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# Case Study: Documenting grass growth and productivity in a grass-based organic dairy in Oregon

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## ABSTRACT

Managing pastures on grazing dairies is a continuous challenge because pasture quality, quantity, and growth rate are changing daily. The objectives of this study were to document weekly pasture growth, forage quality, and performance to understand how to use this information to make management decisions on US dairies. One organic grazing dairy was studied for 3 consecutive years. Pastures were measured and mapped, and total standing DM was estimated weekly in all 22 pastures using a calibrated rising plate meter. Weekly grazing wedges were developed and were used to make grazing decisions that week. Paddocks grazed and residual pasture covers were recorded daily. Paddock grazing and residual heights were also included in the electronic recordkeeping. Dry matter yields ranged from 11,277 to 22,346 kg/ha per year and averaged 15,887 ± 1,919, 17,848 ± 1,966 and 17,956 ± 2,014 for each consecutive year. Daily growth rates ranged from 18 to 100 kg/ha per day throughout the season and averaged as high as 56 ± 20.3 kg/ha per day in yr 3. Pasture quality and productivity in Oregon is comparable to some of the most productive dairy pasture systems reported from around the world.

**Key words:** dairy grazing, milk solids, pasture measurements, plate meter

## INTRODUCTION

High relative feed prices for dairy production have increased interest in New Zealand–style pasture production in the United States as a way to remain profitable. Pasture systems and feeding more forage provide a less expensive alternative to concentrates and have been used extensively in other parts of the world (Mosquera-Losada and Gonzalez-Rodriguez, 1999). There are many areas throughout the country that are able to grow high quality grass, including western Oregon. Comparisons between the New Zealand dairy model and conventional farming in Pennsylvania (Parker et al., 1992) have been made, but no comparisons between New Zealand and the Pacific Northwest have been reported. It was found that farms in the Northeast United States could gain $121/cow profit by using a grazing system compared with a confinement feeding system (Parker et al., 1992). During the last 20 yr, New Zealand has made an effort to improve its low-cost system through pasture, livestock, and grazing management. Monitoring individual-paddock pasture cover is one of the key factors in achieving profitable farm management in the New Zealand dairy system. Informative data on farm pasture cover increase feed utilization by optimizing rotation lengths and improving forage conservation and timing of fertilizer applications and forage supplementation (Dalley et al., 2009). Even with these highlighted benefits, only 25% of New Zealand dairy managers use a formal feed budgeting system. The objective of this study was to measure pasture growth and performance weekly for 3 consecutive grazing seasons and estimate milk solids produced from grazing pastures per hectare and per cow.

## MATERIALS AND METHODS

This study was conducted on one dairy farm in Tillamook County, Oregon. This is an organic dairy that milks 220 cows and has 22 grazing paddocks and a total of 70 ha. The cow herd consists of Jersey × Friesian crossbred animals that have been selected for various traits including performance on pasture. Animals were housed in freestall barns during the winter months and grazed approximately 9 mo out of the year. Diets included pasture and some alfalfa hay and 1 kg of grain/d. The quantity of alfalfa hay offered varied depending on pasture availability early and late in the growing season and was increased during weather constraints but average 1.72 kg/d during the grazing season. Pastures are a mixture of perennial ryegrass and white clover and were irrigated with a pod irrigation system. The dairy herd was rotated through 22 grazing paddocks from March through mid-November depending on the weather. Pastures are grazed at approximately 3,000 kg of DM/ha down to a residual of 1,300 kg of DM/ha, with the cow herd typically being rotated into a new paddock every 12 h after each milking. Pastures where fertilized 4 times throughout the year with liquid dairy manure at a rate of approximately 220 kg of total N/ha for the season. Soil types were predominantly

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well-drained Nehalem silt loams. Pasture was measured throughout the grazing season by weekly estimates of forage cover (DM) in every paddock using a rising plate meter (Jenquip, Fielding, New Zealand); the data were tabulated using Pasture Coach software (Farm Software Solutions Ltd., Darfield, New Zealand). The route through the fields and the number of measurements taken were the same every week to reduce error. Calibrations for the rising plate meter were performed 3 times annually to account for seasonal variability. Calibration was done by measuring a known pasture area, cutting forage within the area using hand shears, drying the sample at 50°C for 24 h, and weighing the dried result. Field measurements with the rising plate meter were taken as a composite of 50 individual samples as suggested by the equipment manual and the literature (Gourley and McGowan, 1991). Weekly farm walks were recorded in a field notebook for each paddock and then entered into electronic recordkeeping software (Pasture Coach). Dairy farm managers also recorded when fields were grazed, the paddock grazing residual, and when and how much supplemental feeding took place.

Grazing feed wedges were generated on the farm after each farm walk weekly after calculating paddock covers and entering the pasture DM into grazing management software. These grazing wedges showed graphically the total standing DM that week for all the pastures on the dairy.

Bulk tank weights were recorded, and monthly milk shipped was totaled all 3 yr. Every tank shipped was analyzed for SCC, fat content, protein content, and lactose content using mid-infrared spectrophotometry (Organic Valley Cooperative, McMinnville, OR). The amount and cost of feed that was purchased to supplement grazing were recorded, and this DM was used to estimate the volumes of DM consumed during the grazing season.

## RESULTS AND DISCUSSION

The main objective of this study was to design a system to successfully document pasture growth, feed quality, and milk production. At the completion of this project, we are now able to calculate the quality and quantity of pasture grown throughout the season and the kilograms of milk solids produced per hectare from grass. Walking every paddock weekly and estimating weekly pasture DM with the plate meter for 3 yr has generated an abundance of data and helped researchers and the dairy operator gain a new performance perspective of this dairy. Every week we estimated growth and yields from grazing throughout the growing season. The feed wedges generated gave the dairy farmer a visual assessment of the feed availability in the grazing platform, which he used to make grazing decisions that week (Figure 1). The producer found it to be a valuable tool and has continued to plate his pastures since this trial ended.

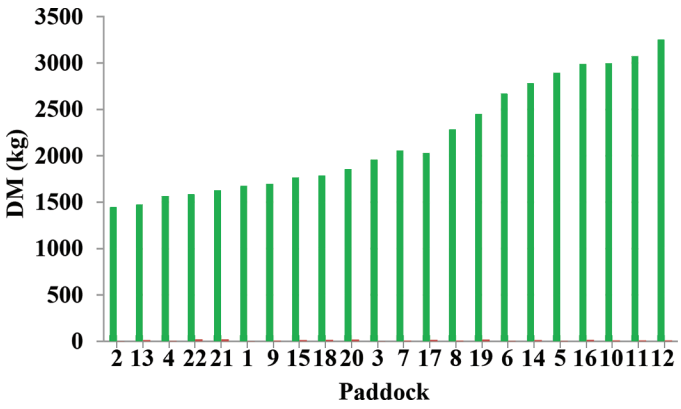


**Figure 1.** Grazing wedge illustrating the estimated DM for each paddock on the dairy grazing platform. Color version available online.

Dry matter yields and average daily growth rates for the 3 consecutive growing seasons are in Table 1. Year 1 ranged from 11,312 to 17,513 kg/ha, averaging 15,887 ± 1,919 kg/ha, with an average growth rate of 47 ± 27 kg/ha per day for the 9-mo grazing season. Yields in yr 2 were estimated to be approximately 2,000 kg/ha higher, and the average growth rate was also up. In yr 3, the estimated DM removed ranged between 13,354 and 22,346 kg/ha, averaging 17,956 ± 2,014 kg/ha, with an average growth rate of 56 ± 20 kg of DM/ha per day for the entire grazing platform.

Milk production per cow averaged 5,806 kg/yr, with 5.2% fat and 3.9% protein. Total milk solids produced (milk fat and protein) from pasture were calculated per hectare and per cow for all 3 yr (Table 2). Milk solids produced ranged from 793 to 1,089 kg/ha and per cow ranged from 291 to 336 kg from grass. For the 9-mo grazing season, the percentage of the diet that was estimated to be coming from pasture ranged from 72 up to 85%. This was estimated to average around 10 kg of grass and 2.72 kg of conserved

**Table 1.** Estimated ranges of DM grown annually and average daily growth rate

| Item | Yr 1 | Yr 2 | Yr 3 |
|---|---|---|---|
| Estimated paddock yields (kg/ha) | 11,312–17,513 | 14,586–20,257 | 13,354–22,346 |
| Average DM grazed ± SD (kg/ha) | 15,887 ± 1,919 | 17,848 ± 1,966 | 17,956 ± 2,014 |
| Daily DM growth rate ± SD (kg/ha) | 47 ± 27 | 49 ± 20 | 56 ± 20 |