MAXIMIZING MILK PRODUCTION ON WISCONSIN PASTURES: LESSONS FROM THE PADDOCK

Abstract

Organic dairies that fail to maximize pasture production may have reduced milk production. Pasture management, forage nutritive value, and soil fertility are known to influence milk production, but have not been studied concurrently. We evaluated agronomic and management variables on 20 organic dairies in the Upper Midwest to determine factors associated with high levels of milk production. At each farm, two pastures were sampled before grazing in June and September for species composition, productivity, and nutritive value. Soil samples and management information were collected in October. Potential milk production was calculated based on forage productivity, cell wall concentration and digestibility, and estimated dry mater intake by a 500 kg cow. A classification and regression tree was used to prioritize the factors associated with potential milk production. Improved legume cover exceeding 40% in June increased milk production by 97%. Non-improved grass cover less than 70% in June and September increased milk production by more than 75%. Maintaining residual sward height at 9 cm or greater throughout the year was also associated with increased milk production. Soil fertility was not highly associated with milk production. Our results suggest that to increase milk production from pasture, management of residual height, improved legume and non-improved grass populations should be prioritized.

Introduction

Wisconsin has the largest number of organic dairies in the United States with over 450 dairy farms that represents more than 25% of the nation's certified organic dairy farms (USDA NASS, 2014). Despite the large amount of organic dairy operations in Wisconsin, interest in expansion of existing and new operations exist due to consumer demand for organic milk (Greene and McBride, 2015). With the challenges that expanding operations face (e.g. purchasing land), interest in maximizing pasture performance exist. Previous research has shown that pasture productivity, forage quality, soil fertility and pasture management are all critical to maximizing milk production, but these factors have been observed to vary widely across farms. We visited pastures from organic dairies throughout Wisconsin to assess productivity and determine what facets measured could be improved to maximize milk production.

Methods

We evaluated key variables across twenty organic dairies in the Upper Midwest during 2013 and 2014. At each farm, two paddocks were chosen and visited just prior to a grazing event in June and September. During each visit, pasture species composition, productivity and nutritive value were estimated. As species differed dramatically from farm to farm, they were grouped into planted (improved) and unplanted (not-improved) grasses and legumes. Soil fertility measurements in each paddock were collected in October. Forage productivity and nutritive value were used to estimate milk production within each paddock. Management practices were collected by asking producers about their average pasture management over the last five years. This allowed for integration of

what has happened over time as past practices often impact current pasture composition and performance. A classification and regression tree (CART) was used to prioritize factors affecting potential milk production from pastures in June and September separately.

Results/Discussion

June and September classification and regression trees found factors in each category associated with potential milk production. Although there were differences between timings, common factors were found that explained a large portion of the variability.

Species composition: More than 40% improved legume cover and less than 70% cover of unimproved grass cover were both associated with higher milk production in both June and September (Fig.1 and 2). Improved legume cover exceeding 40% in June increased milk production by 97%. While not-improved legumes also improved milk production, improved varieties were much more important. This is likely due to active breeding of varieties to fix more atmospheric nitrogen and have increased yield and persistence compared to not-improved legumes like wild white clover. Not-improved grass cover less than 70% in June and September increased milk production by more than 75%. Common not-improved grasses found on farms included Kentucky bluegrass and quackgrass. These species have been shown to produce less yield and have greater NDF concentrations compared to improved varieties. Not-improved grasses also have the potential to reduce establishment and development of legumes, which was identified as an important factor in milk production. Fortunately our results suggest that not-improved

grasses do not have to be completely eradicated, just must be managed to not dominate a sward.

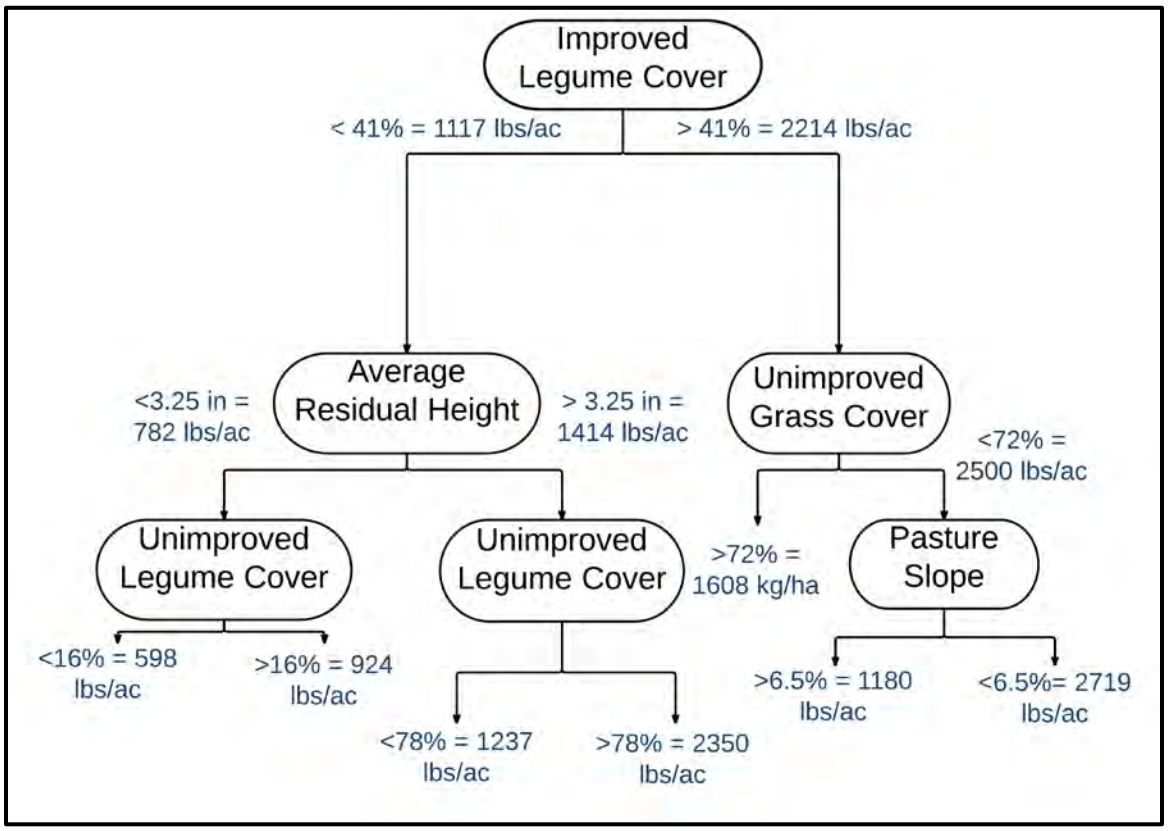

Figure 1. Classification and regression tree results for factors most associated with potential milk production from Upper Midwest pastures for a June grazing event.

Grazing management: Residual sward height was a grazing management factor that was associated with more milk production in both June and September. In June, maintaining a residual sward height of at least 3.25 inches throughout the year almost doubled potential milk production. Adequate residual height is necessary for improved grass species persistence and can increase the annual number of grazing events. In September, maintaining a residual sward height of 3.75 inches at the end of the grazing season was

important for milk production. Residual sward height at the end of the season is particularly important for winter survival and spring regrowth of legumes and grasses.

Soil characteristics: Pasture slope was the only soil factor found as important for potential milk production in June and September. Although pasture slope cannot easily be changed, our results suggest producers utilize lands with less slope for pastures, which are traditionally used for other agronomic crops (e.g. corn, soybean, alfalfa). Although no soil fertility factors were important in explaining potential milk production, factors like soil pH are essential for the survival of legume populations and therefore should be considered. Although soil fertility was not identified as an important variable it may be more a significant factor on some pastures. Research was designed to determine regional issues, not problems for specific pastures. This should be taken into consideration when using this information.

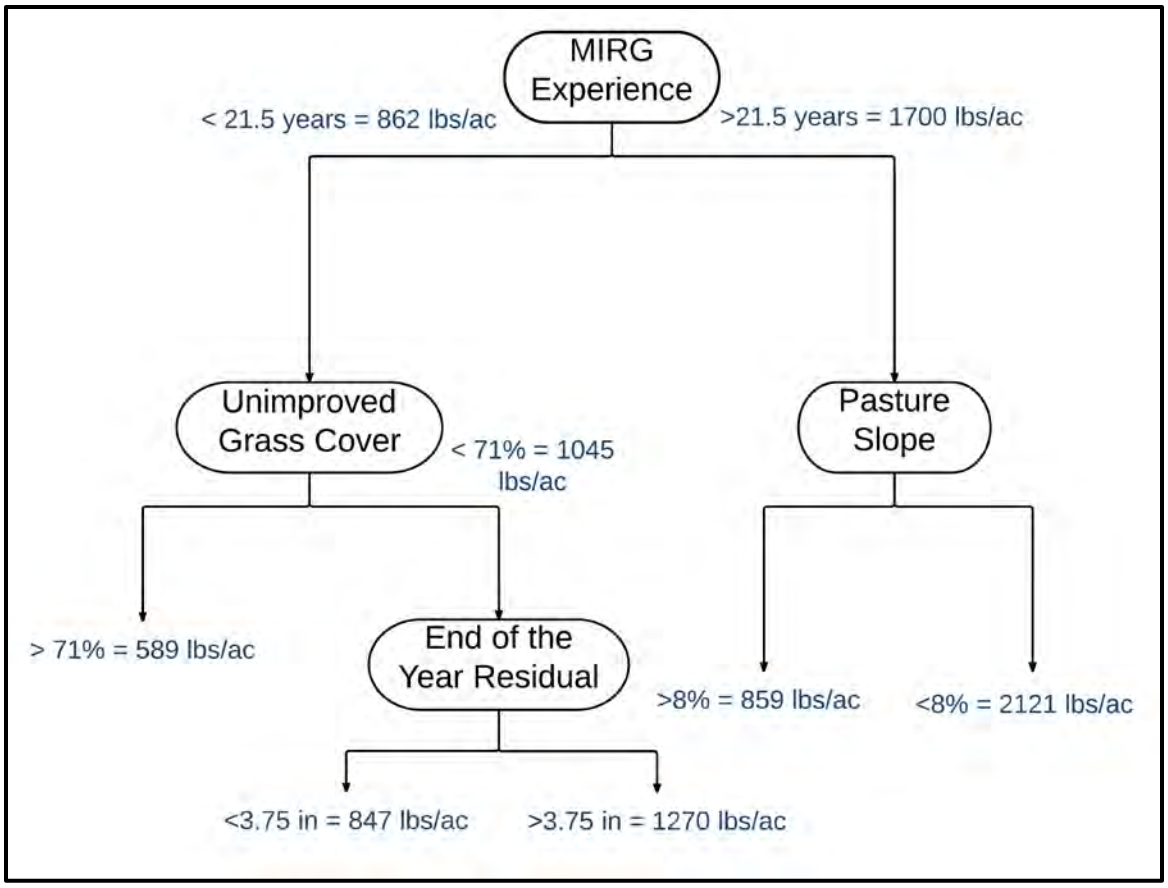

Figure 2. Classification and regression tree results for factors most associated with potential milk production from Upper Midwest pastures for a September grazing event.

Conclusions

Our results suggest that improvements can be made on organic dairy farm pastures for milk production. Results of this research suggest that in order to maximize milk production on temperate organic pastures, producers should place high priority on maintaining a high proportion of improved legumes, an adequate residual sward height, and suppressing not-improved grass cover.

Outreach and Extension

These results on how to improve organic pasture milk production have been presented at over 10 events to the scientific community, producers, educators and consultants. Results were presented to Midwest producers at the Grassworks grazing conference (150 people), MOSES organic farming conference (150 people), Wisconsin Extension Team Forage Pasture Technology Transfer (50 people) and the Wisconsin Agribusiness classic (75 people). We were able to work with our collaborator CROPP cooperative to present at their annual member meeting in 2016 (150 people), where many of the participating producers were in attendance. Our findings have been summarized at multiple conventional and organic field days at agricultural research stations in Wisconsin (50 people each). A pasture walk focusing on the results was organized at a participating producer's farm in August 2015 (50 people). This unique on farm research using regression tree analysis has also been presented to other researchers at the American Society of Agronomy and Soil Science Society of America annual meeting (50 people) and at a grant planning meeting with organic dairy researchers from the University of New Hampshire.

We intend to publish the results in both a peer reviewed journal and a UW-Madison Extension fact sheet by the summer of 2017.

References

Greene, C., & McBride, W. (2015). Consumer Demand for Organic Milk Continues to Expand—Can the US Dairy Sector Catch Up?. *Choices*, 30(1).

USDA NASS, 2014 Organic Survey, Ag Census Web Maps. Available at: https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Organics/ORGANICS.pdf