Nutrient Management Issues

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Interference with Amenities

In 1999 Chapin and Boulind found that the effects of large hog farms are far reaching. Besides the odor and gases, nearby residents must cope with an increasing number of flies, rats, and other scavenging animals. Improperly managed manure wastes and pre-slaughterhouse carcasses threaten water quality. The close proximity of humans to these facilities raises concerns that infectious diseases may cross over from hogs to humans. In addition, new evidence indicates that the use of antibiotics in industrial swine production can contribute to the increase of antibiotic resistance in human pathogens. [1]

A study of 1,106 rural communities by Gómez and Zhang of Illinois State University found that large hog farms tend to hinder rural economic growth at the local level.. All models in the study indicated an inverse relationship between hog production concentration and retail spending in local communities. Economic Growth rates were 55% higher in areas with conventional hog farms as opposed to those with larger hog operations in spite of the fact that economic growth rates had been almost identical in all the studied communities before the advent of larger hog operations in the1990s. Data in the study also showed that communities with heavy hog concentration suffered larger population losses than those with conventional hog operations. According to the authors, the results of this study suggest that without public policy to protect rural communities, the most probable outcome is the continuing decline of rural communities in the future as the size agriculture and livestock production units continue to increase.[2]

A study by Palmiquist, Roka and Vulkina (1998) shows that large hog operations tend to depress the sales value of nearby homes and real estate.[3] An eighteen month study of 75 rural land transactions near Premium Standard's hog operations in Putnam County, Missouri that was conducted by the departments of Agricultural Economics and Rural Sociology at the University of Missouri found an average $58 per acre loss of value within 3.2 kilometers (1.5 miles) of the facilities. This study primarily evaluated farmland without dwellings. These findings were confirmed by a second study at the University of Missouri-Columbia by Hamed, Johnson, and Miller that found that proximity to a hog ILO does have an impact on property values. Based on the averages of collected data, loss of land values within 3 miles of a hog ILO would be approximately $2.68 million (US) and the average loss of land value within the 3-mile area was approximately $112 (US) per acre.[4]

These findings were further substantiated by a Sierra Club study that found that tax adjustments by county assessors in at least eight states lowered property taxes for neighbors of factory farms. As Table 1 shows, local property tax assessments were lowered in Alabama, Illinois, Iowa, Kentucky, Maryland, Michigan, Minnesota and Grundy County, Missouri. Grundy County has lowered some residents' taxes by up to 30% due to their close proximity to the corporate hog operations of Continental Grain.

Table 1--Property Tax Reductions In Areas Around ILOs

Area	Amount of Reduction	Reduction In Value Of:
Grundy Co, MO	30%	
Mecosta Co, MI	35%	dwellings only
Changed to	20%	total property (land and structures)
Midland Co, MI	20%	
DeWitt Co, IL	30%	rescinded
McLean Co, IL	35%	
DeKalb Co, AL	base reassessment, variable rates	

Renville Co, MN	base reassessment, variable rates	dwellings only
Humbolt Co, IA	20-40%	dwellings only--now rescinded
Frederick Co, MD	10%	now reduced to 5%
Muhlenberg Co, KY	18%	dwellings only

Radius of reduction varied, up to 2 miles. All were for hogs except Muhlenberg, for chickens.
Source: Property Tax Reductions, scott.dye@sfsierra.sierraclub.org, March 13, 2000

Odor From Injection of Manure

Actual field tests on injection odor were conducted in Iowa in 1998 by Iowa State University. The researchers found that injecting manure resulted in odor reductions of as little as 50% and never greater than 75% compared to broad-cast applications (application by sprinkler--the highest odor option.)[5] Thus, injection of manure is not odor free and it can be accompanied by excessive odor.

Groundwater Contamination From Manure Injection

Injection of liquid manure is only acceptable in areas where pathways to the underlying groundwater do not exist. Improperly closed wells are a likely source of groundwater contamination. For example, based on a number of scientific studies, the US Department of Agriculture's Agricultural Waste Management Field Handbook states specifically that

> (n) Presence of abandoned wells and other relics of past use
> The site and its history should be surveyed for evidence of past use that may require special design considerations…. If an abandoned well exists on the site, special efforts are required to determine if the well was sealed according to local requirements. An improperly sealed well can be a direct pathway for contaminants to pollute an aquifer. Other remnants of human activity, such as old foundations, trash pits, or filled-in areas, require special design or site relocation.[6]

The Field Handbook also stresses that caution is necessary because openings formed after initial deposition or formation of the soil enable contaminants to move to the groundwater with little attenuation (reduction) or filtration.[7]

Phytase Use and Excreted Phosphorus

The use of phytase to reduce excreted phosphorus does not result in a firm, guaranteed reduction. Studies have found that the amount of reduction varies significantly and is heavily dependent on specific feed types and application rates. The following studies provide an overview of the reductions various researchers have experienced:

(a) Harper, Zhang, and Kornegay, of the Virginia Polytechnic Institute and State University, Blacksburg, USA, estimated that 500 U/kg of phytase released .96 g of P for grower-finisher pig utilization and reduced fecal phosphorus excretion by 21%.[8]
(b) Harper, Kornegay, and Schell, also of the Virginia Polytechnic Institute and State University, Blacksburg, USA, found in a second study that phytase reduced fecal phosphorus excretion by 21.5%.[9]

(c) Ragland, Orban, Cline, Sutton, and Adeola of Purdue University state only that the results of three experiments suggest that phytase would have an environmental benefit of reducing phosphorus concentrations in manure.[10]

(d) Nasi, Partanen, and Piironen, in a study done by the Department of Animal Science, University of Helsinki, Finland, found that the addition of phytase improved absorption of phosphorus by 21% in a barley-soy bean meal diet and 29% in a maize-soy bean meal diet.[11]

(e) Simoes and Guggenbuhl, in a French study, found that when used in animal feed, phytase decreased the phosphorus concentration in feces between 13 and 33%.[12]

(f) Kemme, Radcliffe, Jongbloed, and Mroz, in a study by the Institute for Animal Science and Health (ID-DLO), Department of Nutrition of Pigs and Poultry, Lelystad, The Netherlands, concluded that phytase enhanced total P apparent total tract digestibility by an average of 18.1 percent. Digestibility of phosphorus was lower in pigs housed in pens than in pigs housed in metabolic crates and they noted that estimates of total P digestibility using pigs in metabolic crates are lower than estimates in practice.[13]

(g) Yi, Kornegay, Ravindran, Lindemann, and Wilson, of the Virginia Polytechnic Institute and State University, Blacksburg, USA, found that fecal phosphorus excretion (grams per day) decreased as microbial phytase was added ($P < .01$) and increased with added phosphorus ($P < .01$). In comparison to the results with the .32% phosphorus diet, fecal phosphorus excretion decreased 25 to 50% by the addition of phytase. [14]

In sum, there is no firm, standard rate for phosphorus reductions in hog excreta with phytase use. Implications that a specific rate would result from a proposed operation are highly speculative and use of a single rate instead of a range of likely reduction rates to calculate spreadable acreage requirements is not supported by the majority of research results.

The Difference Between Animal Manure and Inorganic Fertilizer

Statements that manure application by subsoil injection at agronomic rates has a risk of groundwater contamination that is no different than inorganic fertilizer ignore the non-nutrient content of animal manure. A large number of diseases are present in animal manure. These diseases are not present in inorganic fertilizers. Table 2 shows that the potential presence of 25 different diseases in animal manure make this form of fertilizer very different from the inorganic chemicals that are used as crop fertilizer.

Table 2, Diseases and organisms spread by animal manure

Disease	Responsible organism	Disease	Responsible organism
Bacterial		Viral	
Salmonella	Salmonella sp	New Castle	Virus
Leptospirosis	Leptospiral pomona	Hog Cholera	Virus
Anthrax	Bacillus anthracis	Foot and Mouth	Virus
Tuberculosis	Mycobacterium tuberculosis	Psittacosis	Virus
	Mycobacterium avium		
Johnes disease	Mycobacterium	Fungal	
	paratuberculosis	Coccidioidomycosis	Coccidoides immitus
Brucellosis	Brucella abortus	Histoplasmosis	Histoplasma capsulatum
	Brucella melitensis	Ringworm	Various microsporum
	Brucella suis		and trichophyton
Listerosis	Listeria monocytogenes	Protozoal	
Tetanus	Clostridium tetani	Coccidiosis	Eimeria sp.
Tularemia	Pasturella tularensis	Balantidiasis	Balatidium coli.
Erysipelas	Erysipelothrix rhusiopathiae	Toxoplasmosis	Toxoplasma sp.
Colibacilosis	E.coli (some serotypes)		
Coliform mastitis	E.coli (some serotypes)	Parasitic	
Metritis		Ascariasis	Ascaris lumbricoides
		Sarcocystiasis	Sarcocystis sp.
Rickettsial			
Q fever	Coxiella burneti		

Source: Agricultural Waste Management Field Handbook, United States Department of Agriculture Soil Conservation Service, April, 1992, p. 3-13, 3-14.

The pathogens present in hog manure are not found in inorganic chemicals. These pathogens could be transported to ground water supplies through improperly sealed wells or other naturally occurring pathways. Studies released since 1999 have found that:

(a) Swine herds are a potential animal reservoir for Swine Hepatitis E Virus and this virus is present in fields to which manure has been applied and in water waste from these fields. Swine Hepatitis E Virus may persist in the environment for at least 2 weeks and possibly longer.[15]

(b) A broad profile of chemical and microbial constituents are present in both ground and surface water proximal to large-scale swine operations--chemical (pesticides, antibiotics, heavy metals, minerals, and nutrients) and microbial (Escherichia coli, Salmonella sp., Enterococcus sp., Yersinia sp., Campylobacter sp., Cryptosporidium parvum) contaminants were present.[16]

(c) Antibiotics are present in waste generated at confined animal feeding operations and may be available for transport into surface and ground water.[17]

These data directly contradict the contention the risk of groundwater contamination from hog manure is no different than that from inorganic fertilizer. In fact, the use of animal manure for fertilizer carries with it not only all the contamination issues associated with inorganic fertilizers but also a large number of additional pollution and health concerns.

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