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The Economics of North Carolina

Hog Farming and Lagoon Management in North Carolina: The Environmental Perspective

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Starting in the 1980's and moving through the mid 1990's, hog farming in North Carolina underwent a substantial and rapid growth. North Carolina's hog farming population grew from 900,000 hogs in 1990, up to roughly 5 million in 1998 and is the second largest leading swine producer, second only to Iowa. The other major swine producing states are Minnesota and Illinois. Roughly sixty percent of the United States' hog supply is from these four states (Growth of a Billion Dollar Industry, paragraph 1). Swine herding is roughly worth $1 billion dollars annually to the state of North Carolina (Growing Hogs and water Quality, paragraph 4).

Simpson and Dublin counties are located near the coast and account for roughly 10 percent of the total US swine herd supply. Dublin County is the second largest swine producing county in the nation. The two main watersheds in North Carolina that are affected most by hog farming are the lower Cape Fear watershed and Black River watershed. The Cape Fear watershed consists of 42 percent on North Carolina's hog farming and the Black River 53 percent. Thus, these two watersheds encompass 95 percent of North Carolina's hog industry. Because of the increase in hog farming, the hog capacity in these two areas has increased. In this area, the hog population rose from roughly 225,000 in hogs in 1990 to an estimated 2.5 million in 1998.

Many North Carolinians were concerned with the rapid increase in hog production within the state and were afraid that it would have a negative impact on the environment. In 1997, the state created a moratorium on any new swine operations. The moratorium still exists to this day (North Carolina Hog Farming and Water Quality, paragraph 2, 3, 5 and 15).

Although hog farming in North Carolina is a big business and brings a lot of money and jobs to the state, there are many externalities that come along with hog farming. Many of the externalities are concerning environmental effects. Hog farming affects the environment in three main ways: water quality, air quality and soil quality. The most predominate environmental cost is the effect of hog farming on water quality. Water quality can be affected by dumping of hog wastes or dead hogs into streams, runoff by fields, or natural disasters.

Direct Dumping

Because of laws set forth by legislation, direct dumping of hog wastes into streams, lakes or rivers is illegal. Before legislations, many farmers would directly dump manure or dead pigs into rivers, which contaminated the rivers. Once the state recognized this problem, the state created regulations by which the farmers must abide when dumping any animal products. All farms throughout North Carolina have regulations that require farmers to adopt a whole-farm waste management plan. This plan specifies how manure is to be stored, how much manure is to be applied to fields, the nutrient balance of the manure, the crops to be grown on land, where it is applied and rates and timing of application. As well, growers must provide a vegetative buffer at least twenty-five feet wide between streams and fields where manure is applied (Applying Lagoon Liquid Wisely, paragraph 47 and 48).

Dangerous Materials

Consequently, hog wastes still end up seeping into the ground water due to inadequate hog lagoons or runoff. There is no doubt that hog farming adds nutrients to a watershed but nitrogen and other nutrients such as phosphorus is what seems to pose the greatest environmental cost to water quality in North Carolina (PARAGRAPH 10). Ground water is affected when soil below the root zone contains levels of high concentration of nitrogen and other nutrients. In some cases, the nitrogen will move through the soil and into the ground water, contaminating both soil and ground water. If the nitrogen or other harmful nutrients contaminate ground water that flows into drinking water supplies, it could pose a threat to humans. Also, the nitrate can be carried to other lakes and streams contaminating them as well (PARAGRAPH 14 AND 15).

Elevated levels of nitrate in the human body can alter the body's ability to transport oxygen, causing a condition known as Blue Baby Syndrome. Although, there has never been a case reported in North Carolina, multiple sites throughout the Black River and Cape Fear watersheds have had reported levels above healthy limits.

Phosphorus is also present in hog manure and is another cost to the environment. Phosphorus is not soaked up by the soil as rapidly as nitrate but collects on the surface and is carried away by runoff into lakes and streams. This runoff causes a build up of sedimentation, which contains phosphorus and nitrate, and is known to be the biggest threat to North Carolina water quality. (PARAGRAPH 20). When water with high levels of nitrate or phosphorus become stagnant or slow-moving, a rare occurrence called eutrophication can occur. Eutrophication is when the nutrients in the water, such as nitrate or phosphorus, speed up the growth of algae. Algae consume a lot of the oxygen in the water and can deprive other plants and animals living in the water of oxygen.

Fertilization

Water contamination can also occur from fertilizers that are sprayed on crops adjacent to the hog farms. A specific amount of manure is allowed to be sprayed on crops as fertilizer. But with excessive rain, the fertilizer can become run off and contaminate the streams. This is another example of why phosphorus and nitrate levels in streams surrounding hog farms are exceeding regulations.

Commercial fertilizers have also been traced in causing high nitrogen and phosphorus levels in the ground water. The commercial fertilizers not only cause this contamination but can be very toxic in large amounts when consumed by plants or animals.

Other Sources of Water Contamination

Even though many nitrate and phosphorus contaminations of watershed can be attributed to hog farming, hog farming is not the only one to blame. Many rural areas contribute a lot of the wastes that contaminate the watersheds:

> "When compared to watersheds draining the urban area of Fayetteville, Durham, and Greensboro, with their large paved areas, storm water delivery systems and waste water treatment plans, the impacts from farming in the coastal areas seem patently innocuous. These areas report far higher concentrations of nutrients, sediments, and metal than do rural areas in Sampson and Duplin counties (North Carolina Hog Farming and Water Quality, paragraph 51."

In many wells in surrounding areas of hog farming, levels of high nitrate have been found but could not directly be traced back to hog farming. In some cases, the wells were near septic lines and septic systems and were thought responsible for the high nitrate levels.

Preventive Measures

Along the way, many preventative measures have been taken to decrease the amount contamination from hog manure. The restrictions on the building of the hog lagoon are constantly being added and revised. The North Carolina Cooperative Extension Service has provided hog farmers with the most available and latest information on proper construction of lagoons since the early 1970's. The restrictions consist of hog large the lagoon is allowed to be, how deep, what type of liners must be used, clay barriers must line the bottom of the lagoons and many more.

The lagoons are constantly sprayed with anaerobic bacteria which is carbon-containing compounds that decompose the manure. The manure then turns into the

harmless nitrate into either carbon monoxide, methane, ammonia or ammonium and is released into the air, decreasing the chance that the nitrogen will make it into the watersheds or nearby lakes and streams. Much of the manure from the lagoons is sprayed on adjacent crops to take the place of commercial fertilizers. This not only helps the crops growth but lowers the levels of manure which decreases the chance of an overflow of the lagoon.

Another way of preventing water contamination is by having riparian buffers. Riparian buffers are rows of plants or trees that line the streams and help prevent a good amount of nitrate from reaching surface waters. The buffers turn the nitrate into a gaseous form and release it into the atmosphere. Although, if levels become too high, the riparian buffer can become overwhelmed and nitrate levels in the water will rise (paragraphs 39-31).

Ways to Lower Impact on Environment

One of the newest technologies that are helping decrease the amount of contamination from hog manure is through the waste water treatment plants. Even before the manure is sprayed as fertilizer onto the crops, a biological nutrient removal (BRT) is sprayed over the lagoon. The BRT can also be sprayed directly onto crops and fields, to further remove the harmful waste products. This new adopted process will not only help water quality by decreasing harmful nutrients, but will save water treatment plants money by not having to filter these nutrients out of the water (paragraph 11).

The physical changes and in-stream processes can cause a dramatic effect on water quality and exports of nutrients from watersheds. Throughout the Cape Fear River Basin, rivers and streams have been de-snagged and cleared to create a better flow of

water and to decrease flooding in the area. Although this has caused a change in the ecosystem for marine life, scientists conclude that in order to keep our waters clean, society may need to rethink their attitudes about flood control, wildlife and wetlands (paragraph 52).

Scientists at North Carolina State University have an on-going research looking for other methods in dealing with excess nutrients. One method of dealing with excess nutrients is producing constructed wetlands. These constructed wetlands will transform the nutrients in roughly the same manner as the riparian buffer. Also, more research is being conducted on lagoon wastes possibly becoming fertilizer for hardwood forests. Research is also getting underway for a new alternative for fertilizer called struvite. Struvite normally forms in wastewater and scientists believe struvite could be harvest in streams which run along hog farms. (Water Quality, paragraph 45).

Natural Disasters and the Effects on Hog Farming

Weather can play a huge role in effectively managing hog manure and lagoons. Substantial rains in hog farming areas can cause the lagoons to overflow or the walls surrounding the lagoons to break, allowing for the hog waste to enter nearby streams and rivers. During the mid 1990's, a series of sever weather storms swept through the coastal areas of North Carolina and caused major flooding of streams and river. After Hurricane Fran, the US Department of Agriculture granted federal grants to coastal areas to help with clean up. Much of the environment was effected by downed trees and having to clean out materials from rivers and streams but according to the NC DENR report, hog farming might have had a big impact on the amount of damage down by the storm: "…it is difficult to separate out the effects of de-snagging in these streams from the potential

impact of increased numbers of hog farms within the same area." Although much of the damage from Hurricane Fran could not have been anticipated, overflow of hog lagoons is one issue that the state is looking into and deciding how this problem can be better managed in the case of another hurricane (Paragraph 42.)

Another incident in North Carolina effecting water quality was after Hurricane Floyd. A hog lagoon broke and spilled over two million gallons of waste from Lanier Farm in Rose Hill into a tributary in the Northeast Cape Fear River. Two other hog lagoons on the farm burst as well. Sampson and Pitt country were also two counties to get hit hard by the hurricane and many of their hog lagoons overflowed as well (Stancill, paragraphs 5-11).

In October of 1999, a hog farm in Hurdle Mills, Orange County, was told to shut down to continuous lagoon spills and numerous fines due to water pollution. Fred McPherson, the owner, was illegally dumping wastes into neighboring waters and two of his lagoons did not pass state regulations (Williams, paragraphs 3 and 5).

Environmental Groups

The Environmental Quality Improvement Program (EQIP) is a program that provides educational, technical, and financial assistance to farmers to concentrate efforts on soil, water, and natural resource concerns. The program wants farmers to address these to become more environmentally beneficial and cost-effective. This organization wants to work with farmers to make sure they are complying with state and national regulations to ensure environmental quality.

The North Carolina Agriculture Cost Share Program helps to reduce agricultural pollution in state waters. This program established in 1984, works with farmers and

renters to help them improve on-farm management programs. The Agricultural Cost Share program helps farmers with the cost of installing the new technology and upholding new regulations. Roughly 75% of the costs of these upgrades is covered by the Agriculture Cost Share Program.

The Agricultural Sediment Initiative is a program funded by the NC Association of Soil and Water Conservation that gives its efforts to remove built-up sediments in stream channels and watersheds. This program monitors roughly 47 streams in 34 counties and 11 river basins to assess damages and severity of sedimentation related to agricultural activities Agricultural Best Management Practices Funding Opportunities, Chapter 11).

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