USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Utilization of Best Management Practices for the Treatment of Animal Waste, Sludge, and Herbicides

Duration: July 1, 1996 to August 31, 1997

Federal: $54,926

Non-Federal: $137,757

Principal Investigators:

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Congressional Districts: Third and Fourth

Water Problem, Need for Research:

The proper utilization of animal waste, sludge, and herbicides has become a primary focus of federal, state and local officials and agricultural leaders in the southeastern United States. For example, in North Carolina, animal waste production is projected to increase by 45% from 1992 to 2000 (Barker, 1996); sludge production is projected to increase by 25% from 1992 to 2000 (Holman, 1992); and herbicide usage has dramaticallyincreased since 1960 (National Research Council, 1993). Similar trends can also seen in other southeastern states that have large agricultural components. Due to this increase in production and use of these materials in the agricultural setting, best management practices (BMPs) are being established to deal with the proper utilization of these potential pollutants. However, limited research has been conducted on the effectiveness of these BMPs and their potential impact on surrounding water resources. A

major research effort is required to determine the "best" management practice(s) to be applied for a particular setting.

Agriculture is an important nonpoint source of pollution in the southeastern United States. For example in North Carolina, there has been a dramatic increase in both poultry and hog numbers in the past few years and the knowledge of potential water quality problems has the public demanding that these wastes be regulated to protect our water resources. Many scientists in the southeast consider large concentrations of animal and associated waste utilization problems to be the largest single nonpoint source threat to water quality. The best utilization method for these wastes is land application but this method also poses potential problems for water quality. Vegetative filter strips between land and surface water supplies is one of the Best Management Practices (BMP) recommended whether or not the land is receiving waste application. However, there is very little scientific data to use as guidelines for buffer requirements for areas receiving waste. It is important that effectiveness data be obtained for different soil types, slopes, hydrologic and vegetative conditions. This information can be used to test and modify predictive models under a large range of conditions. Nutrient management plans for large scale animal operations involve waste storage inlagoons and land application as fertilizer at no more than agronomic rates. improper management will encourage eft-site transport of nutrients to adjoining ecosystems. This part of the proposed research will examine the effect of common management practices and soil type on denitrification rates in soils of lagoon waste-amended fields

Off-site movement of pesticides has also become a major problem facing agriculture today. Increased concern over pesticide effects on the surrounding environment has also lead to questions management techniques to alleviate these problems. More than 75% of the soybean and cotton acreage in the Southern Region is treated with some type of soil applied herbicide. They are used for reemergence weed control, and therefore are vulnerable to movement in surface runoff through both the aqueous and sediment phase. The 1985 and 1990 Farm Bills have forced producers to implement practices which control erosion. On moderately sloping land, one common recommendation has been the use of permanent filter strips which act as traps for sediment. These filter strips have been found to substantially reduce sediment loss, and reduce contaminants from feedlots. However, little information is available as to the effect these strips have on off-site movement of herbicides. This part of the proposal should help to answer some of these questions concerning the use of filter strips for herbicide removal.

Land application of sludge to agricultural land has been a common disposal practice for agricultural, municipal, and industrial facilities. However, new regulations would make this practice illegal for some facilities. The concern stems from environmental problems ranging from buildup of heavy metals in the soil to nutrient deficiencies in the plants. The regulatory community does not consider the sludge to be a soil amendment because of it low fertilizer value. Therefore, an urgent need for research to develop best management practices for specific, locally important sludge/soil combinations is needed.

Expected Results, Benefits, Information:

Results of this research will help refine current agricultural BMPs and further reduce the risk of contaminants from impacting water resources. More specifically, issues of the effectiveness of filter strips (natural and man-made) in removing contaminants from runoff will be refined; the development of practices that promote denitrffication and provide the nitrogen requirement for cover crops will be defined; and the utilization of sludge as a soil amendment for pasture growth will be defined.

Part of the proposed research is designed to determine effectiveness of various widths of both planted and naturally vegetated buffers to remove contaminants from runoff water from fields receiving animal waste. This information will be of value to such agencies as the USDA-SCS, state extension services, and state agencies dealing with soil and water issues. Related research will evaluate the effects of management practices on denitrifying activity in lagoon waste-amended agricultural soils. Therefore, this part of the study will facilitate refinement of BMPs that simultaneously promote denitrification and meet the nitrogen requirement of the cover crops. This will minimize transport of dissolved nitrogenous nutrient from the site of swine waste fertilizer application.

Another part of the proposal will evaluate the effect of varying filter strips width on off-site movement of two widely used soil-applied herbicides. This portion of the study will also evaluate the off-site movement over time and runoff event. The information will benefit the environment, as well as producers, by determining maximum benefit of filter strips while minimizing the amount of land taken out of production. These results will provide critically needed data on mechanisms which can effectively reduce erosion, thus meeting compliance with federal conservation programs, and concurrently reduce herbicide content in runoff exiting fields.

Managers of sludge producing facilities that utilize land application along with state regulatory community will be interested in this part of the proposal. The results will determine if management practices can be developed that will allow sludge to be applied without posing a threat to the environment while enhancing soil and water quality.