

YIELD, QUALITY AND SPECIES COMPOSITION OF FORAGE FROM MIXED
GRASSLAND UNDER DIFFERENT NUTRIENT MANAGEMENT REGIMES

By

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An Abstract of the Thesis Presented
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Long-term grasslands composed of cool-season grasses and perennial legumes constitute a large portion of the total forage acreage on Maine dairy farms. Some of these grasslands have been established on agronomically poor soils, while intensive forage management is often limited to fertile, easily accessible cropland. The role of long-term grasslands in whole farm nutrient management systems on Maine dairies is an underlying focus of this project. The capacity of mixed species grasslands to respond, under intensive cutting management, to applications of N, P, and K in the forms of commercial fertilizers and liquid dairy manure was examined.

Experiments were initiated in Stillwater, Maine on a Lamoine silt loam (fine, illitic, nonacid, frigid Aeric Epiaquepts) in 1995 and 1996. The grassland was composed of timothy (*Phleum pratense* L.), white clover (*Trifolium repens* L.), Kentucky bluegrass (*Poa pratensis* L.), quackgrass (*Elytrigia repens* L. Nevski), orchardgrass (*Dactylis glomerata* L.), small amounts of reed canarygrass (*Phalaris arundinacea* L.), and dandelion (*Taraxacum officinale* Weber). Nutrient treatments

included no fertility, N fertilization, N, P and K fertilization, liquid dairy manure, a fertilizer-manure split application, and a manure-fertilizer split application.

Nutrient treatments out-performed the control in yield for Experiment 1, by 34 and 59% in 1995 and 1996, respectively. Annual yields for nutrient treatments increased an average of 29% over the control in Experiment 2 (1996). Nitrogen fertilization was the main factor in these overall yield increases. Split applications of P and K, above soil test recommendations, increased DM yields slightly in both years of Experiment 1. Fertilizer NPK increased Experiment 1 yields by 23 and 17% over manure in 1995 and 1996, respectively.

Nitrogen fertilization increased forage crude protein and neutral and acid detergent fibers concentrations in both experiments. Nitrogen fertility also increased the grass component of the forage mixture. These composition changes were progressive in nature over the duration of the two year experiment, suggesting a tendency for N fertility to drive these mixed grasslands to a grass monoculture.

Application of N fertilizer effectively helped forages remove P and K from the soil system over a two year period. Application of P maintained or slightly increased available P levels in the soil system. Application of K at rates slightly above soil test recommendations did not restore K to a level observed at the start of the experiment.