Fact sheet

U.S. Dairy Forage Research Center
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Effect of residue height and timing of grazing on pasture quality, productivity and persistence

While there are many dairy grazing systems, there are fundamental questions related to pasture management that are common to all systems. At the U.S. Dairy Forage Research Center (USDA-Agricultural Research Service) in Madison, Wis., an agronomist set out to answer five pertinent questions with two grazing trials.

1. *How does residue height of vegetative grass influence pasture growth?*
2. *How does mob-stocking of mature grass influence pasture growth?*
3. *What is the effect of early grazing in the spring when grass is still short?*
4. *What is the effect of grazing short, drought-stressed grass?*
5. *What is the effect of grazing grass that is still growing late in the fall?*

These questions are often asked by graziers, but there had been very little previous research to help answer them, especially for grasses grown in the temperate Midwest and Northeast. So the agronomist designed two trials to determine how meadow fescue, orchardgrass, quackgrass, and reed canarygrass respond to different grazing management systems. The research was conducted on 8 acres of intensively managed pasture at the USDFRC farm near Prairie du Sac, Wis. The results are presented as answers to the five questions.

1 How does residue height of vegetative grass influence pasture growth?

As can be seen in Table 1, the amount of grass consumed per rotation (avg. rotation yield) increased as the residue height decreased. But it took longer for short-residue grass to grow back and consequently it could not be grazed as often in the season. Grass grazed at the medium height of 3 inches had the greatest annual yield. The one advantage of leaving a longer residue (6 inches) was that regrowth was quicker the subsequent spring (Table 2, Column 5).

Table 1. Residue effects on orchardgrass grazed at 12 in.

Residue height (in.)	Number grazing events	Rotation time avg. (days)	Rotation yield avg. (lb/acre)	Annual yield (lb/acre)
6	6	24	750	4500
3	6	32	900	5400
1.5	4	44	1250	5000

A quick look at grass physiology helps to explain why. In order to regrow and make the necessary leaves, the plant uses two sources of energy: existing leaves, which make new carbohydrates via photosynthesis; and stored carbohydrates. When adequate residual is left after grazing, photosynthesis in the leaves remaining produces most of the carbohydrates for new leaves. When there is inadequate residual left after grazing, the plant must move stored carbohydrates up from the stem to produce new leaves. Plants would prefer to grow new leaves by producing carbohydrates with old leaves than by moving stored carbohydrates.

Pasture research plots at the U.S. Dairy Forage Research Center were used to study the effect of residue height and timing of grazing with four different grasses grazed under five different management systems.

In the study, the grass grazed to a 3-inch residual had the highest annual yield. An analysis shows that this height was the most economical, too. Table 2 shows that the per acre value of the grass grazed to 3 inches is 8 percent greater than the grass grazed to 1.5 inches and 20 percent greater than the grass grazed to only 6 inches. The same is true for the value of the milk produced from that grass.

Table 2. Economic value of residue management.

Residue height (in.)	Annual yield (lb/acre)	Yield value as hay ($/acre)	Yield value as milk ($/acre)	Date grass at 12 in.*
6	4500	$270	$1270	April 28
3	5400	$325	$1520	May 4
1.5	5000	$300	$1410	May 11

*Date grass reached 12 in. in following year.

To summarize, when grass is grazed to a short height, it may increase the yield at each grazing, but it also: increases the time needed for the pasture to recover, particularly during stress periods; increases feeding costs; and decreases tiller density in the fall and vigor in the following spring.

2 How does mob-stocking of mature grass influence pasture growth?

Mob-grazing (heavy stocking) of mature pasture has received a lot of attention by pasture-based producers. Some graziers like it because they feel it results in more complete utilization of the pasture. But how does it compare to grazing grass that's in the vegetative stage, and how does it influence pasture growth? According to the results shown in Table 3, grass grazed at the vegetative stage yielded 20 percent more on an annual basis. It was also more digestible for the cattle. When grass reaches a mature stage, its yield plateaus; even though there may appear to be new growth on top of the plant, the leaves at the bottom of the plant are senescing so the yield does not increase.

Table 3. Grass maturity effects on orchardgrass production.

Age of grass	Number grazing events	Rotation time avg. (days)	Rotation yield avg. (lb/acre)	Digestibility (%)	Annual yield (lb/acre)
Veg.	6	32	900	76-84	5400
Mature	3	60	1500	68-74	4500

Table 4. Timing of grazing effects on annual pasture production.

Treatment period	Yield loss during treatment (lb/acre)	Yield loss after treatment (lb/acre)	Total yield loss (lb/acre)	Value of loss (milk $/acre)
May[1]	400	100	500	$140
July[2]	200	600	800	$225
October[3]	0	0	0	$0

[1] early spring, [2] summer drought, [3] late fall

To summarize, when grass is allowed to mature before it is grazed, there are fewer rotations; annual yield decreases; the potential for wasted feed increases; forage quality decreases; and tiller density in the fall decreases along with vigor the following spring. Because of the decrease in forage quality, this research suggests that mob grazing is not a good fit for dairy herds but is better suited for beef herds. It's also a useful management practice for certain situations, such as when renovating a pasture or frost seeding.

The next three questions fall under the umbrella question, "Should I manage the pasture for the grass or for the cows?" There are times when the cattle need feed but it may not be an appropriate time to graze pastures. Graziers face the decision of grazing or feeding conserved forages.

3 What is the effect of early grazing in the spring when grass is still short?

Producers have to start grazing early in the spring to set the grazing wedge, or to get the rotation started. For this treatment in the study, grass was grazed when it reached 3-4 inches in early spring. Annual productivity was compared to grasses always grazed at a normal height of 12 inches. Although this management practice had an obvious effect on grass yield during the first grazing period, it had little effect on subsequent productivity of pastures (Table 4).

4 What is the effect of grazing short, drought-stressed grass?

For this management treatment in the study, grass was grazed when short during a drought period in mid July and compared to grasses always grazed at a normal height of 12 inches. It was found that when drought-stressed grass was grazed short, pasture growth after the drought ended was significantly reduced (Table 4).

5 What is the effect of grazing grass that is still growing late in the fall?

For this management treatment in the study, grass was grazed when only 3-4 inches tall in the fall before a frost event. This grass was compared to grass grazed at a normal height of 12 inches. It was found that this grazing management had no impact on pasture productivity the following year (Table 4).

In summary, the effect of residue height and timing of grazing was different under different management treatments or conditions.

Take-home message:

- A residue of 3-4 inches is best for pastures with tall-growing grasses (orchardgrass, tall fescue, etc.). Routinely grazing these grasses short (less than 2 inches) reduces pasture productivity, persistence, and profit.
- Permitting grasses to fully mature in order to mob-stock reduces pasture productivity and forage quality. Carefully consider your management objectives before using this system for dairy.
- Grazing pastures short (2-3 inches) during summer drought will have the greatest negative effect on annual pasture productivity compared to grazing in early spring or late fall.

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