

Science Says

Science Facts & Analysis from Science for Georgia

Airborne Chicken Waste

Airborne chicken waste may cause detrimental effects on the GA timber and row-crop industry.

Introduction

Chicken waste is a natural part of poultry production. This waste, called litter, contains several things that can be harmful to chickens, humans, and the environment. To clean the chicken houses, growers regularly clean the floors, store the litter, and then use it to make fertilizer. They also use large fans to circulate the air in the houses to prevent the buildup of noxious gases.

The rich nitrogen content of chicken litter makes it an ideal fertilizer, but processing it requires time, effort, and proper storage to turn it into usable fertilizer and to prevent hazardous runoff into surrounding areas.

Anecdotally, tree and row-crop farmers are starting to notice ill effects on their crops located near poultry houses. This may be due to the large exhaust fans used for air circulation causing chicken litter to become suspended in the air as aerosols, which can travel great distances and affect surrounding land.

This fact sheet outlines frequently asked questions about chicken litter and potential airborne circulation.

Problem

Chicken litter contains nitrogen, which makes it a popular fertilizer after proper composting and treatment. There are three potential problems from chicken litter becoming airborne and then settling on row-crops, trees, and land.

1. The direct application of untreated manure is detrimental for plants and crops and can cause E. Coli and other health outbreaks.
2. Airborne chicken litter causes a different set of hazards than ground based manure.
3. Too much nitrogen can harm trees and row-crops.

Recommendations

To ensure that chicken litter is not harming the surrounding environment:

1. Monitor poultry farms to check that chicken litter is being properly stored and disposed.
2. Conduct annual soil & water analysis of neighboring land to ensure waste is not seeping into the environment at dangerous levels.

Facts & Analysis

What is the economic impact of various industries?

[GA Timber: \\$36.2B](#)

[GA Poultry: \\$28B](#)

What is chicken litter?

Chicken litter is the waste that accumulates on a chicken house floor and can include [wood shaving, rice hulls, sawdust, chicken feces, uric acid, feed, and feathers](#). This litter [contains the highest amount of nitrogen, phosphorus, and potassium](#) of all animal waste. After proper treatment, this makes the waste an ideal fertilizer.

One chicken produces about 10 pounds of chicken litter monthly; thus, a house of 5000 birds will produce 50,000 pounds of manure a month.

Chicken waste must be stored out of the elements, because untreated waste contains high levels of nitrogen which can cause environmental problems in surrounding waterways and farmland. Waste may also contain E. coli, Stenotrophomonas, Cladosporium, Salmonella, and Acremonium and these [pathogens can infect](#) neighboring crops, water, and air. These pathogens can cause [foodborne illnesses](#).

If chicken litter is used as a fertilizer, [studies have shown it can escape into the environment unless it is tilled into the soil](#).

How are chicken houses cleaned?

Typically, chicken houses are cleaned between each flock, and the litter is stored, treated, and turned into fertilizer.

The cost of bedding materials and waste storage and treatment have caused many producers in the US to recycle their bedding between flocks of chickens. Bedding can be recycled for over a year.

Commercial broiler chicken farms have [about 5 to 7 flocks per year](#). [Studies have shown](#) that proper treatment of litter between flocks makes reuse of the bedding a viable option; however, there are some concerns over the buildup of dust and bioaerosols in chicken houses.

Why is dust and bioaerosol buildup a concern?

As the number of flocks raised on recycled litter increases, the amount of dust and bioaerosols increases. Airborne chicken litter contains [hazardous gases](#) such as ammonia, hydrogen sulfides, and inorganic materials. Ammonia is difficult to get rid of and can spread [beyond the farm's property](#).

The litter can also [contain diseases that can become airborne and spread](#). [Studies suggest](#) that airborne transmission of an avian flu strain was responsible for decimating poultry farms in 2015.

Proper treatment and removal of chicken waste is necessary [to prevent hazardous concentrations](#) of bioaerosols in ambient air. Poultry farmers know that chicken houses need to be cleaned frequently and have adequate ventilation.

What is a bioaerosol?

[Bioaerosols](#) are created when wind or another source of airflow travel over soil or water and the airflow picks up small particles of pathogens, volatile gases, and dust. These particles become suspended in air. These tiny particles are small enough to be inhaled, potentially endangering human health if they contain bacteria, fungi, viruses, etc.

About [80% of bioaerosols](#) from chicken waste can be inhaled.

How far can airborne waste travel and carry these pathogens?

Bioaerosols are capable of long-distance travel.

Multiple studies have been conducted on how far dust and bioaerosols can carry downwind from a chicken house. One found [evidence of contamination at an almond orchard](#) over 100 feet away from the chicken house and saw an altered microbiome in the almond tree leaves. Another found that it is possible for [viable bacteria to travel several hundred feet](#) (about one to three football fields).

Temperature, presence of water, and other environmental factors can [influence survival](#) of airborne pathogens. [Ammonia concentrations](#), which are high in airborne chicken waste, are increased by hot and humid conditions - which is GA's typical summer climate.

What are the health effects of breathing bioaerosols?

Ill effects of a harmful substance are increased by long exposure time or high concentrations (which is why people are told to socially distance and make trips short to prevent COVID-19). It is no different with bioaerosols. People chronically exposed to bioaerosols, such as farmworkers and other occupational workers, show that they are [prone to respiratory aggravations](#), including [Avian Flu](#).

What are the crop effects of bioaerosols?

When airborne chicken litter settles on crops it will contain nitrogen, which in high concentrations can [decrease yield](#) and damage crops. Gardeners know to grow squash, cabbage, broccoli, and corn to use up excess nitrogen in their soil. While this makes the soil healthy again, [the crops are inedible and look sickly](#).

Additionally, the waste may contain diseases such as E. Coli, [which can cause health outbreaks if eaten](#).

What happens to trees when they get too much nitrogen?

When nitrogen composition is not correct, [it can inhibit pine growth](#).

Several studies have shown that [excess nitrogen](#) is [changing the chemical composition](#) of forests. At high levels, this [nitrogen saturation](#) can cause reduced [tree growth and even kill trees](#). Symptoms of too much nitrogen can be [yellow, wilted, or brown leaves](#). Additionally, the trees pull other nutrients out of the ground to balance out the nitrogen, which [can harm the surrounding forest vegetation](#).

[In one study](#) in New England, excess nitrogen caused red pine mortality to reach 56% and the loss of all forest biomass.

Summary

While there have been no direct studies on Georgia trees, the scientific evidence aligns with the anecdotal observations seen by Georgia tree farmers.

Increased nitrogen can cause harm to a forest, with symptoms such as yellowing and wilting trees.

Increased nitrogen can also cause damage to row-crops, esp. squash, cabbage, broccoli, and corn which are known to take in excess nitrogen.

Untreated chicken waste causes ill health effects, and this can be compounded when airborne chicken waste is breathed in.

Chicken manure contains E.Coli and other pathogens that can cause adverse health effects if spread on row-crops.

About Science for Georgia

Science for Georgia is a 501c3 dedicated to bridging the gap between scientists and the public through training, outreach opportunities, and direct contact with the public, policymakers, and the press. Science for Georgia highlights how science can impact people's lives and advocates for the responsible use of science in public policy.