# THE USE OF GRASSLANDS TO IMPROVE WATER QUALITY IN THE NEW YORK CITY WATERSHED

D. J. Flaherty[1] and J. Drelich, Jr.[2]
[1]Cornell Cooperative Extension of Delaware County
[2]USDA Natural Resources Conservation Service, 44 West Street, Suite 1, Walton, New York

**ABSTRACT**
The purpose of this paper is to demonstrate how grasslands are used in the New York City (NYC) Watershed to improve water quality. A Watershed Agricultural Program was established to voluntarily implement Pollution Prevention Best Management Practices on watershed farms. Grasslands have been used in Whole Farm Plans to reduce nutrients, sediments and other toxic materials reaching New York City's water supply. Rotational grazing has been used to limit access to streams and stream banks and improve nutrient distribution on pastures. Improved grassland management also helps correct the nutrient balance on the farm and facilitates better nutrient management. Brush removal on farms has enhanced nutrient distribution. Grasses are also used to filter out pollutants from barnyards, milkhouses and silos. Grasslands are effective in controlling erosion on highly erodable tilled land. A research project is underway on a grassland based dairy farm to assess the flow of nutrients and management needed to deal with the variation in pasture quantity and quality in supporting profitable levels of milk production.

**INTRODUCTION**
The NYC Watershed is the largest surface water supply in the world. Nine million residents depend on the safety of this water supply. In 1990 New York City was forced to meet standards of the 1989 Surface Water Treatment Rule. The city sought to avoid filtering its water which was estimated to cost $8 billion for construction of a filtration plant and up to $500 million in annual operation costs. The city sought to avoid filtration by establishing a traditional watershed protection program through regulation and land acquisition. (Chapman and Coombe, 1996).

The regulations that NYC was going to impose would doom agriculture as a land use in the watershed. A series of negotiations and debates between watershed farmers and New York City convinced the city to withdraw the proposed regulations and adopt a voluntary whole farm planning program (Watershed Agricultural Program) providing incentives to farmers who participate. The whole farm plan is designed to protect water quality while at the same time maintaining or enhancing economic viability of the farm. The purpose of this paper is to demonstrate through whole farm planning how grasslands are used in the watershed agricultural program to improve water quality (Chapman and Coombe, 1996).

**METHODS**
A whole farm plan is developed by the county project teams consisting of a Cooperative Extension Agent, Resource Conservationist, Civil Engineering Technician and the participating farmer. Best Management Practices (BMP's) are recommended to reduce nutrients, pathogens, sediment and other toxic materials reaching the water supply of NYC. Grasslands have been used as a BMP's in many of the Whole Farm Plans. (Whole Farm Planning Manual, 1994).

**DISCUSSION**
Intensive rotational grazing has been implemented to reduce livestock exposure to a watercourse by subdividing pastures into cow proof paddocks around which the herd grazes in rotation, along with providing an alternate water source. This results in livestock spending less time in watercourses and reduces the potential for stream bank erosion. Rotational grazing is also used to increase quality and quantity of forage of the pasture thereby decreasing the amount of purchased feed utilized resulting in reduced amounts of imported nitrogen and phosphorus. This can play a key role in improving the nutrient balance on the farm since purchased feed accounts for the majority of nutrients coming onto the farm. (Cheney & Allen, 1995). Improving grazing management on farms also improves nutrient distribution, thereby preventing concentrated accumulation of nutrients in any one location such as feeding areas, shady areas and waterway locations (Gerrish, 1994). Rotational grazing distributes nutrients on pastures traditionally low in nutrients from meadows near farmsteads with very high nutrient concentrations.

Grasses can and are being used in nutrient management plans do facilitate the uptake of excess nitrogen found in manure. Permanent grass sods also have advantages such as the ability to support vehicular traffic and tolerate saturated soils as compared to legumes such as alfalfa. (Cheney and Allen 1995).

Removing brush from pasture is also being promoted to help improve nutrient distribution. Livestock on watershed farms are commonly concentrated adjacent to existing watercourses, primarily due to forage availability and water. Removing brush and improving grassland production on the hillside enables the producers to relocate the livestock where they will have less impact on streams and stream banks. The Watershed Agricultural Program is currently attempting to demonstrate the use of goats to assist in the removal of brush from overgrown pastures (NRCS, National Handbook of Conservation Practices, 1980).

Grasses are used to filter out pollutants such as runoff from barnyards, discharges of milkhouse waste and leachate from silos. Grass filter strips are designed to slow water flow which traps sediment and other nutrients, the grasses take up nutrients from the water and are then harvested and taken off site to minimize phosphorus and other nutrient build up. (NRCS, National Handbook of Conservation Practices, 1982).

Grasslands are also used to control erosion on highly erodable lands. Grasses are utilized in crop rotations; and in strip cropping systems to slow surface water flow, increase infiltration and reduce sediment running off tilled fields. (NRCS, National Handbook of Conservation Practices, 1977). Farmers are also encouraged to convert corn lands to permanent grass whenever soil and economic sustainability becomes questionable.

**RESEARCH PROJECT**
There is a research study underway in the Watershed on a pasture based dairy farm to assess the flow of nutrients and management needed to deal with the variation in pasture quantity and quality in supporting profitable levels of milk production (Fox et al, 1996).

**OBJECTIVES**
1. To determine the variation in forage intake, quality and quantity on a well managed pasture based dairy farm.

2. To develop tools that can be used to make daily management decisions on paddock size and supplementation.
3. To determine the balance, flow and losses of nutrients to the environment.

**METHODS**

1. Pasture samples were randomly clipped within the paddock prior to grazing to estimate pregrazing forage availability along with a rising plate meter sward height measurement. Clipped samples were dried to determine dry matter content. After observing where the cows grazed, samples were picked and analyzed for carbohydrate and protein fractions and digestion rates.

2. Concentrates, forages fed, animal body condition scores and weights; individual milk weights and samples were determined on a monthly basis corresponding with DHIA test day.

3. The Cornell Net Carbohydrate and Protein System is being used to determine pasture intake using the amounts of carbohydrate and protein fractions measured in the concentrated hay fed and the pasture grazed; milk production fat, protein and weights and body condition score of cows.

4. Manure production will be predicted with ration and milk production information using Cornell's Net Carbohydrate Protein System. Manure spread on the pasture by cows will be determined by weighing the amount of manure removed from the barn and subtracted from the total manure production. Soil sampling will be done on a 9 acre paddock to determine the effects of gate and water location on nutrient concentration in the soil and uniformity of manure distribution. Results are still being compiled on this study (Fox et al, 1996).

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