



SUSTAINABLE
AGROECOSYSTEMS
LABORATORY

NWSG GRAZING TARGETS FOR HIGHER QUALITY



THE OHIO STATE
UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL
AND ENVIRONMENTAL SCIENCES

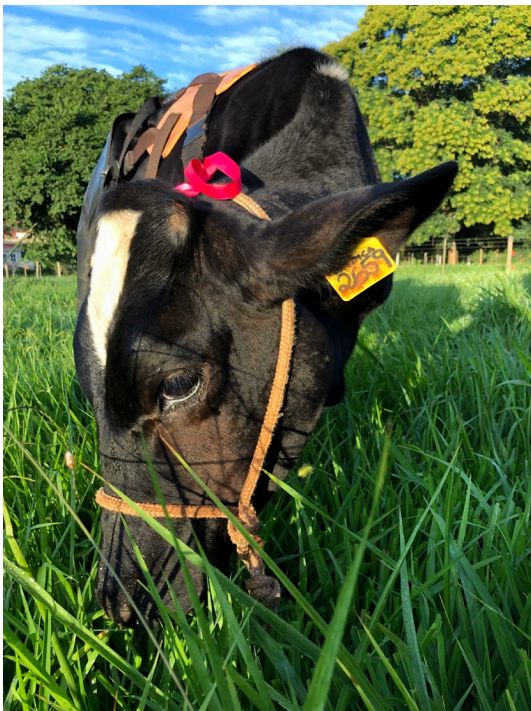
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Do warm-season grasses have lower quality than cool-season grasses?

It depends on grazing management!

In a pasture, leaves are the most nutritious part of the plant, offering higher protein content, lower fiber levels, and greater digestibility compared to stems. Leaves also support photosynthesis, promote regrowth, enhance forage yield, and contribute to pasture persistence. They are easier for animals to harvest, leading to improved intake and better animal performance.



Warm-season grasses can produce high-quality leaves, comparable to cool-season grasses. Effective grazing management that encourages a higher leaf-to-stem ratio will result in more nutritious forage.

During regrowth, grasses primarily produce leaves. As plant density increases, competition for sunlight intensifies, which triggers stem elongation and reduces overall forage quality. There is a point in this growth cycle when the leaf-to-stem ratio is optimal, providing the highest proportion of leaves and peak forage quality.

Grazing When Leaf Proportion is Higher Boosts Forage Nutritive Value!

HCS

Department of Horticulture and Crop Science

ANSCI

Department of Animal Sciences

Although stems contribute to forage mass, leaves are more nutrient-dense. Research consistently shows a strong link between forage quality and animal performance. To maximize nutritive value, it's essential to graze when the proportion of leaves is at its highest.

Forage Height for Optimal Leaf proportion

In a 2022 greenhouse study, we identified the forage heights that maximize leaf-to-stem ratio for various warm- and cool-season grasses when grown individually (Table 1) and their respective nutritive value (Table 2).

Forage Species	Height (in)
<i>Warm-season grasses</i>	
Big bluestem	20
Indiangrass	20
<i>Cool-season grasses</i>	
Tall fescue	13
Orchardgrass	13
Kentucky Bluegrass	12
White clover	8

Table 1. Optimal forage heights for maximizing leaf proportion in warm- and cool-season species. Grazing at these heights is expected to enhance forage nutritive value.

Forage nutritive value from leaves

Forage Species	Crude Protein	NDF	ADF	Lignin	Digestibility
	%				
<i>Warm-season</i>					
Big bluestem	15	62	38	4	74
Indiangrass	16	61	35	3	79
<i>Cool-season</i>					
Tall fescue	23	54	27	2	86
Orchardgrass	23	56	29	3	83
Kentucky Bluegrass	20	54	30	2	88
White Clover	31	26	16	4	89

Table 2. Nutritive value of warm-season and cool-season grasses cut at heights indicated in Table 1. The results reflect the nutritive value of the upper 50% of available forage, representing the portion most likely to be grazed by livestock.

Post-Grazing Residual and its importance for Regrowth and Pasture Persistence

Post-grazing residual is crucial for both forage regrowth and long-term pasture persistence. Leaves play a key role in promoting faster regrowth of high-quality forage. Our preliminary findings suggest the removing 50% of available forage is sufficient to provide animals with high-quality feed while allowing for quicker regrowth.

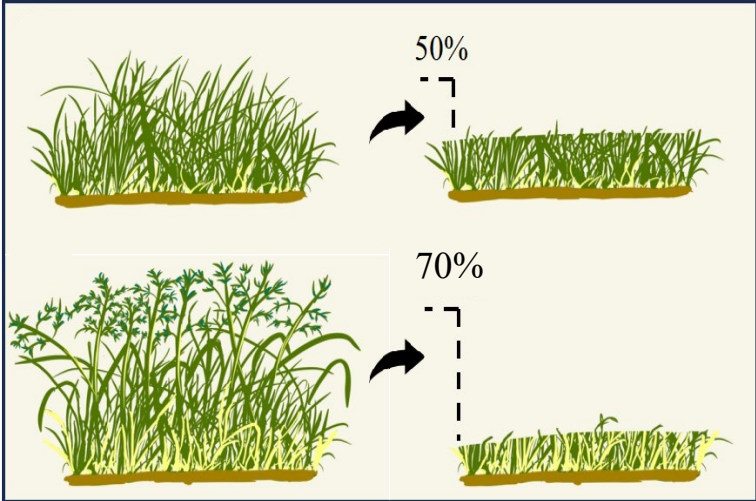


Figure 1. Leaving 50% of forage residue supports faster regrowth and improves long-term pasture persistence.

Forage Height for Higher Leaf Proportion in Forage Mixes

In the field, these species are typically not grown individually. In 2023 we initiated a field experiment in Jackson, OH, to test 3 different forage species combinations, grazing them at an averaged target height for each mix.

Pre-grazing target heights were calculated by averaging the optimal heights for individual species to maximize leaf production in all species in the mix.

In our field study, we compared 3 grazing strategies (Table 3):

1. A typical fescue + clover mix grazed at higher target height, removing 70% of available forage.
2. A more diverse cool-season mix including fescue, orchardgrass, bluegrass and clover, grazed at a shorter height to maximize leaf proportion and removing 50% of available forage.
3. A warm-season mix, also grazed to maximize leaf proportion and removing 50% of available mass.

Forage Species	Height (in)		Removal
	Pre-grazing	Post-grazing	
<i>Warm-season Mix</i>			
Big bluestem + Indiangrass	20	10	50%
<i>Cool-season Mix</i>			
Tall fescue + White Clover	16	5	70%
Tall fescue + White Clover + Orchardgrass + Bluegrass	12	6	50%

Table 3. Pre- and post-grazing heights and forage removal for different forage mixes compared in a field study at Jackson, OH, in 2023.

Leaves Proportion x Grazing Frequency x Forage Mass

Grazing cool-season mixes at a higher target height (16 in) with higher removal rate (70%) resulted in greater pre-grazing available forage mass (pre-grazing mass minus post-grazing mass) (Table 4). However, much of this mass consisted of dead forage material rather than green leaves, which likely led to lower forage quality, although the final quality results are not yet available. This management strategy resulted in only 2 grazing cycles from May to November in the 2023 growing season.

In contrast, grazing cool-season mixes at shorter target height (12 in) with lower removal – a strategy designed to maximize leaf proportion and promote faster regrowth – produced less overall forage mass but significantly more green material, indicating better forage quality. This approach allowed for 4 grazing cycles during the season.

Similarly, grazing warm-season grasses at shorter heights (20 in) with lower removal rate (50%) resulted in high availability of green material and supported 3 grazing cycles in 2023 (Table 4).

Forage Species	Pre-grazing height	Removal	Available forage	Green forage mass	Dead forage mass	Total forage mass
	in	%	lbs/acre			
<i>Warm-season</i>						
Big bluestem + Indiangrass	20	50	6,410	13,099	2,230	15,329
<i>Cool-season</i>						
Tall fescue + white clover	16	70	5,946	6,503	4,831	11,334
Fescue + Orchard + Bluegrass + Clover	12	50	3,716	8,547	4,459	13,006

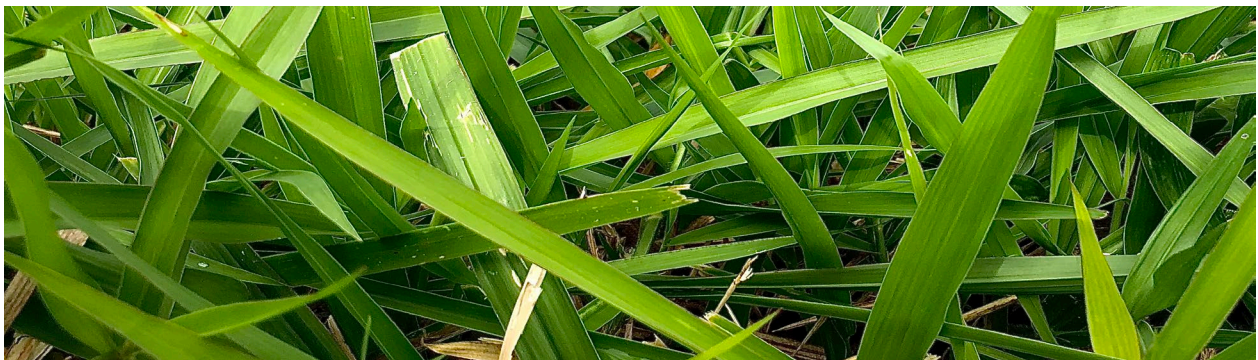
Table 4. Comparison of warm- and cool-season mixes grazed at heights to maximize leaf proportion, with different removal rates.

The table shows available forage mass (pre- minus post-grazing mass), green forage mass, dead forage mass and total mass for the 2023 growing season in Jackson, OH.

Study indications so far

- 1. Maximizing Leaf Proportion:** Grazing at shorter heights to optimize the leaf-to-stem ratio, in both cool- and warm-season mixes, has resulted in higher availability of green, nutrient-dense material. This approach improves forage quality and supports more frequent grazing cycles.
- 2. Impact of Grazing Height and Removal Rates:** Cool-season mixes grazed at a higher target height with higher removal rates resulted in higher pre-grazing forage mass, but much of it consisted of dead or low-quality material. In contrast, grazing at lower heights (12 inches) with a 50% removal rate resulted in less total forage mass but a much higher proportion of green leaves, improving overall forage quality.
- 3. Post-Grazing Residuals:** Leaving 50% of the forage as post-grazing residual has been shown to be effective in maintaining faster regrowth and long-term pasture persistence. This strategy allows for more frequent grazing without depleting the pasture's productivity.
- 4. Grazing Frequency:** More frequent grazing cycles were achieved with lower grazing heights and reduced removal rates. Shorter, more controlled grazing promotes quicker regrowth and higher-quality forage, making it a more sustainable strategy for pasture management.

These preliminary results suggest that balancing grazing heights and removal rates to maximize leaf proportion and promote regrowth can significantly enhance forage quality and grazing frequency, benefiting both pasture health and animal performance.



Graze for Leaves, Grow for Quality!