

NOTE

**CONCENTRATED ANIMAL FEEDING OPERATIONS AND
MANURE RUNOFF: SUPPLEMENTING CURRENT
REGULATION WITH COMMUNITY BASED INITIATIVES**

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INTRODUCTION

Runoff from animal waste is one of the most pressing water quality issues today. For over thirty years, both federal and state level governments have tried to regulate and monitor disposal of animal waste. However, with

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the changing technological and production aspects of the agricultural industry, it has been difficult for policy to address animal waste issues comprehensibly and effectively.¹ As the human population continues to grow, the demand for agricultural products also grows. This growth has dramatically altered the way agriculture is practiced, resulting in high concentrations of animals and crops. Water quality concerns increased considerably as growth and efficiency shifted all-purpose farming to specialty farming, and more time and cost effective measures were adopted in agriculture and animal production.²

As the demand for agriculture products has increased, output has multiplied. Between 1930 and 2000 output quintupled; however, inputs of land, labor, and capital have remained fairly constant.³ Yet, the number of operating farms in the United States has decreased by 4.5 million since 1930, leaving just over 2 million in operation today.⁴ Data gathered by the United States Department of Agriculture (USDA), National Agriculture Statistics Service, showed that since 1979 the average per farm acreage has remained in the mid-four hundreds.⁵ To demonstrate this dramatic increase in production: the average cow produced 4,508 pounds of milk per year in 1930, and in 2007 the average cow produced 20,267 pounds of milk per year.⁶ Another example illustrating this increase is that in 1930 the United States produced 228,147 pounds of turkey, and in 2009 the United States produced 7,149,942 pounds of turkey.⁷

1. David Zilberman et al., *Creative Solutions to the Animal Waste Problem*, in ANIMAL AGRICULTURE AND THE ENVIRONMENT: NATIONAL CENTER FOR MANURE AND ANIMAL WASTE MANAGEMENT WHITE PAPERS 161–62 (J.M. Rice et al. eds., 2006).

2. See Anita R. Bahe et al., *Emerging Environmental Contaminants: Current Science and Policy Concerns*, in ANIMAL AGRICULTURE AND THE ENVIRONMENT: NATIONAL CENTER FOR MANURE AND ANIMAL WASTE MANAGEMENT WHITE PAPERS 181 (J.M. Rice et al. eds., 2006) (examining emerging contaminants in water due to increased population and agricultural practices).

3. Bruce Gardner, *U.S. Agriculture in the Twentieth Century*, ECON. HIST. ASS'N (Feb. 1, 2010, 6:21 PM), <http://eh.net/encyclopedia/article/gardner.agriculture.us>.

4. U.S. DEP'T AGRIC., *American Farms*, in AGRICULTURE FACT BOOK 2001-2002 (2002), available at <http://www.usda.gov/factbook/chapter3.htm> [hereinafter *American Farms*].

5. *Id.*

6. *U.S. & All States Data – Dairy: Milk Production, Milk Cows, Milk per Cow: Annual*, NAT'L AGRIC. STATISTICS SERV., U.S. DEPARTMENT AGRIC., http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats_1.0/index.asp (select US & State - Dairy and follow “Go” hyperlink; then search “step 1” for “Milk Production, Milk Cows, Milk per Cow: Annual” and search “step 3” for “1930 & 2007” and search “step 4” for “United States” and follow “Add” hyperlink; and follow “Get Data” hyperlink).

7. *U.S. & All States Data – Turkeys: Turkeys – Annual Turkey Raised by States and U.S.*, NAT'L AGRIC. STATISTICS SERV., U.S. DEPARTMENT AGRIC., http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats_1.0/index.asp (select US & State - Turkeys and follow “Go” hyperlink; then search “step 1” for “Turkeys - Annual Turkey Raised by State and

This increase in output is a result of many factors. Prior to World War II, American agriculture was typically comprised of chickens running freely in the yard, a small herd of milking cows, and a few draft animals.⁸ After World War II, American agriculture underwent dramatic changes. First, with the end of the war came the conversion of nitrogen-based munitions (the projectile and its propellant that are fired from a gun, including missiles and bombs) into inorganic fertilizer that was used for the production of crops.⁹ Second, there was a huge movement of people into urban centers and fewer people remained in rural America to manage and operate farms.¹⁰ Third, with education streaming in from land grant universities, new technologies, availability of nutrient fertilizers, and an abundance of excellent soils, the farm quickly shifted from providing food for one or two families to an incredibly efficient industry capable of producing products for a global market.¹¹ With this increased efficiency in production came dense concentration of beef, dairy, swine, and poultry animals.¹²

This concentration of animals led to a concentration of manure, which combined with reduced available acreage has led to environmental degradation. These concerns, in part, led to the creation of the Clean Water Act in 1972.¹³ The rate of environmental degradation has increased over the last several decades, prompting the Environmental Protection Agency (EPA) to identify agriculture as the leading source of pollution to surface water.¹⁴ One reason for this pollution is that manure is often mismanaged and inappropriately applied to land. This mismanagement does not allow the land to benefit from manure application and instead results in runoff into water. In order to address these water pollution concerns, the Clean Water Act set forth regulations for concentrated animal feeding operations (CAFOs).¹⁵ While these regulations have been in effect for many years, water pollution caused by manure runoff is still a growing environmental

U.S.” and search “step 3” for “1930 & 2009” and search “step 4” for “United States” and follow “Add” hyperlink; and follow “Get Data” hyperlink).

8. L.M. Risse et al., *Land Application of Manure for Beneficial Reuse*, in ANIMAL AGRICULTURE AND THE ENVIRONMENT: NATIONAL CENTER FOR MANURE AND ANIMAL WASTE MANAGEMENT WHITE PAPERS 283, 287 (J.M. Rice et al. eds., 2006).

9. *Id.* at 286.

10. *Id.*

11. *Id.*

12. *Id.*

13. *Id.*

14. *Id.* at 296.

15. See 40 U.S.C. § 1362(14) (2006) (including CAFOs as a regulated point source under the CWA).

concern. Why are these regulations not curtailing the environmental harm caused by land application of manure?

Through a close analysis, this article explores: first, the benefits and limitations surrounding the land application of manure; second, mandatory permits under the Clean Water Act; third, effectiveness of those permits; fourth, other authors' suggestions to supplement existing regulation; fifth, a community based initiative case study; sixth, the description of a manure bartering system; and, lastly, this article recommends that current regulation be supplemented with community based initiatives.

I. BENEFITS AND RESTRICTIONS ADJOINED TO THE LAND APPLICATION OF MANURE

When manure is correctly applied to the land, soil and plants receive several benefits.¹⁶ However, there are many limitations that prevent a more intense practice of manure application to land, including: potential adverse water quality caused by runoff, uncertainty regarding the nutrient availability in manure, high transportation and handling costs, and odor issues.¹⁷

A. Benefits of Manure Application

The application of manure to the land offers benefits to soil, crops, and nearby water bodies; however, many limitations have discouraged greater practice of manure application.¹⁸ Manure is an excellent source of nitrogen, phosphorous, potassium, and secondary nutrients which are required in plant growth.¹⁹ A study conducted by the National Center for Manure & Animal Waste Management concluded that manure used as fertilizer contributes to increased crop utilization and less nutrient loss through soil erosion and surface runoff.²⁰ The same study established that crop production levels from land where only manure was applied were equal to or higher than those of crops harvested from land applied only with inorganic fertilizer.²¹

16. Risse et al., *supra* note 8, at 284.

17. *Id.*

18. *Id.*

19. *Id.* at 283.

20. *See id.* at 283–86 (stating that the benefits of manure application are increased crop growth, soil nutrient retention, and reduced soil erosion and runoff).

21. *Id.* at 289.

These conclusions resulted from a number of elements. First, manure increases soil organic matter which significantly affects the soil's physical, chemical, and biological properties.²² Organic matter bolsters the physical properties of soil by supporting the formation of water-stable aggregates, which help the structure of soil by improving infiltration, porosity, and water-holding capacity.²³ Also, compaction and erosion are decreased, which help to maintain a strong physical structure.²⁴ These improved physical properties permit seedlings to easily sprout roots and penetrate the surface.²⁵

Second, the increased levels of organic matter in the soil reduce dependence on pesticides due to greater amounts of microbial activity.²⁶ This activity limits the growth of pathogens that cause crop diseases in the soil.²⁷ However, studies only found depressed pathogen growth in soils where swine and poultry manure were applied, while no consistent results were found with either fresh or composted cow, sheep, or horse manure.²⁸ These results are attributed to the high level of nitrogen found in swine and poultry manure; although, more research is needed to verify this.²⁹

Lastly, the presence of organic matter in the soil reduces runoff and soil loss.³⁰ Many factors affect the level to which runoff and soil loss are reduced, including: loading rates, soil characteristics, time between application and rainfall, and the solids content of manure.³¹ Even with this variability, a 2001 study concluded that land treated with manure showed reduced runoff by up to sixty-two percent and soil loss up sixty-five percent compared to untreated land.³²

According to the USDA, Economic Research Service, the United States produced sixty-four million tons of manure in 1997.³³ There is a great deal of manure produced yearly in the United States, and research concludes that

22. *Id.*

23. *Id.* at 290.

24. *Id.*

25. *Id.*

26. *Id.*

27. *Id.* at 291.

28. *Id.*

29. *Id.*

30. *Id.*

31. *Id.*

32. The study was conducted on more than seventy plot-years of data from seven locations of different tillage and cropping conditions. *Id.* at 292-93.

33. *Confined Animal and Manure Nutrient Data System*, ECON. RESEARCH SERV., U.S. DEPARTMENT AGRIC., <http://www.ers.usda.gov/Data/Manure/> (follow Data Files "Standard Delivery" hyperlink; then search "Year" for "1997" and separately search "Animal Type" for "Dairy Cows," "Feedlot Beef," "Other Cattle," "Poultry," & "Swine" and follow "Submit" Excel Spread Sheet).

there are several beneficial reasons to apply manure to the land. Given these facts, it seems that manure application to the land would be general practice. However, applying manure to the land in ways that will have the greatest benefit on the soil is not widely practiced today and results in manure disposal problems and environmental degradation.³⁴

B. Limitations Surrounding Manure Application

While manure can be beneficially applied to the land, several limiting factors deter and, in some cases, prevent the proper land application of manure. First, the characteristics and nutrient contents of animal manure are dependant on a number of factors, including: animal type, food rations, the process of collection and storage, and the process of application and climate, and is therefore difficult to control.³⁵ Variations obviously exist among species (phosphorus concentration in dairy cow manure can be 6.0 g phosphorous kg⁻¹, while chicken layer manure phosphorus concentrations can be 30.3 g phosphorous kg⁻¹), but such dramatic variability also exists within a single species (phosphorus concentrations in poultry litter have been found to range from 8.0 to 25.8 g phosphorous kg⁻¹).³⁶ This amount of variability makes developing manure application management plans based on average or anticipated nutrient levels quite difficult.³⁷ Since future nutrient levels in the manure are unknown, the manure would need to be tested at the time of application. Currently, there are no inexpensive, on-site test kits available.³⁸

One option is to send samples to labs for testing, but that requires an extended wait for results and during the lab process nutrient concentrations in the manure may change.³⁹ It is also difficult to collect a truly representative sample of manure for nutrient testing.⁴⁰ Manure is made up of clumps (where the majority of the nutrients are held), organic material, and liquid elements; to be accurate a sample must contain all parts of the manure.⁴¹

Another limitation surrounding the land application of manure is public perception. Over the last several decades, the public has become disconnected from agriculture. The media has cast a negative light on the

34. Risse et al., *supra* note 8, at 286.

35. *Id.* at 286–87.

36. *Id.* at 302.

37. *Id.*

38. *Id.*

39. *Id.* at 303.

40. *Id.* at 302–03.

41. *Id.*

industry because of issues involving the size of animal operations, noise and odor, and the impact on neighboring land owners.⁴² This public perception has limited the land application of manure.⁴³ If animal manure is going to be successfully applied to land, then the public needs to be accepting of it.⁴⁴ Currently, odor problems are the number one complaint brought by citizens against animal facilities.⁴⁵ As urban communities creep into agricultural land, these complaints may only worsen.

The final, and greatest limitation, surrounding the land application of manure today is that the farms with the greatest amounts of manure are those with a large concentration of animals and do not have the acreage needed to apply manure at agronomic rates.⁴⁶ In these situations, removal of manure off-site is often not economically feasible.⁴⁷ It is very expensive to collect, transport, store, and handle manure from point to point.⁴⁸ At this time, there are limited options for manure disposal and not much emphasis on research for new manure handling concepts.⁴⁹ Due to these limitations, it is not the general practice to apply manure to the land in a beneficial manner.

C. Water Concerns

The concentration of animals and limited available acreage for land application of manure can have potentially detrimental effects to ground and surface water if manure is not applied appropriately to the land.⁵⁰ Prior to World War II, manure was not a serious waste problem because enough food was produced locally and recycled to meet the farmer's needs.⁵¹ Post World War II, the farming community started to see an increase in production efficiency, which resulted in specialized systems devoted to crops or animals existing in separate parts of the country.⁵² This specialization has led to concentrated animal units on limited land.⁵³

42. *Id.* at 304.

43. *Id.*

44. *Id.*

45. *Id.*

46. *Id.* at 303.

47. *Id.*

48. *Id.*

49. *Id.*

50. *Id.* at 296.

51. *Id.* at 285–86.

52. *Id.* at 286.

53. J.H. Edwards & Arun V. Someshwar, *Chemical, Physical, and Biological Characteristics of Agricultural and Forest By-Products for Land Application*, in *LAND APPLICATION OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL BY-PRODUCTS* 1, 4 (Warran A. Dick et al. eds., 2000).

Without enough land, economic restrictions and other limitations force the application of manure at inappropriate sites, specifically those “with elevated levels of [nitrogen (N)] and [phosphorous (P)] from repeated application, or sites that are susceptible to runoff and leaching of nutrients from manure application.”⁵⁴

Today, this mismanagement of manure can lead to serious environmental degradation.⁵⁵ The environmental concerns associated with mismanaged manure application to the land encompass a number of things including: pollution to surface water, leaching of excess nutrients to groundwater, odor issues, and salt contamination of the land from over application.⁵⁶ This article addresses only the concerns of pollution to surface water.

In a 1994 report, the EPA found that more than seventy percent of surveyed rivers and streams showed decreased water quality, which “resulted from agricultural nonpoint sources.”⁵⁷ These nonpoint sources lost thirty-six percent of their N, five percent of their P, and four percent of their potassium (K) due to collection and storage volatilization, leaching, or runoff.⁵⁸ Agricultural land was once a sink for P, but as the demand for agricultural products increased so did the demand for more efficient and less costly sources of fertilizer.⁵⁹ Now that both fertilizer and manure are applied, agricultural land has shifted from serving as a sink for P to becoming a source of P.⁶⁰ Over the last fifty years, more than 600 tons of P fertilizer has been applied to land worldwide and only about 250 tons has been removed as produce.⁶¹ These increased levels of nutrients being applied to—but not being completely utilized by—the land leads to pollution of surface water, since these lands are already susceptible to runoff.

54. *Id.*

55. *Id.*

56. *Id.* at 3.

57. *Id.* at 3–4.

58. *Id.* at 5–6.

59. A. N. SHARPLEY ET AL., U.S. DEP’T OF AGRIC., BEST MANAGEMENT PRACTICES TO MINIMIZE AGRICULTURAL PHOSPHORUS IMPACTS ON WATER QUALITY 1 (2006), available at <http://www.ars.usda.gov/is/np/BestMgmtPractices/Best%20Management%20Practices.pdf>.

60. *Id.*

61. *Id.*

D. Eutrophication

The runoff of N and P into surface waters is of serious environmental concern because it leads to eutrophication.⁶² Eutrophication is the increase of nutrients into waters, which promotes increased plant growth and biological productivity and decreases the availability of dissolved oxygen, and which ultimately degrades water quality.⁶³ The mismanagement and over-application of manure has increased the nutrient loading rates in waters, resulting in increased eutrophication and degraded water quality.⁶⁴

According to state and local estuary managers, eutrophication is a critical problem.⁶⁵ Eutrophication limits water use not only economically, but also scenically and recreationally.⁶⁶ These limitations occur because eutrophication results in an increased growth in a variety of different types of algae.⁶⁷ Scenic, recreational, and economic problems result from odor caused by the decomposition of algae on beaches, adverse taste and filtration problems for drinking water,⁶⁸ changes to fish pollutions, and fish kills.⁶⁹

II. CURRENT REGULATORY ORGANIZATION

The Clean Water Act strives to protect water quality in response to the environmental degradation caused by the mismanagement and over application of manure to the land.⁷⁰ Even with the regulation of confined animal feeding operations, manure runoff is an increasing concern across

62. William F. Ritter, *Potential Impact of Land Application of By-Products on Ground and Surface Water Quality*, in LAND APPLICATION OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL BY-PRODUCTS 263, 275 (Warren A. Dick et al. eds., 2000).

63. *Id.*

64. *Id.* at 275–76.

65. OFFICE OF WATER, U.S. ENVTL. PROT. AGENCY, ENVIRONMENTAL INDICATORS OF WATER QUALITY IN THE UNITED STATES 17–18 (1996).

66. WILLIAM MCGUKEN, LAKE ERIE REHABILITATED: CONTROLLING CULTURAL EUTROPHICATION, 1960s–1990s, at 15 (2000).

67. *See id.* at 28–30 (attributing limited uses of Ontario waters to an increase in algae growth due to cultural eutrophication).

68. *Id.* at 29–30.

69. Jack Foehrenbach, *Eutrophication*, 44 J. WATER POLLUTION CONTROL FED’N 1150, 1151 (1972).

70. *See Clean Water Act (CWA)*, U.S. ENVTL. PROTECTION AGENCY, <http://www.epa.gov/agriculture/lcwa.html> (last updated Oct. 10, 2010) (stating that the objective of the CWA “is to restore and maintain chemical, physical, and biological integrity of the nation’s waters by preventing point and nonpoint pollution sources”).

the country.⁷¹ Author Terence J. Centner concludes that current regulations are not successfully addressing water pollution caused by concentrated animal feeding operations because of a lack of accountability and enforceability.⁷² Ultimately, he asks for additional regulatory action.⁷³ Other potential solutions to the manure waste management problem include incentive programs and economic solutions.⁷⁴ However, the National Research Council suggests alternative uses for animal manure to alleviate manure runoff.⁷⁵

A. Defining a Concentrated Animal Feeding Operation

An animal feeding operation (AFO) is an animal production facility where:

- (i) Animals . . . have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period, and
- (ii) Crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.⁷⁶

Both of these requirements must be met in order for the production facility to be considered an AFO.

A concentrated animal feeding operation (CAFO) meets the definition of an AFO “if it stables or confines as many as or more than the numbers of animals specified” by section 122.23(b)(4) of the regulations created to follow the Clean Water Act.⁷⁷ CAFOs are common throughout the United States. In 2006, there were approximately 13,400 CAFOs with 1,000 or

71. See TERENCE J. CENTNER, *EMPTY PASTURES: CONFINED ANIMALS AND THE TRANSFORMATION OF THE RURAL LANDSCAPE* 143 (2004) (stating that data shows CAFOs are “producing unacceptable pollutants” across the country).

72. *Id.* at 132.

73. *Id.* at 143.

74. See Zilberman et al., *supra* note 1, at 177 (proposing that a key element of a comprehensive animal waste policy is an emphasis on incentive based policies); Robert Innes, *The Economics of Livestock Waste and its Regulation*, 82 AM. J. AGRIC. ECON. 97 (2000) (examining economic solutions that could drive changes to environmental regulatory practices pertaining to manure management).

75. Edwards & Someshwar, *supra* note 53, at 4.

76. 40 C.F.R. § 122.23(b)(1) (2008).

77. *Id.* § 122.23(b)(4).

more animal units and 5,600 CAFOs with 300 to 1,000 animal units, totaling 19,000 CAFOs in the United States.⁷⁸

B. Clean Water Act

The battle of addressing the issues surrounding surface water pollution is not a new challenge. With the passage of the Clean Water Act in 1972 came the identification and regulation of point source and nonpoint source polluters.⁷⁹ A point source is defined as “any discernible, confined, and discrete conveyance . . . from which pollutants are or may be discharged.”⁸⁰ Those that are not point sources are considered nonpoint sources.⁸¹ The Clean Water Act has made huge strides in reducing the discharge of pollutants caused by point sources.⁸² However, there is still a growing concern for the pollution caused by nonpoint source polluters.⁸³ The 1998 list of impaired waters provided by states to the EPA found that it would not be possible to meet specified water quality standards through regulation of point source pollutants alone.⁸⁴ CAFOs are considered point sources under the Clean Water Act; however, the excess application of manure to land can lead to nonpoint source pollution problems.⁸⁵

C. Mandatory Permits Under the Clean Water Act

Under the CWA, section 122.21(a) states that only a person who “discharges or proposes to discharge pollutants” must apply for a National Pollutant Discharge Elimination System (NPDES) permit.⁸⁶ The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.⁸⁷ Under the Clean Water Act, all CAFOs are defined as point source polluters and are therefore, subject to NPDES permitting.⁸⁸ In order for a CAFO to avoid the NPDES requirements, it must request and be granted by the permitting

78. ALLISON WIEDEMAN, UPDATE ON CAFO NPDES PERMITTING IMPLEMENTATION (2007), available at <http://www.state-cafos.org/events/docs/WACAFO/Wiedeman.pdf>.

79. Edwards & Someshwar, *supra* note 53, at 3.

80. 40 C.F.R. § 122.2 (2010).

81. *Id.* §§ 122.2, 122.3(e).

82. Marc Ribaud, *Non-point Source Pollution Control Policy in the USA*, in ENVIRONMENTAL POLICIES FOR AGRICULTURAL POLLUTION CONTROL 123, 123 (J.S. Shortle & D. Abler eds., 2001).

83. *Id.* at 124.

84. *Id.*

85. *Id.* at 128, 145.

86. 40 C.F.R. § 122.21(a)(1).

87. *Clean Water Act (CWA)*, *supra* note 70.

88. 40 C.F.R. § 122.23(a).

authority a “no potential to discharge” determination.⁸⁹ This determination is granted once a CAFO provides evidence to the permitting authority that it will not discharge “manure, litter, or process wastewater to surface waters.”⁹⁰ This includes providing evidence that no discharges can result from accidents or human error.⁹¹ Based on the 2006 approximation of 19,000 CAFOs in the United States, 14,019 still needed to be issued NPDES permits.⁹² Therefore, the NPDES program may not be an effective CAFO regulation.

D. Effectiveness of Regulations

Regulations in place to control the point-source pollution caused by CAFOs have not been effective in reaching water quality goals.⁹³ Do the governmental activities and regulations actually address the issues that cause the pollution? And, are there strict enough enforcement mechanisms in place to effectively punish violators? These are the two questions that Terence Centner, author of *Empty Pastures*, attempted to answer. Centner states that the first question deals with the issue of accountability, and the second, with enforcement.⁹⁴

First, when it comes to accountability, policy makers must identify the problem causing the pollution and develop regulations that accurately deal with the issue.⁹⁵ After these regulations are in place, violators must learn to take the appropriate actions to come into compliance.⁹⁶ In order to discourage polluters, the penalties must be severe enough to successfully deter future violations.⁹⁷

Second, enforcement requires resources, personnel, and the willingness on the part of the enforcer.⁹⁸ In many states, enforcers are aware that agriculture is a very large industry that provides jobs not only directly on the farm but also in manufacturing, services, wholesale, retail, finance, insurance, real estate, transportation, communication, utilities, construction,

89. OFFICE OF WATER, U.S. ENVTL. PROT. AGENCY, PRODUCERS’ COMPLIANCE GUIDE FOR CAFOs 17–18 (2003), available at [http://yosemite.epa.gov/opei/Sbrefa.nsf/0/075c8d8508d15d6385256d050064f0b0/\\$FILE/4153.pdf](http://yosemite.epa.gov/opei/Sbrefa.nsf/0/075c8d8508d15d6385256d050064f0b0/$FILE/4153.pdf).

90. *Id.* at 17.

91. *Id.*

92. WIEDEMAN, *supra* note 78.

93. CENTNER, *supra* note 71, at 143.

94. *Id.* at 132.

95. *Id.* at 132–33.

96. *Id.* at 133.

97. *Id.* at 132.

98. *Id.* at 133.

and government.⁹⁹ To demonstrate the magnitude that agriculture can play in an economy, this article uses Wisconsin as an example. In the state of Wisconsin, sixteen million acres undergo some type of agricultural production, which accounts for forty-four percent of the total land in the state.¹⁰⁰ Agriculture is responsible for \$16.8 billion or 10% of Wisconsin's total income.¹⁰¹ Finally, 12.2% of the state is employed by agriculture or some sort of agricultural service.¹⁰² This large impact on the state economy causes significant political pressure, thus affecting the willingness of enforcers. While this may be an example of why an enforcing agency is unwilling to enforce the law, it is often difficult to distinguish between unwillingness and inability caused by lack of personnel.¹⁰³ In either case, the lack of enforceability allows for continued manure runoff, which leads to environmental degradation.¹⁰⁴ Centner concludes that both accountability and enforcement by the government have failed to achieve the desired water-quality goals, and "additional regulatory action" is needed to increase compliance.¹⁰⁵

E. Additional Manure Management Solutions

A potential solution to the manure waste management problem suggests that the monitoring of manure production through the use of monetary incentives and taxes is part of the answer to dealing with excess manure.¹⁰⁶ One possible incentive is to charge animal operations a tax for producing above the optimal level of waste.¹⁰⁷ To avoid the tax, animal operators would keep manure production at the level where the marginal benefits would equal the marginal social costs.¹⁰⁸ The level is determined by the amount of nutrients the soil can utilize and the tax would represent the

99. See generally Steven C. Deller, *Wisconsin and the Agricultural Economy*, in AGRICULTURAL & APPLIED ECONOMICS STAFF PAPER SERIES (2004), available at <http://www.uwex.edu/ces/ag/wisag/2004/documents/wisconsin%20and%20the%20ag%20economy%20-%20deller.pdf> (applying research to the impacts of agriculture on the Wisconsin economy).

100. *Dairy*, FORWARD WISCONSIN, <http://www.forwardwi.com/sub108/Dairy> (last visited Feb. 12, 2011).

101. Deller, *supra* note 99, at 16.

102. *Id.*

103. CENTNER, *supra* note 71, at 138.

104. *Id.* at 138.

105. *Id.* at 143.

106. Zilberman et al., *supra* note 1, at 177.

107. *Id.* at 163.

108. *Id.*

social cost caused by any runoff of nutrients due to lack of soil utilization availability.¹⁰⁹

A second incentive based recommendation is a cap and trade program that distributes permits to producers that cap their waste allotment based on historical production levels and allows for trading of the permits.¹¹⁰ The final incentive based recommendation is to offer producers a subsidy that is equal to the optimal level of waste for reducing their manure production below its initial level.¹¹¹ The idea behind these recommendations is that producers' self-interest in the monetary incentives or taxes will lead them to act in a responsible manner and reduce their manure production to socially optimal levels.¹¹²

Another potential solution to the manure waste management problem suggests the following economic solutions in order to provide for "environmentally friendly manure management."¹¹³ First, there are greater environmental benefits when animal producing facilities are smaller and are greater in number.¹¹⁴ In order to establish these smaller and more frequent facilities, the combination of "a per acre limit on animal numbers" or "a direct limit on the size of facilities" would need to exist.¹¹⁵ Second, "economic efficiency may be enhanced by regulating observable producer choices that affect both their manure spreading practices and the environmental effects of these practices."¹¹⁶ Lastly, greater regulation of producer choices will decrease the risk of spills and leaks associated with manure storage facilities.¹¹⁷ These suggestions strive to create the abovementioned smaller and more spaced out facilities, thus creating "environmentally friendly manure management."¹¹⁸

As described earlier, CAFOs do not have the acreage necessary to apply manure at an agronomical rate.¹¹⁹ As animal concentrations have increased over the years, the average acreage owned by a farm has remained virtually unchanged since the 1970's.¹²⁰ This difference in growth between farm acreage and animal concentration resulted in more manure without

109. *Id.* at 162–63.

110. *Id.* at 163.

111. *Id.*

112. *Id.*

113. Innes, *supra* note 74, at 113.

114. *Id.* at 112.

115. *Id.* at 112–13.

116. *Id.* at 113.

117. *Id.*

118. *Id.*

119. *See supra* Part I.B.

120. *American Farms, supra* note 4.

providing additional land for manure application.¹²¹ Based on agriculture trends of growth and overproduction, this article discusses a solution that can help to mitigate the manure runoff problems without waiting for regulatory, monetary, or governmental incentives to create change. These solutions require legislative action, extensive resources, and a significant amount of time for implementation. The “National Research Council has suggested that reducing nutrient loading of agricultural land will be difficult to achieve unless alternative means of using animal manure by-products are developed.”¹²² For these reasons, this article suggests a community based approach to supplement existing regulations, which does not require the same level of resources to implement.

III. COMMUNITY BASED INITIATIVE CASE STUDY

“CAFOs have failed us. They have damaged our farming communities, degraded our natural resources, and polluted our watersheds.”¹²³ The Environmentally Concerned Citizens of South Central Michigan (ECCSCM) believe that CAFOs are creating a great deal of harm to their community. The ECCSCM works hard to raise community awareness and provide contact information for South Central Michigan community members to the local air, water, and emergency pollution hotlines where they can report the citing of any pollution.¹²⁴ However, the ECCSCM are doing more than just complaining about the pollution caused by CAFOs, they are challenging the local community members to adopt best management practices by planting “aromatic or flowering plants; lilac, fruit trees, pines, crabapples, hawthorns, pussy willow, forsythia, trumpet honeysuckle, witch hazel, wild grape, American cranberry, sage, and lavender.”¹²⁵ Additionally, the ECCSCM provides an exhaustive list of the local greenhouses alongside instructional information on how to plant and maintain the new fauna.¹²⁶ This is an example of a community based initiative which is used to supplement existing regulation in order to help curb the stench, noise, dust, and discharges from local CAFOs. It is suggested that community involvement is the best way to find a creative

121. *See supra* Part I.B.

122. Edwards & Someshwar, *supra* note 53, at 4.

123. ENVIRONMENTALLY CONCERNED CITIZENS OF SOUTH CENTRAL MICHIGAN, <http://nocafos.org/> (last visited Feb. 12, 2011).

124. *Id.*

125. ENVIRONMENTALLY CONCERNED CITIZENS OF SOUTH CENTRAL MICHIGAN, <http://nocafos.org/hedge.htm> (last visited Feb. 12, 2011).

126. *Id.*

solution to current pollution problems. Instead of pitting the community against the CAFOs, it is more effective to have a community based initiative to curtail the pollution problem.¹²⁷

IV. FUTURE EXTENSION NEEDS

In this section, this article looks at all the information that has been presented thus far and makes a community based recommendation that supplements existing regulations. The community level is important to discuss, because these are the people that live, work, and maintain lives in and around CAFOs. Why would it be the job of the local community to help CAFOs with their excess manure problem? As discussed earlier, it is often the case that CAFOs are located on a very small amount of land while maintaining a large concentration of animal units. This imbalance of land acreage to animal numbers results in far more manure production than can be appropriately applied to the land. However, someone may own the land within a distance where CAFOs can apply their excess manure for a feasible cost. This is where the community plays a vital role. A manure bartering system is described in this part, demonstrating the benefits that can occur from a community-CAFO relationship.

A. Manure Bartering System

Manure has benefits when applied at agronomical rates.¹²⁸ Since CAFOs do not have the land acreage for agronomical application rates, it becomes necessary for initiatives to find land for the excess manure.¹²⁹ In 1992, the Water Quality Demonstration Project-East River (WQDP-ER) located in Wisconsin developed a manure bartering system.¹³⁰ Two lists were created, one with the names of those wanting to dispose of manure and one with the names of those willing to receive manure.¹³¹ These lists proved to be a very useful tool to provide an exchange of information.¹³² In some cases, those needing to dispose of manure were unaware that there were people willing to receive manure within a few miles of their

127. Ribaldo, *supra* note 82, at 149.

128. Risse et al., *supra* note 8, at 286.

129. *Id.* at 303.

130. Kevin A. Erb, *Manure Bartering: Linking Farmers without Manure to Those with Too Much*, <http://www.p2pays.org/ref/21/20005.htm> (last visited Feb. 12, 2011).

131. *Id.*

132. *Id.*

operation.¹³³ The WQDR-ER found that giving this information to those needing to dispose of manure was a successful idea.¹³⁴

The WQDR-ER had to overcome a few challenges before initiating their manure bartering system.¹³⁵ One of the initial concerns with this system was that no one was aware of the benefits that manure could have on their land.¹³⁶ Before the bartering system was initiated, few community members located near operations that had excess land understood the benefits.¹³⁷ In order to overcome this challenge, the WQDR-ER released articles in their newsletter and newspapers about the benefit of manure application.¹³⁸ From there, they asked community members to consider joining the list.¹³⁹ This was a long process, but showed good results.¹⁴⁰

Another challenge faced by WQDR-ER was convincing CAFOs with surplus manure to join the list.¹⁴¹ They found that CAFOs did not want to be labeled as having too much manure, because of the concern of being seen as a potential polluter.¹⁴² In order to overcome this concern, the WQDR-ER kept the list of those needing to dispose of manure private.¹⁴³ Once both lists grew to more than twenty names, those needing to dispose of manure were given the names of the nearest community members that would be willing to take excess manure.¹⁴⁴ After a year of implementation, the manure bartering system documented twenty-two exchanges.¹⁴⁵

This type of manure bartering system is something that could be beneficial across the entire country. As described above, manure offers many benefits to the land. However, if it is not applied at agronomical rates, then there is potential for manure to cause serious environmental degradation. Currently, manure is viewed as a waste and a pollutant. CAFOs do not have the time or resources to transport its excess manure many miles away from its production site. For this reason, it is over-applied to land near the operation. Regulations require CAFOs to receive NPDES permits in the attempt to regulate water pollution. However, due to a lack of

133. *Id.*

134. *Id.*

135. *Id.*

136. *Id.*

137. *Id.*

138. *Id.*

139. *Id.*

140. *Id.*

141. *Id.*

142. *Id.*

143. *Id.*

144. *Id.*

145. *Id.*

accountability and enforcement, most CAFOs fail to obtain permits. These shortfalls explain why alternatives are needed.

A manure bartering system would be a cost effective way for CAFOs and their local communities to dispose of manure onto land that will either benefit from the manure application or where there is not danger of manure running off into nearby bodies of water. In one case monitored by the WQDP-ER, it was discovered that one CAFO was renting land several miles away but directly across the street from a different CAFO.¹⁴⁶ At the same time, the second CAFO was also renting land close to the first CAFO.¹⁴⁷ Due to the great distance of the rented land from the CAFOs, both facilities were over-applying manure to land owned adjacent to their operations.¹⁴⁸ After the development of the manure bartering system, it was discovered that the operations were renting land near to each other and both had excess manure.¹⁴⁹ This realization allowed for the CAFOs to apply excess manure on the other operation's rented land.¹⁵⁰

Today, regulations are not mitigating the problem of pollution caused by manure runoff. This pollution creates concern among citizens that live and work near CAFOs. As seen in the case of the Environmentally Concerned Citizens of South Central Michigan, it is important for the community to become involved and help mitigate the pollution. The ECCSCM is doing this by raising awareness within the community. This is a community involvement step that allows the local population to do more than just complain about the pollution caused by the CAFOs. A manure bartering system has the potential to build a relationship between CAFOs and the local community. In a situation where there is already community involvement and the willingness to make change, there is a greater likelihood that this type of system would be successful.

Environmental degradation caused by manure runoff is a serious issue in the United States. Current regulations are not effective. Suggested monetary solutions could take a long time to implement. Other areas of research such as removing phosphorus from manure before applying it to the land, using manure to produce energy, and removing the liquid in order to make it easier to transport are expensive processes and are still in the beginning stages of research. However, a manure bartering system could begin tomorrow and for free.

146. *Id.*

147. *Id.*

148. *Id.*

149. *Id.*

150. *Id.*

This article's recommendation to concerned community members, extension workers, and worried CAFOs is to start developing relationships within the community that would facilitate the application of manure onto nearby lands. While this is not the answer that will solve all manure pollution problems, it provides a partial solution from the disposal of excess manure and helps to mitigate the manure pollution problem. While a manure bartering system can start to mitigate the excess manure problem, enforcers will be given time to continually develop their working relationship with CAFOs in order to ensure the success of current regulations.

CONCLUSION

Finding an effective solution to the problems associated with animal waste is a great challenge for policy makers, CAFOs, and community members. It is clear by looking at manure, and the potential pollution problems it poses on water systems, that manure pollution caused by runoff is a serious environmental concern. It is very difficult to target manure pollution because of the multidimensionality of the problems that it produces.

Manure offers many benefits to soil and nutrients which are readily available for plant uptake; however, these benefits are not fully understood and are under-researched. Manure is over applied to the land because of limited availability of land, high transportation costs, and other limitations. The over application of manure can result in runoff. Policymakers have been addressing the challenges associated with animal waste for over thirty years. Still, the dimensions, concerns, and political power of the industry place constraints on enforcement and regulation compliance.

Over time, citizens, especially those living in and around communities with CAFOs, have become increasingly aware of the water pollution problems caused by manure runoff and have started to take individual steps toward finding a solution. Research suggests that regulations, for a variety of reasons, have not been successful in solving water quality issues. Acclimating enforcers and CAFOs to the regulations is going to take time, but that does not mean there is nothing that can be done to mitigate the pollution in the meantime. Community members can urge others to implement best management practices and plant trees and flowering plants in places where manure runoff causes environmental damage. In addition, recommendations for a manure bartering system have been made that would facilitate a relationship between community members and CAFOs.

This bartering system is necessary because CAFOs lack the acreage required for manure to be appropriately applied.

However, a manure bartering system is not the final answer. CAFOs still need to develop good management practices and work to achieve compliance with current regulations. A manure bartering system can supplement current regulation and help to mitigate water pollution caused by manure runoff and mismanagement of manure.