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Managing Dairy Grazing for Better Grass and More Milk

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Pasture and grazing management is a science that dairy managers can learn and apply. The study of how pastures grow and how the dairy cow uses them provides the scientific knowledge needed to manage pastures effectively.

Pasture can provide inexpensive nutrients for growth and production. When farmers understand how pasture growth interacts with cattle grazing, they can plan efficient systems to manage dairy grazing. Managing grazing to keep plants in the vegetative stage will help you get the most from pasture by efficiently producing and using high-quality forage. Concentrates to supplement forages are most cost-efficient when abundant, high-quality pasture is available.

To develop a system to manage pasture and grazing, you'll need a good understanding of the following processes:

- How plants grow most efficiently
- How cows use of pasture interacts with plant growth and how to control their use of the pasture
- How to establish and maintain a high-producing dairy pasture
- How to develop a balanced fertilizer program to meet plant nutrient requirements

How plants grow most efficiently

The grass plant consists of the following:

- Roots, which draw nutrients from the soil for growth and photosynthesis and provide nutrient storage for the plant
- Leaves, which capture sunlight for photosynthesis of carbohydrates and conversion of nitrogen into protein
- The stem and seed head, which allow the plant to reproduce

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Grass plants grow rapidly in the spring and produce seed in early summer. Leafy, vegetative growth is ideal for good animal performance. As plants mature and begin to form seed, the content and digestibility of nutrients decrease.

Clover and grass pastures grow most efficiently if you keep them at a 3- to 8-inch height. Figure 1, based on New Zealand research, shows how pastures in phase 1 (about 1.5 inches high, 450 lb dry matter per acre) grow very slowly because they lack leaf area for photosynthesis. They must draw nutrients from stores in the roots until there is enough leaf area for the manufacture of carbohydrates. Repeated overgrazing depletes root reserves, reducing vigor and long-term productivity of the stand.

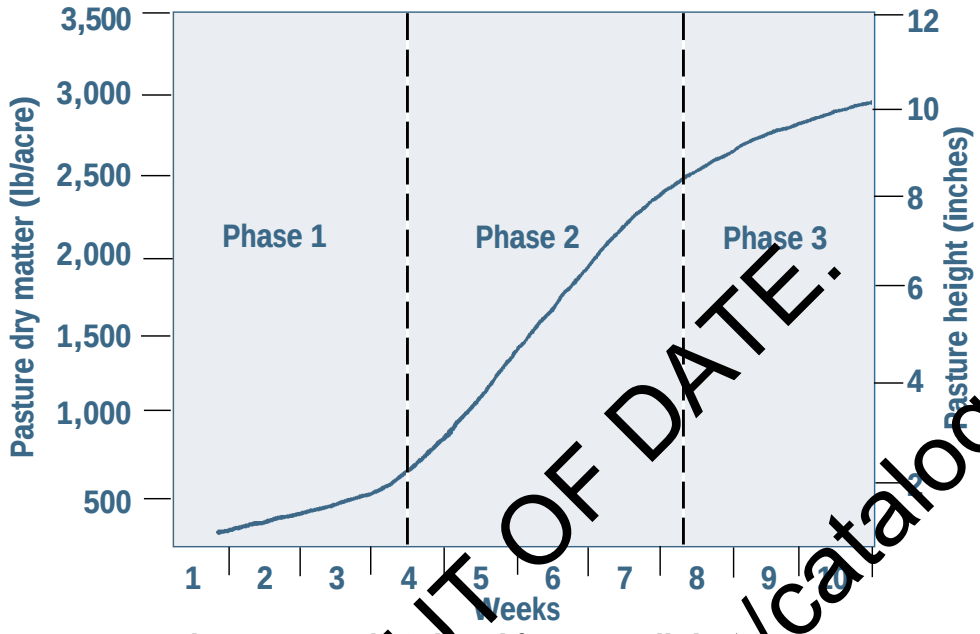

Figure 1.—Typical pasture growth. (Adopted from Controlled Grazing Systems: Introduction, *Figure 1. 1983. Wellington, New Zealand: Ministry of Agriculture and Fisheries, FPP 681)*

In phase 2 (3 to 8 inches, 900 to 2,400 lb dry matter per acre), the plants make the most rapid and efficient growth; their leaf area is great enough to use more of the sunlight falling on the area. Pasture nutrient content and quality also are highest in this phase.

Pasture growth slows in phase 3 (8 to 12 inches high) as lower leaves become shaded and die. Plants begin to send up stems to support seed heads. In this phase, nutrient content and digestibility decrease.

This pattern of growth is influenced by soil temperature, soil moisture, soil fertility, and day length.

Allowing dry matter (DM) per acre to exceed 3,500 lb before grazing, or grazing below 1,200 lb DM/acre, severely reduces pasture regrowth and, thus, the efficiency of pasture production.

How cows' use interacts with plant growth and how to control their use

Understanding grazing

High-producing cows early in lactation can't consume enough forage to meet their nutritional needs. Therefore, all of the feed they consume must be of the highest quality if you're going to maintain production.

Dairy cows prefer grazing grasses rather than legumes and will graze the most palatable species. For example, they'll graze ryegrass before tall fescue.

Pasture intake is directly affected by the amount of feed allocated in the pasture. You allocate feed when you control the height of the pasture presented to the animals, the size of the pasture, and the percentage of the forage in the pasture they consume.

Pasture intake is controlled by biting rate. The ease with which the cow can tear off and consume the pasture plants greatly influences biting rate. Quality and maturity of the pasture also affect

intake. Coarse, mature grasses reduce intake. Feed intake also is reduced if you don't control the cow's tendency to walk considerable distances while grazing.

Cattle on pasture will graze up to 8 to 10 hours a day and spend an additional 3 to 4 hours ruminating the feed they've consumed while grazing. Research has shown that a cow takes about 36,000 bites and consumes a maximum of about 28 lb DM per day given ideal conditions. Under less than ideal conditions, the amount of pasture dry matter consumed is considerably less.

Pasture allowances for high-producing, lactating dairy cattle need to be generous if cows are to consume the 20 or more pounds of pasture dry matter required daily. If you maintain forage quality, the height of the pasture determines how much feed the animal can consume and how much milk she can produce.

Managing grazing

High milk production from pasture requires low pasture use at any one grazing. A good guideline is the 50:50 rule, which means 50 percent or less of the available forage should be consumed each grazing period. When dairy cattle are forced to use more than half the available forage, intake is limited, even though it may be of high quality. At the end of the grazing period, you should have "leftover" forage in the pasture.

For pasture forage to support the first 35 to 40 lb of milk per day, graze pastures to a residual dry matter level of not less than 1,400 lb DM/acre. The ideal situation is to keep pastures growing in phase 2 by grazing them from 2,400 to 2,800 lb DM/acre down to 1,400 to 1,600 lb. This requires strip grazing—moving cows daily or twice daily.

Leaving more than 1,800 lb DM/acre after grazing will reduce the quality of the grass for future grazing. You can use dry cows, heifers, or mowing equipment to clip the pastures and remove the remaining forage evenly to about 4 inches (1,200 lb DM/acre).

Pastures allowed to grow more than 3,000 lb DM/acre become coarse and of lower quality even though total production is high. If you offer this feed to high-producing dairy cows, production will suffer.

Forage height is a good indication of the amount of DM available. Each inch of pasture height represents about 300 lb DM. Meters such as the "rising plate" or "floating plate" meter can estimate DM more accurately. These meters consist of a flat disk that slips around a measuring stick. To measure the forage, you place the measuring stick vertically in several representative areas of the pasture, allowing the disk to rest on top of the forage. By reading the stick, you can estimate the DM/acre. More expensive electronic meters that

Table 1.—Sample pasture budget, based on Oregon growing conditions

Total forage in pasture (8 inches)	2,400 lb DM/A
Subtract residual pasture desired (about 5 inches)	–1,500 lb DM/A
Feed available	900 lb DM/A
Daily feed allowance for 100 cows @ 24 lb DM/day	2,400 lb DM
Pasture needed for 1 day = $\frac{2,400 \text{ lb}}{900 \text{ lb/A}}$ =	2.7 acres
Days required before regrazing (growth @ 35 lb DM/A/day)	26 days
Area needed for a 26-day rotation = 2.7 x 26	70 acres

estimate the forage density and display a reading of estimated DM also are available.

Intensive grazing improves the quality of regrowth in pastures, but you must manage the rate of regrowth and, thus, the yield from the pastures.

Table 1 (page 3) shows a sample feed budget for pasture systems, based on Oregon growing conditions.

How to establish and maintain high-producing pastures

Pasture renovation usually is done to control weeds or undesirable grass species. Growing an annual crop such as oats or annual ryegrass will help provide a general cleanup of the pasture before reseeding.

High-producing varieties of perennial ryegrass or orchardgrass combined with white or red clover can produce over 12,000 lb DM annually. Newer varieties of white clover and perennial ryegrass, such as some developed in New Zealand, are well adapted to western Oregon.

Do not use pasture mixes that include more than one perennial grass; differences in palatability cause dairy cattle to graze selectively. Table 2 shows two recommended pasture mixes.

When you reseed a pasture, it's very important to prepare a fine, firm seedbed, use a roller after cultivation and seeding. Broadcast seeds evenly over the ground. If you broadcast evenly, a seeding rate of 28 lb of perennial ryegrass per acre provides one seed per square inch. Don't drill seed in wide rows, which would leave large open areas (6 to 8 inches between rows) for weed establishment. If you do want to drill the seed, drill lighter rates in two directions to fill open areas.

Table 2.—Pasture seeding recommendations for well-drained soils in western Oregon (lb seed/acre)

	Mixture	
	No. 1	No. 2
Perennial ryegrass	—	25
Orchardgrass	20	—
Annual ryegrass	—*	4–6*
White clover	2–3	2–3

*Use only if early growth is important and pastures will be dry enough to graze early. Annual ryegrass can reduce the growth of perennial grass and clover, resulting in poor establishment.

How to develop a balanced fertilizer program

Plan a well-balanced fertilizer program to meet the needs of your established or newly seeded pasture.

Nitrogen (N) is the most limiting nutrient for pasture production. Adequate nitrogen supports forage growth and dry matter production. Nitrogen also affects protein content of the grass.

Legumes are included in pasture mixes because they fix nitrogen from the air and are high-quality forages. Nitrogen fixed by legumes isn't directly available to grass plants. To become available, legume plants first must be decomposed in the soil by bacteria.

White clover can fix 125 lb of nitrogen per year from the atmosphere when soil temperatures are above 52°F. Soil temperatures below 52°F greatly reduce bacteria's ability to fix nitrogen or to break down the organic matter that provides nitrogen for pasture growth.

If adequate nitrogen is available as ammonium or nitrate in the soil, grass plants will produce 8 to 25 lb DM/acre per day at soil temperatures between 41°F and 50°F. When soils warm above 52ºF, growth rates increase sharply. Phase 2 growth in warm soils can produce 80 to 100 lb DM/day.

The following guidelines provide a basic foundation for a pasture N fertilization program.

- Lower soil temperatures early and late in the pasture season and pastures without legumes require application of nitrogen fertilizer before turning cows on pasture in the spring to significantly increase spring grass growth (see *Early Spring Forage Production for Western Oregon*, EM 8852-E).
- Apply about 30 lb N/acre per month during the growing season to pastures without legumes to support continuous production.
- Apply nitrogen in August or September, with adequate soil moisture, to correct late-summer shortages and promote fall grass growth.

Monitor the grass in the pasture for symptoms of nitrogen deficiency (i.e., slow growth, yellowish color). New seedings or pastures cut for greenchop, silage, or hay may require nitrogen, either as animal manure or commercial fertilizer, to keep the grass component of the pasture healthy.

Analyze manure for nutrient concentration before application (see *Which Test Is Best? Customizing Dairy Manure Nutrient Testing*, PNW 505). A typical nitrogen content is 6 lb N/1,000 gallons liquid manure from a tank and 4 lb N/1,000 gallons liquid manure from a storage pond. Apply 5,000 gallons/acre of tank manure or 7,500 gallons/acre of pond manure to provide 30 lb N/acre. See the publications on dairy manure nutrients listed below for more information.

Potassium requirements are about 20 percent higher for harvested pastures than for grazed pastures. In addition, maintain adequate levels of phosphorus, calcium, magnesium, sulfur, and soil pH on any pasture, based on periodic soil tests. Fall soil tests allow time to apply fertilizer and meet grass needs for the next grazing season.

For more information on pasture fertilization, see *Fertilizer Guide: Pastures—Western Oregon and Western Washington*, FG 63.

For more information

Calculating Dairy Manure Nutrient Application Rates, EM 8768 (2000)

Dairy Manure as a Fertilizer Source, EM 8586 (1995)

Early Spring Forage Production for Western Oregon Pastures, EM 8852-E (2004)

Fertilizer Guide: Pastures—Western Oregon and Western Washington, FG 63 (revised 1996)

Keeping Track of Manure Nutrients in Dairy Pastures, PNW 549 (2002)

Manure Application Rates for Forage Production, EM 8705 (1996)

Which Test Is Best? Customizing Dairy Manure Nutrient Testing, PNW 505 (1997)

Who's Coming to Dinner? (video), VTP 28 (1998)

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Copies of many of the above publications and videos also are available from OSU Extension and Experiment Station Communications. For prices and ordering information, visit our online catalog or contact us by fax (541-737-0817), e-mail (puborders@oregonstate.edu), or phone (541-737-2513).

Summary

- Leafy, vegetative growth is ideal for good animal performance.
- In phase 2 (grass is 3 to 8 inches tall, with 900 to 2,400 lb DM/acre), plants have the most rapid and efficient growth, and nutrient content and quality are highest.
- Ideally, to keep pastures growing in phase 2, graze them from 2,400 to 2,800 lb DM/acre down to 1,400 to 1,600 lb DM/acre.
- Allowing pasture growth to exceed 3,500 lb DM/acre before grazing, or grazing below 1,200 lb DM/acre, seriously reduces pasture productivity. To maintain adequate intake, don't graze pastures to less than 1,400 lb DM/acre. To maintain quality for future grazing, leave no more than 1,800 lb DM/acre.
- Pasture intake and subsequent milk production are directly affected by the amount of forage allocated for grazing. Control the height of the pasture, the size of the pasture, and the percentage of the forage in the pasture cows are allowed to consume.
- Follow the 50:50 rule for high milk production. Fifty percent or less of the available forage should be consumed each grazing period.
- Nitrogen is the most limiting nutrient for pasture production. For optimal pasture production, apply nitrogen 6 weeks prior to spring grazing, periodically throughout the grazing season, and prior to fall growth.
- Always leave about 4 inches of growth (1,200 lb DM/acre) at the end of the grazing season for stronger pastures next year.

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