
chemical analysis to determine the nutrient content of livestock
wastes, the guidelines give data for estimating the nutrient value of
wastes from different types of animals and various management sys-
tems. Further information, that is, information on nitrogen produc-
tion and the number of animal units needed to provide 100 pounds
of nitrogen per year, helps farmers determine the adequacy of their
land area for manure application.\textsuperscript{137}

Other restrictions on field application in these Illinois guidelines
focus on water and odor pollution. For example, these guidelines
prescribe that waste should usually not be applied within 200 feet of
surface water or within 150 feet of any water well, and that bacteria
or nitrate contamination of groundwater should be avoided.\textsuperscript{138} Fur-
thermore, waste should not be applied in a ten-year flood plain un-
less it is injected or incorporated into the soil. It should not be
applied during a rainfall, on saturated soil, or in waterways, nor
should it be applied on frozen or snow-covered ground, unless
slopes are gentle or erosion is controlled.\textsuperscript{139} Farmers are directed to
consider methods of application, location, and climatic conditions, to
avoid unnecessary odors from manure.\textsuperscript{140}

\textsuperscript{135} Some other state regulations are less detailed. See, e.g., OR. ADMIN. R. 340-51-
070(2)(a) (1987) (stating in part that "[f]ield spreading of [solid] manure should be uni-
form in distribution and limited in quantity to the capacity of the land to retain it."); see also
OHIO ADMIN. CODE § 1501:15-5-05(A) (1986) (requiring application of animal waste "to
achieve maximum utilization of the nutrients in manure for crop production and to mini-
mize the potential for water pollution . . . ." factors considered including nutrient content
of manure, as well as the amount and type of available land).


\textsuperscript{137} Id., ch. II, § 560.201.

\textsuperscript{138} Id. § 560.203.

\textsuperscript{139} Id. § 560.204-.207.

\textsuperscript{140} Id. § 560.208.
2. Operational Rules for Livestock Facilities

Operational rules for livestock facilities are also intended to prevent animal wastes from polluting water sources. Here the focus is on manure storage and handling. One typical set of rules, included in the Illinois Livestock Waste Regulations, states that new livestock facilities may not have streams or other surface waters within their boundaries, and that they may not be located in close proximity to populated areas. These facilities must avoid both flooding and groundwater pollution. All facilities must prevent excessive outside surface waters from flowing through the operation, and must direct runoff to an appropriate disposal, holding, or storage area. Waste stored for over six months must be contained in an impermeable manure storage structure with adequate storage capacity. The Illinois Livestock Waste Regulations also include a set of technical design and maintenance criteria for runoff field application systems as an alternative to manure holding tanks, ponds, or lagoons.

IV. Conclusion

Despite the many facets of U.S. law and regulation affecting manure reviewed in the preceding section of this Article, it is clear that none of these legal schemes offers a comprehensive program for controlling pollution from animal wastes. In contrast, the Dutch manure laws, with the related regulations and decrees, have been designed to govern nearly every phase of manure production and application. The Dutch legislation offers a complicated system of provisions. Although its main outline appears relatively simple, in

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142 Id. § 501.402. See Ohio Admin. Code § 1501:15-5-02 to -04 (1986), which requires construction of animal waste management facilities to avoid pollution. Cost sharing for animal waste storage or management facilities and other purposes is available. Id. § 1501:15-5-08; see also Wis. Stat. Ann. § 92.14(4)(c) (West Supp. 1989) (authorizing cost share grants for construction of facilities or systems to farmers who are discharging pollutants). The Wisconsin provision, part of the soil and water resource management program, is aimed at nonpoint source pollution.
143 Tex. Admin. Code tit. 31, § 501.403 (Supp. 1988). For new facilities, a holding pond must have a prescribed storage volume, which can never be less than the 25-year, 24-hour storm effluent guidelines for feedlot point sources under the NPDES program. Id. § 501.404 (Supp. 1988).
144 Temporary manure stacks must not be located within 100 feet of a water well; they must be constructed and maintained to prevent pollution of ground and surface waters. Tex. Admin. Code tit. 31, § 501.404 (Supp. 1988).
145 Ill. Admin. Code tit. 35, subtit. E, ch. II, pt. 570 (1984). Appropriate only for livestock facilities with 300 or fewer animal units, vegetative filter systems are relatively inexpensive, but require careful design and maintenance. The regulations prescribe in detail the type of facility; they give specific procedures and calculations to be used in design. Id. §§ 570.201-.204 & apps. A-J. They prescribe the type of vegetation to be used and how it must be established. Id. § 570.205. In addition, the regulations govern operation and maintenance of the system. Id. § 570.206.
implementation—through numerous governmental decrees and ministerial regulations—the system is extremely complex and detailed.

The Dutch Minister of Agriculture has characterized coping with the manure problem as one of the most difficult tasks the Netherlands must face in the near future. Therefore, in evaluating this Dutch system, the central question is whether these stringent measures will really succeed in solving the manure problem. At the outset, it must be noted that the standards for application of manure have been so broadly chosen that in the first phase (through 1991), there is no manure surplus, at least in terms of the legal system. On the contrary, expansion of manure production is still possible. In environmental protection circles, these norms (especially the “free zone” of up to 125 kilograms of phosphate per hectare) are considered much too lenient. These norms clearly represent a compromise between what is desirable from an environmental point of view and what the livestock industry is believed to be able to bear.

Still, among Dutch farmers, the restrictions are obviously not welcomed. Moreover, to date, the actual effect has also been rather limited. After the 1985 enactment of the Interim Act, which aimed at freezing the number of pigs, the swine population nevertheless continued to grow dramatically for two years. This growth cannot be explained solely by the exercise of rights of expansion that had already been acquired. Thereafter, there was a slight decrease in the number of pigs.\footnote{\textsuperscript{146} During the periods 1985-1986 and 1986-1987, the number of pigs increased by approximately 8\% per year. In the period 1987-1988, there was for the first time a decrease of 2\%. (These figures are from press releases of the Ministry of Agriculture and Fisheries.)}

The new manure legislation enacted in 1987 was also unpopular among farmers. In the beginning, groups of farmers sent the manure bookkeeping forms they received back to the Minister, unopened. The Minister was forced to postpone the introduction date for some months, and in the meantime changed to a simpler form of bookkeeping. Nonetheless, keeping the manure bookkeeping up to date, which is essential for control of the flow of manure, remains a difficult issue, in part because farmers still consider the forms too difficult.\footnote{\textsuperscript{147} In 1988, 3000 Dutch livestock breeders were fined for breaches of manure regulations. NRC-Handelsblad, Dec. 6, 1988, at 1, col. 1.}

Without a doubt, the Dutch livestock farmer has been put under great pressure by the measures now in effect. A heavy responsibility has been laid on those who are subject to the new rules. Farmers are faced with the economic stress of extra burdens and high invest-
ments for manure storage, at a time when the "superlevy"148 also burdens the industry. In addition, the system of regulation itself burdens the farmer. In particular, farmers themselves have to judge whether and to what extent they come under specific regulations, and they must keep the relevant records up to date.

Recent research indicates that farmers are beginning to understand the seriousness of the manure problem. A survey of representative livestock farmers, published in June 1989, found that, although not all farmers understand the burdens that excess application of manure puts on the environment, a large majority realize that the government must impose regulations to solve the serious problems caused by surplus manure. In addition, farmers realize that eventually a balance must be reached between the amount of manure applied to the ground and the amount taken up by crops. A majority of farmers surveyed also accept the fairness of the manure bookkeeping regulations and the rules for the use of manure (maximum amount per hectare, prohibition against spreading at certain times, and requirement for incorporating the manure into the ground). Other structural provisions (for example, the prohibitions on expanding production and on transfer of manure production) are not as widely accepted.149 Although the general level of farmer acceptance indicated in the survey was greater than expected, farmers are likely to face more technical and financial problems in the second phase of regulation beginning in 1991.150

In the future, the efficacy of the manure legislation may depend largely on the degree to which the regulatory measures can be enforced. In the system of manure legislation, that responsibility lands on the shoulders of the official inspection service of the Ministry of Agriculture and Fisheries, on the one hand, and of the Public Prosecutor and the criminal law judge, on the other hand.

In the meantime, there are also feverish activities to find technical solutions for the manure problem, in particular by drying the manure to a manageable and salable product. That effort takes time, and it is unclear to what extent it will lead to a financially profitable solution. As the contamination of soil and air increases, it is often heard that the only effective solution is to decrease the livestock population.

148 The superlevy (superheffing) is a measure of the European Community that places an extra levy on milk production. The measure is intended to decrease the milk surplus.


150 Agrarisch Dagblad, 7 juli 1989, at 3, col. 4. For example, two-thirds of the livestock producers anticipated a shortage of manure storage capacity in 1991.
In the National Environmental Policy Report published in May 1989, the Dutch Government has established the objective of restoring the equilibrium between supply and removal of phosphorus and nitrogen in soil and water. Therefore, a reduction of emissions of fertilizing matter by seventy to ninety percent will be necessary. A large-scale program of manure processing, aiming at a capacity of twenty million tons of manure in the year 2000, will be implemented to meet that objective. Moreover, the obligation of "minerals bookkeeping" for farm businesses will be introduced gradually. In addition, the manure legislation will be sharpened and extended. To reduce the evaporation of ammonia, beginning in 1991, manure must be worked into the soil immediately after spreading on arable land and fodder cropland. If these measures prove to be insufficient in the coming years, supplementary measures will be taken. These measures may include a decrease in the Dutch livestock population.  

It is to be hoped that the Dutch measures intended to reduce environmental pollution from manure will be successful, and that they will not threaten the economic stability of farmers subject to the measures. It is also to be hoped that this Dutch experience will have lessons to offer to other nations, like the United States, where regulation of pollution from animal waste (and, for that matter, from other agricultural activities) is both less stringent and less effective.

Admittedly, the combination of a restricted land area, high population density, a large livestock population, and a high water table has made the manure problem more compelling in the Netherlands than in the United States. Nevertheless, it is clear that agricultural practices and activities threaten the environment in the United States as well. Indeed, it has long been clear that the "domestic agricultural industry is a principal source of nonpoint [water] pollutants." Despite clear indications of the harmful effects of many agricultural activities, these activities have been exempted systematically from environmental laws and regulations. As the discussion above has indicated with respect to manure pollution, some of the laws that do apply have tended to approach the problem indirectly and thus have been only partially effective.

Despite its potential for causing pollution, manure can be a useful fertilizer, especially effective for maintaining the organic content of soils. More appropriate (and less environmentally harmful) use of manure can be encouraged by improving the fertilizer value of slurry and other manures (for example, with decreased water content and

151 Nationaal Milieubeleidsplan, supra note 11, at 137-39, 188-93.
152 Davidson, Environmental Analysis of the Federal Farm Programs, 8 VA. ENVTL. L. J. 235, 235 (1989).
153 Id. at 247 n.65.
balanced nutrients through animal feed composition) and by reducing odor problems. The government should mandate application in accordance with crop requirements and prohibit application under environmentally unsafe conditions. It may eventually be necessary to require feedlots to adopt more effective practices for manure application, storage, and disposal, or even to reduce animal density. In many instances, substantial progress in ensuring better manure-handling practices could follow from more stringent enforcement of already-existing laws and regulations. Eventually, development of a market for nutrients from manure products may be desirable, when a more efficient economic structure can be designed.\textsuperscript{154}

The Dutch manure law focuses on a single environmental problem and imposes regulation for every type of activity or transaction connected with that problem. This approach imposes serious burdens on Dutch farmers, who understandably objected to many aspects of the laws and regulations. U.S. farmers would be equally (or even more) reluctant to accept stringent restrictions on manure production and use, accompanied by detailed bookkeeping requirements.

In the future, however, it may be expected that U.S. farmers, as well as other segments of the population, will face more intrusive environmental regulation. Despite decades of pollution regulation in the United States, the quality of the environment has not improved and may be deteriorating.\textsuperscript{155} Renewed efforts to avoid further degradation are likely to focus on water quality, so closely dependent on proper control of manure and other agricultural pollution. As one scholar has recently noted, "[i]t is inevitable that the agricultural pollution problem will eventually require the direct regulation of individual farms, just as we now regulate the environmental effects of industry, commerce, and governments."\textsuperscript{156}

Because of different legal and geographical constraints, U.S. law is not likely to mirror Dutch manure regulation precisely. Nonetheless, an understanding of the potential of Dutch manure law for ensuring cleaner soil, water, and air by curbing excess pollution from individual farms may help federal and state lawmakers in the United States to understand the effects and the practical implications of this type of intrusive regulation.

\textsuperscript{154} Organisation for Economic Co-Operation and Development, Water Pollution by Fertilizers and Pesticides 58-63 (1986); see also Sivas, supra note 3, at 161-62.
\textsuperscript{155} See Davidson, supra note 152, at 235 & n.2.
\textsuperscript{156} Id. at 265.