Poultry House of the Future Concept

Jeannine Harter-Dennis Ph. D.
Dept. of Agriculture, Food and Resource Science
University of Maryland Eastern Shore
Princess Anne, MD 21853

Chesapeake Goal Line 2025: Opportunities for Enhancing Agricultural Conservation

October 6, 2010

Joint Venture between Academia, Industry, Non-profit, USDA and State Agencies to Benefit Delmarva

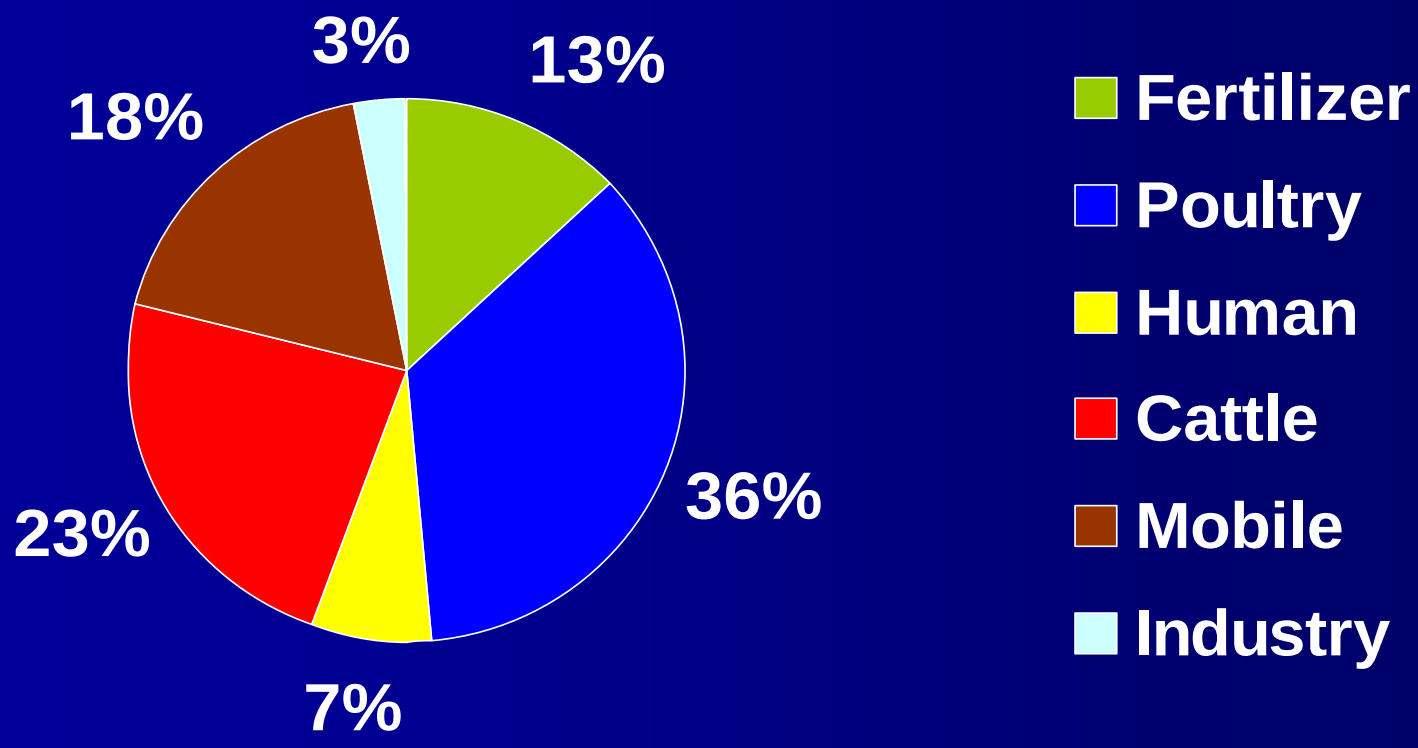
- University of Maryland Eastern Shore Campus (UMES)
- Avihome
- Department of Business and Economic Development (DBED)
- U.S. Department of Agriculture (USDA)
- Maryland Industrial Partnerships (MIPS)
- Department of Natural Resources (DNR)
- Maryland Hawk Corporation
- Maryland Department of Business & Economic Development

Introduction

- Ammonia gas is a by-product of broiler production that
  - Reduces bird performance
  - Causes environmental issues (air quality) including an increase in Particulate Matter (PM) which can affect human health
- Revisions to the Clean Air Act will set a fine particulate matter ($PM_{2.5}$) standard.
- Therefore management and dietary strategies need to be implemented to control ammonia emissions from poultry houses.

Estimated Ammonia Emission Sources for Chesapeake Bay Watershed

(Battye et al, 2000 – NH_3 in Airsheds & Watersheds Workshop)



What conditions are needed to produce ammonia?

- Nitrogen source
  - Uric acid in feces
- Microorganisms to convert uric acid to NH_3
  - Thrive well in the sawdust/woodshaving litter material
- Heat
- **pH levels of ~ 8 or above**
- **Moisture (drinkers and manure)**

If we can remove (or change) any one of these then we can reduce ammonia emissions

Current methods of NH_3 control

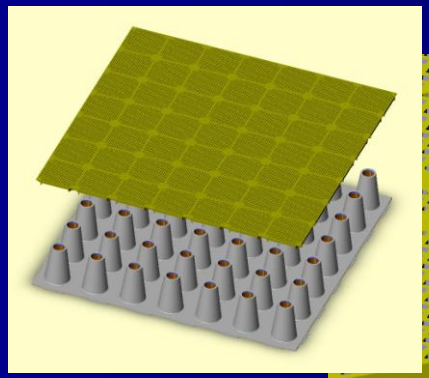
- Litter amendments that lower the pH of the litter
  - Effective for 2-4 weeks then ammonia levels rise
- Reduce wasted dietary protein
- 'Scrub' ammonia from the exhaust air

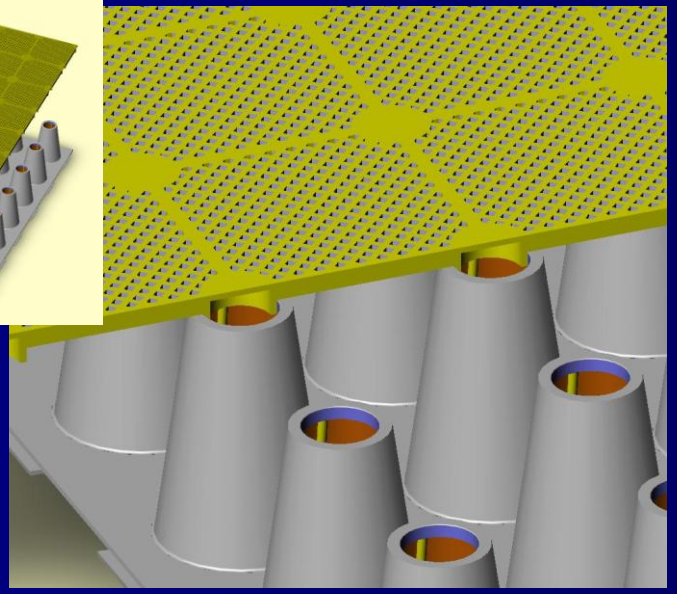
All of these are effective to some degree

Introduction

This project deals with the development of a **novel flooring system** that would reduce ammonia emissions from commercial broiler houses..

The plenum flooring is comprised of 18 in. X 18 in. interlocking squares made from injection molded polymers. The squares have engineered holes that allow moisture in the manure to be wicked away from the manure on the flooring.

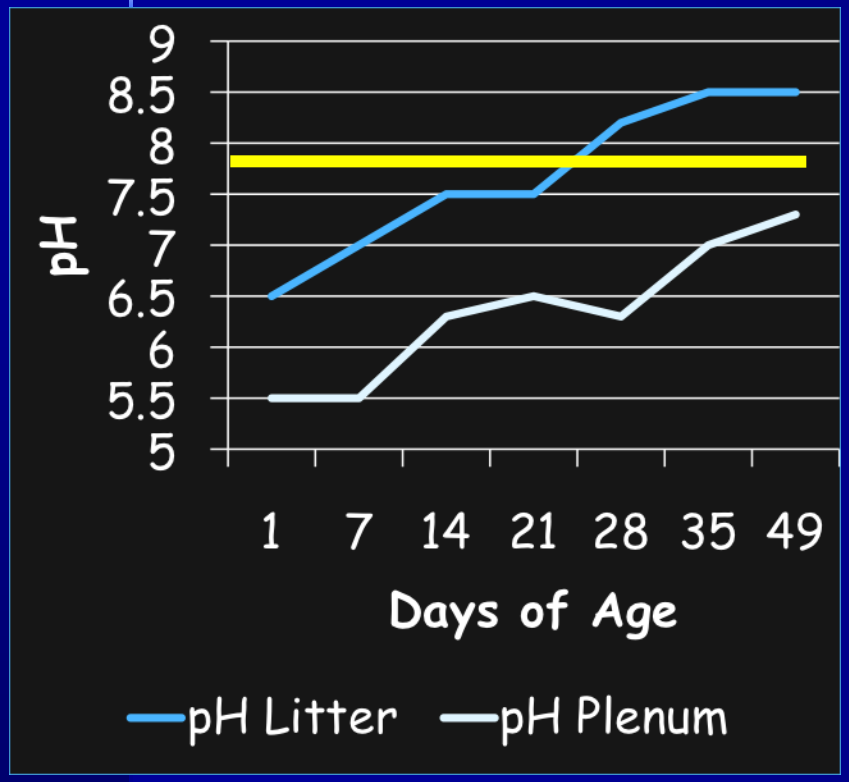


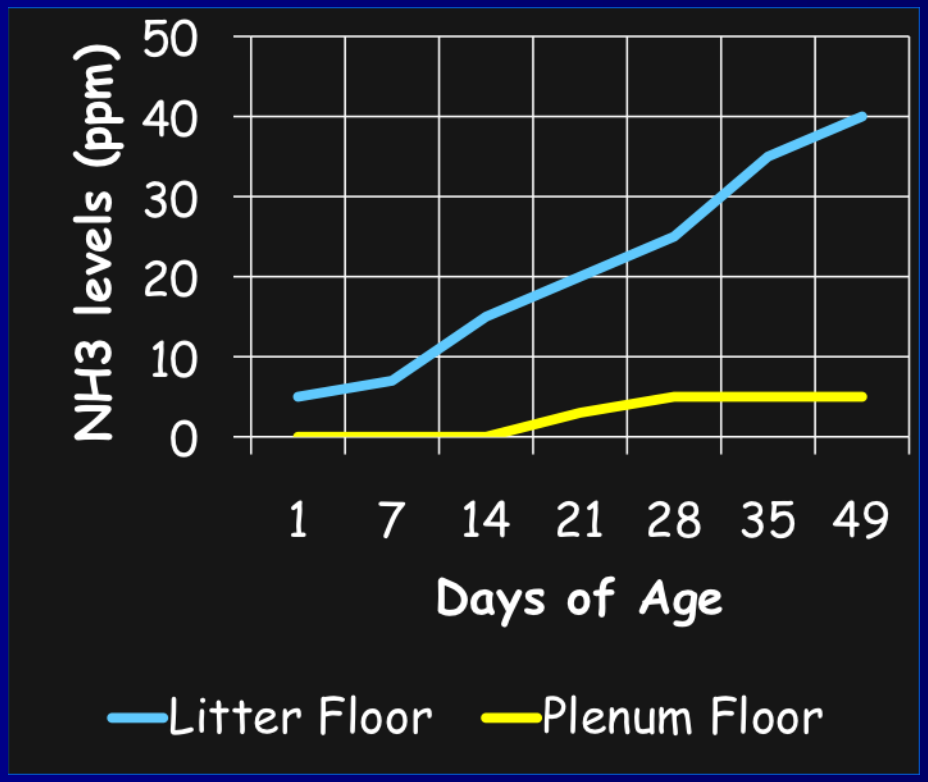


Potential Benefits

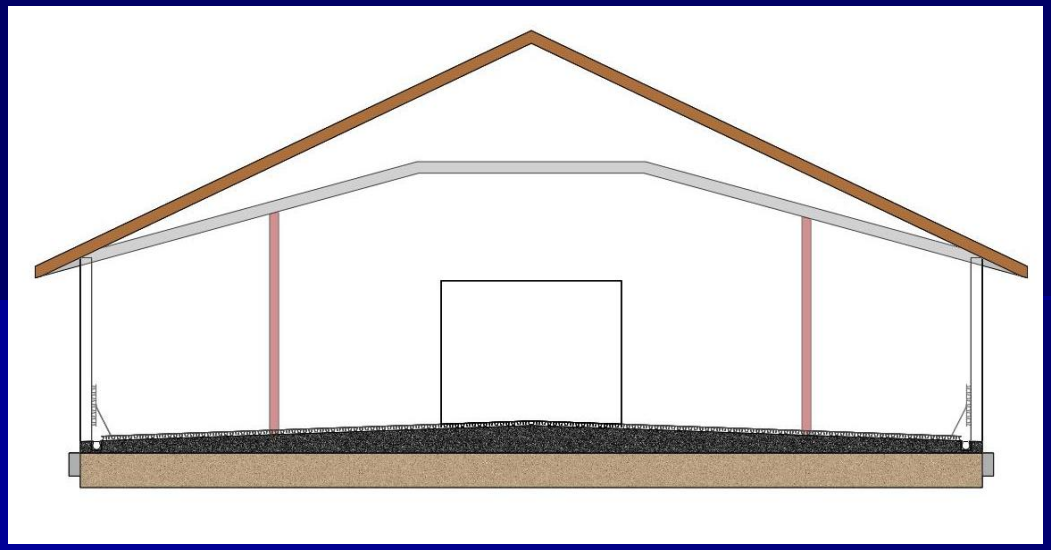
- New system could improve
  - Bird health
  - Human health
  - Environmental health
  - Food Safety
  - Energy savings
- Improve economic return by increasing production potential

Typical pH and Ammonia levels on litter vs. new flooring





Flooring in Experimental Chamber



Before After

Summary of Research

- Multiple small scale trials and 2 commercial size trial have been completed
- Growth was increased up to ½ pound in 42 days over birds raised on litter
- No darkling beetles were detected
- Feed efficiency was not affected or slightly improved
- **pH of the feces remained below 7 = No NH_3**
- Fecal moisture was reduced from 10 to 40%
- Foot pad lesions were a problem
- Migration of debris through the floor

Summary of Research

- We are continuing to evaluate the Avihome plenum flooring system
- In addition, we will be evaluating another system that uses an under-floor radiant heating and cooling system that may provide similar benefits

Thanks!