



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2004AR73B

Title: Nutrient losses in runoff and leaching from poultry litter applications to loblolly pine stands and pastures

Project Type: Research

Focus Categories: Nutrients, Water Quality, Non Point Pollution

Keywords: Runoff, poultry litter, leaching, nitrogen, phosphorus, arsenic, loblolly pine, best management practices

Start Date: 03/01/2004

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Non-Federal Matching Funds: \$36,635

Congressional District: 4th

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Abstract

The poultry industry in the United States produces massive amounts of poultry litter that needs to be disposed of in an environmentally sound manner. In Arkansas, broiler houses alone produce 1.3 million metric tons of litter annually. This litter is commonly used to fertilize pastures. Research on pastures has shown that excessive applications of poultry litter can negatively affect the quality of surface and soil water and raise nutrient levels above water quality standards. Poultry litter applications may also lead to unacceptable high levels of arsenic and heavy metals in the environment. Poultry litter applications to forests could be used to increase timber production and C sequestration while, at the same time, expanding the options for litter disposal. In the southern United States more than 530,000 ha of pine forests are fertilized, and fertilization is estimated to increase productivity by 35% in intensively managed plantations. Potentially, poultry litter could be routinely used in forests in Arkansas because many landowners that produce poultry

litter also own forest land and/or are located within short distances of pine forests. As seen for other types of waste, forests can absorb and retain relatively large amounts of the elements found in poultry litter without causing environmental problems. However, few planned field experiments have been initiated to investigate the ability of forests to mitigate environmental impacts of poultry litter applications. As part of a larger study, this proposed research will address the impacts of poultry litter application on water quality in mature loblolly pine stands and compare the impacts to those observed in pastures. Specific objectives are:

1. quantify the impacts of poultry litter application to forests and pastures on sediment loads, nutrient and other environmentally important elements in surface water runoff.
2. quantify the impacts of poultry litter application to forests and pastures on nutrients and other environmentally important elements in soil water. Poultry litter will be applied to plots within a 13-ha loblolly pine plantation that is 26 years old as well as to plots within nearby pastures. Soil water will be sampled with tension lysimeters while surface runoff will be measured in runoff plots. Total suspended solids will be determined in runoff samples, and both runoff and soil water samples will be analyzed for NH₃-N, NO₃-N, SO₄-S, total Kjeldhal N, total P, Ca, Mg, K, Na, As (V), Cu, Fe, Mn and Zn. Amounts of runoff, and fluxes and concentrations of the analyzed nutrients, As, and metals will be compared between plots that received the poultry litter and those that did not. Changes in nutrients, As, and metals in runoff and soil water by poultry litter applications in pine plantations will be compared to those in pastures. Comparisons will be made on an event, season, and the study period basis. Results will be made available to state and federal agencies related to water quality monitoring as well as to forest landowners and landowners associations. The study will help to develop Best Management Practices for poultry litter applications in forests. The experimental site will be also used for technology transfer and teaching activities of the Arkansas Forest Resources Center and the Arkansas Agricultural Experimental Station.