Renovation & Management Effects on Pasture Productivity Under Rotational Grazing

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INTRODUCTION

"Should I renovate my pasture?" The answer depends on a careful analysis of goals, resources, available varieties, current productivity levels, costs, and benefits. Plant breeders select plants to improve various traits, chiefly persistence, productivity, and forage quality. However, this work is typically carried out in carefully controlled gardens where competition from other plant species is eliminated and fertility levels are systematically improved.

This article describes short-term results from an experiment to compare productivity and composition of pastures with introduced, improved temperate grass varieties under typical and "best management" scenarios.

METHODS

This work was conducted on five grazing farms in Wisconsin located on a latitudinal gradient from Iowa to Marathon Counties. Working with each farmer, a 2-acre area of relatively uniform aspect, slope, and productivity for the project was delineated. The area was split in half for random assignment of renovation. Each area was then split perpendicularly so that half would receive farmer management and the other half researcher management.

Renovation began in November 2005 when researchers sprayed renovated plots with glyphosate. In May 2006, researchers disked and sowed a 50:50 mix of two improved grass varieties, Pizza orchardgrass and Bartura meadow fescue, with a Brillion seeder at 16 lbs/ac. Soil fertility levels were determined from five composite soil cores on each plot. Soil fertility results indicated below optimum levels of potassium on two of the five farms, so 180 lbs K were applied to the researcher-managed plots on both renovated and existing pastures. To stimulate establishment in June 2006, the entire renovated paddock of all five farms received ~20 lbs N/ac. Weeds were also suppressed on the entire renovated paddock with 2-4 D herbicide at 11 oz/ac at the five leaf stage by backpack strip spraying and spot spraying as needed for each paddock. Livestock were excluded from the renovated pastures until July 2006. In May 2007, researchers applied ~40 lbs N/ac at all five farms to the researcher-managed plots on both renovated and existing pastures (100 lbs of 46-0-0). Another fertilizer application of ~40 lbs N/ac and 20 lbs P/ac was applied in October of 2007 (200 lbs of 24-0-12).

Plant species composition was quantified by researchers in August 2006 and 2007 with a line-point method. Forage production was measured by farmers, who were supplied with rising plate meters and datasheets and asked to measure standing biomass immediately before and following each grazing or haying event throughout the growing season. Farmers mailed datasheets to researchers, who converted plate meter measurements into biomass using a proportional relationship determined

Figure 1. *Relationship between plate meter reading and standing biomass immediately before and following each grazing or haying event throughout the growing season.*

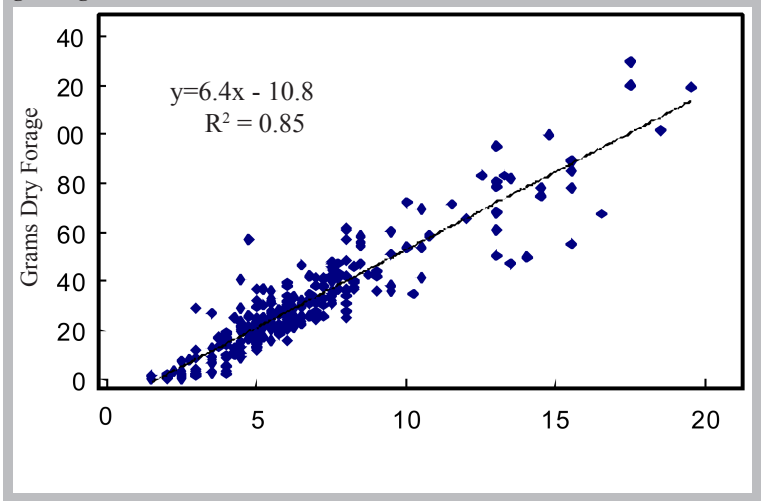


Figure 2. *Annual forage production (bars indicate standard error) across 5 grass farms in the establishment year (2006) and first production year (2007). Different lower case letters above error bars indicate significant differences (P<0.10) between pastures within a given management treatment .*

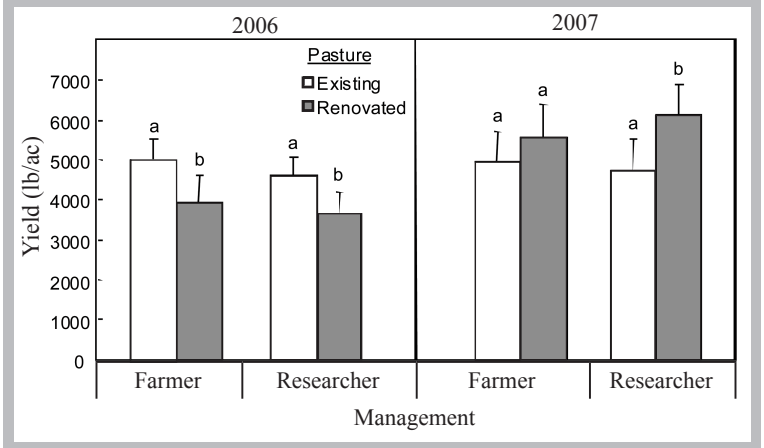
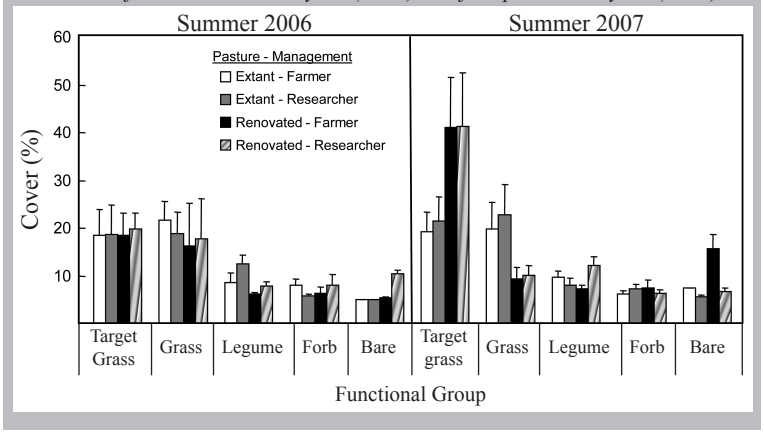


Figure 3. *Functional groups (bars indicate standard error) across 5 grass farms in summer of the establishment year (2006) and first production year (2007).*



on areas near the plots (Figure 1). Productivity data were analyzed separately for each year with linear mixed-effects models assigning farm as a random effect and renovation status and pasture management as fixed effects. Significant differences were determined at the $P<0.1$ level.

RESULTS

Forage production was significantly reduced by renovation in 2006, the establishment year, but no differences were observed between farmer and researcher management (Figure 2). In 2007, a significant interaction was found where renovation stimulated production, but only in researcher-managed plots (Figure 2).

Species composition differences were not observed in 2006, although more bare ground was exposed in the researcher managed-renovated plots, which was likely the result of weed suppression (Figure 3). In 2007, the targeted orchardgrass and meadow fescue had much higher cover levels in the renovated plots, but were not affected by who managed the plots. The increase in target grasses was offset by a reduction in other cool-season grasses by roughly the same degree of cover (Figure 3). A curious result was the dramatic increase in bare ground in the farmer managed-renovated plots in 2007.

DISCUSSION

Renovation with these two varieties improved production in year two, but only with high inputs of fertilizer and herbicide. Overall composition and cover of the pastures were unaffected, but the increased bare ground during the establishment year where weed suppression occurred was undesirable. Existing grasses were replaced with improved varieties, which boosted productivity when managed very carefully. However, the economics of this undertaking should be considered: is renovation effort worth the lost production in the establishment year and additional 1,000 kg/ha in year two? Analyses and tracking of these plots will continue for the next 3-5 years.

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