Chapter 1. Introduction

Phosphorus content in the soil profile is a significant problem for agricultural producers in the eastern U.S. The problem stems from the high cost of manure management and the adoption of P-based nutrient management plans (NMPs) by the regulatory agencies in several states including Maryland and Virginia. Costs associated with manure storage, handling and utilization are less than those of traditional confined animal feeding operation (CAFO) management systems. Phosphorus is the limiting nutrient when land applying stored manure, forcing livestock and poultry producers to reduce phosphorus (P) loading from animal wastes to soils in order to comply with new nutrient management regulations.

The move toward P-based NMPs was precipitated by a U.S. Environmental Protection Agency (US-EPA) study that identified P in runoff as the primary cause of accelerated surface water eutrophication (US-EPA, 1996). Eutrophication is a condition where high nutrient concentrations in surface waters stimulate algae blooms. Severe algae blooms prevent sunlight from penetrating the water column, which causes underwater plants to die. As a result, dissolved oxygen is depleted from the water as the dead plants decay (Carpenter et al, 1998). The effects of eutrophication limit the designated use of the eutrophied water body. For example, recreational, industrial, and drinking water uses of numerous surface waters in Virginia have been impaired by eutrophication.

Several studies have indicated that eutrophication is caused by non-point source (NPS) pollution from confined livestock and poultry operations (Daugherty, 2001; Rotz et al., 2001). The first strategy to curb NPS of surface waters and subsequent eutrophication was to develop NMPs, which limited the amount of N that could be applied to cropland. However, researchers have suggested that eutrophication from NPS can be further minimized by shifting NMPs from a N-based practice to one based on P levels (USDA, 1999; US-EPA, 1999; Sharpley et al, 1996).
Management intensive grazing (MIG) is being promoted as a means of reducing nutrient loading from dairy and beef operations. Numerous studies have found that nitrogen (N) losses from grazing cattle operations were lower than those from traditional confinement operations (Harter et al., 2001; Zhao et al., 2001; Stout et al., 2000). Nutrient loading from imported feed sources is minimized and nutrients directly redistributed on pasture from grazing cattle promote whole-farm nutrient balance (Beegle et al., 1998). However, only limited data is available on the effects of MIG on runoff P levels. This study quantified P losses from runoff release plots that simulated a dairy MIG land use.

1.1 Objectives

The overall goal of this research is to investigate the effects of forage type and manure density on phosphorus levels in runoff from simulated MIG dairy plots.

**Objective 1:** To quantify the effects of forage type on phosphorus levels in runoff from simulated MIG dairy plots.

**Objective 2:** To quantify the effects of manure density on phosphorus levels in runoff from simulated MIG dairy plots.

**Objective 3:** To quantify the effect of forage height on phosphorus levels in runoff from simulated MIG dairy plots.

**Objective 4:** To quantify the interactions between forage type, manure density, and forage height.