Assessing Air Quality Impacts of Industrial Poultry Farms in Rural North Carolina: A Community Engaged Air Quality Modeling Approach

Azucena Maldonado Aguilar, Dannys Ayala, Amanda Northcross, William Vizuete

Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill

ECUIPP LAB

UNC GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH

Background

- Robeson County is home to 116,530 residents, with 70% identifying as people of color.
- Several **C**oncentrated **A**nimal **F**eeding **O**perations (**CAFO**s) have increased production of chickens and turkeys by 24 million since 2012, in this county.
- CAFOs are known to emit air pollutants that can detrimentally affect local air quality and, consequently, human health.
- AERMOD, an atmospheric dispersion model, serves as a tool assess CAFOs' impact on local air quality.

Methods

1. Literature Review: Used databases like Pubmed, Proquest, and Science Direct using keywords like AERMOD, community-engaged, community justice and CAFOs.
2. Analyzed articles to determine AERMODs use in community-engaged research
3. Community Concerns: Examined CAFOs concerns, including: odor, waste regulations lapses, and increase growth of poultry CAFOs in the county.
4. Identifying CAFOs: Used a GIS map to identify CAFOs in the county based on proximity to residents, estimated animal count, and waste produced.
5. Model emissions of CAFOs: Understanding the use of AERMOD applications and limitations.

Results

- GIS map shows more poultry CAFOs than swine in the southern part of the county.
- Hydrogen Sulfide (H2S) will be modeled, a colorless gas with a "rotten egg" odor, commonly found in animal waste pits.
- Significant CAFOs can be determined by analyzing wind patterns and direction based on local weather station data.

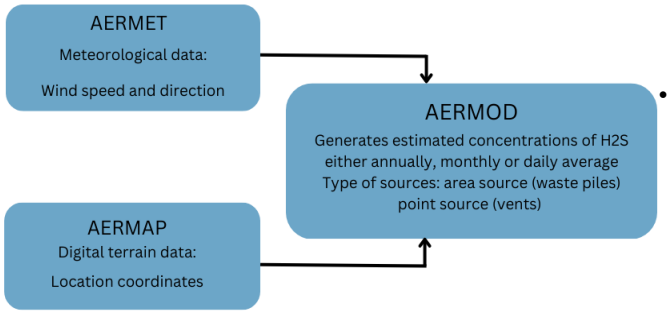

Fig 1. AERMOD intakes inputs by two pre-processors, AERMET and AERMAP.

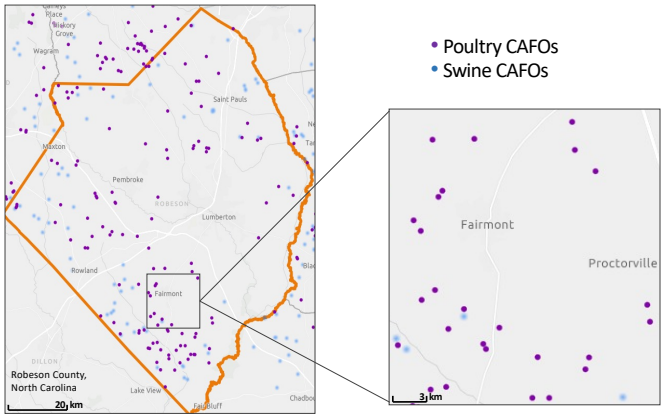

Fig 2. CAFOs located in Robeson, Fairmont identified as a town of interest due to number of CAFOs in the area.

Conclusion

- There is limited research of AERMODs use to model CAFOs through a community engaged approach
- Availability of air pollutant data from poultry farms may limit estimates of pollutant emissions.
- As the number of poultry farms in Robeson County increase, awareness of air pollution from the farms can aid communities make decisions about air pollution.
- Further research will involve identifying sources of concern, like waste piles and vents, from CAFOs and modeling individual CAFOs using publicly available data.
- Understanding air pollution from these facilities becomes crucial for community decision-making and advocacy.

Pollutant	Health Effects
Ammonia	Inhalation can cause chemical burns in respiratory tract, skin, cause severe coughing, and chronic lung disease.
Particulate Matter	Inhalation can cause chronic respiratory symptoms, decrease lung function, and effect reproductive health.
Hydrogen Sulfide	An irritant and chemical asphyxiant, if inhaled can cause olfactory fatigue.

Table 1. Air Pollutants of concern emitted from CAFOs and potential health effects.

References: