



Manitoba Beef & Forage Initiatives Inc.

Determining forage yield, grazing calculations, and stocking rate

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Introduction

There are different ways to create a grazing rotation. This handout details steps to take for taking a yield estimate, determining desired utilization, and calculations for determining number of days on pasture or size of paddocks desired.

Please note that the following information applies to **dry matter intake** only. It is important to consider forage quality for animal nutrition needs when creating a grazing plan.

Building a sampling frame

A standard size frame is 0.25m^2 . To create a frame of this size, each side must be 50cm. They can be easily made from metal rod or PVC pipe.

A hula hoop may be used in place of a custom-built frame. If choosing to use a hula hoop, measure the diameter (the distance from one side of the hula hoop to the other, through the center of the hoop). Determine the radius using the formula: Radius = Diameter \div 2.

Use the formula for area of a circle to determine the area inside the hula hoop (A = Area). $A = \pi r^2$

Ex. If the hula hoop is 80cm (0.8m) diameter

$$\text{Radius} = \text{Diameter} \div 2$$

$$\text{Radius} = 0.8\text{m} \div 2$$

$$\text{Radius} = 0.4\text{m}$$

$$A = \pi r^2$$

$$A = \pi \times (0.4)^2$$

$$A = 0.50\text{m}^2$$

Collect forage samples

1. Supplies:
 - a. Sampling frame
 - b. Scissors or clippers
 - c. Bags – paper or other breathable material is preferred
2. Take at least three samples per pasture. Choose areas that are representative of forage growth for that pasture.
3. During the growing season, sampling should occur just prior to moving cattle in (1-2 days). When the forage is dormant, sampling can take place earlier as forage supply will not change significantly.
4. Place the sampling frame. Ensure only plants with the base inside the frame are included when clipping.
5. Hand rake out standing litter.
6. Clip the forage using scissors at approximately 2 inch (5 cm) off the ground.
7. Place forage into a bag and secure the bag closed. If taking samples in multiple fields, make sure to label the bag with the field number.

Determine dry matter yield

Forages must be dried to determine yield. Drying a forage sample removes variability due to water content in the plants. The grazing calculations in this document all require dry matter yields.

1. Supplies:
 - a. Microwave
 - b. Microwave safe container
 - c. Glass or cup with water
 - d. Kitchen scale
2. Put your microwave safe container on the kitchen scale and turn the scale on. The scale should read 0.0g.
3. Place the entire forage sample in the microwave safe container and record the weight.
4. Place the microwave safe container in the microwave
5. **Place the glass or cup full of water into the microwave.** The glass of water is essential, so the forage sample does not burn.
6. Dry the forage sample in the following intervals, weighing between each interval. When the forage sample stops losing weight, you have fully dried the sample.
 - a. Microwave 3 minutes, weigh
 - b. Microwave 30 seconds, weigh
 - c. Repeat step B until the forage sample stops losing weight.
7. Record the final dry weight. This is the number used in grazing calculations.

Calculate yield

1. Average the dry weights of all samples taken from the same pasture.
 - a. Sum of sample weights (g) ÷ Number of samples = Average sample weight (g)
 - b. Example: $(40g + 35g + 55g + 45g) \div 4 = 43.75\text{ g}$
 - c. Make sure you Enter on your calculator prior to dividing by the number of samples
2. Convert the dry weight from your sampling frame to a yield.
 - a. Frame size:
 - i. 50cm x 50cm frame is 0.25m^2 .
 - ii. Hula hoop frame size will need to be determined using the calculation above.
 - b. Convert from g/m^2 to kg/ha :
 - i. Formula:
$$\frac{\text{g}}{\text{m}^2} \times \frac{10,000\text{m}^2}{\text{ha}} \times \frac{\text{kg}}{1,000\text{g}} = \frac{\text{kg}}{\text{ha}}$$
 - ii. Example:

$$\frac{43.75 \text{ g}}{0.25 \text{ m}^2} \times \frac{10,000 \text{ m}^2}{\text{ha}} \times \frac{\text{kg}}{1,000 \text{ g}} = \frac{1,750 \text{ kg}}{\text{ha}}$$

iii. Yield = 1,750 kg/ha

c. Convert from kg/ha to lb/ac:

i. Formula:

$$\frac{\text{kg}}{\text{ha}} \times \frac{2.2 \text{ lb}}{\text{kg}} \times \frac{\text{ha}}{2.47 \text{ ac}} = \frac{\text{lb}}{\text{ac}}$$

ii. Example:

$$\frac{1,750 \text{ kg}}{\text{ha}} \times \frac{2.2 \text{ lb}}{\text{kg}} \times \frac{\text{ha}}{2.47 \text{ ac}} = \frac{1,559 \text{ lb}}{\text{ac}}$$

iii. Yield = 1,559 lb/ac

3. Calculate the amount of Available Forage:

- a. To protect animals and forage, we do not want to force cattle to eat 100% of the forage stand.
- b. When creating a grazing plan, it is important to know the desired utilization of the pasture. In general, native pastures are utilized 50% and tame pastures are utilized at 70%. Utilization can be increased or decreased depending on moisture or desired outcomes.
- c. To calculate utilization:
 - i. % ÷ 100 = conversion factor
 - ii. Example 50% utilization (take half leave half):
 - 1. $50\% \div 100 = 0.5$
 - iii. Example 70% utilization
 - 1. $70\% \div 100 = 0.7$
- d. To calculate Available Forage:
 - i. Formula:

$$\text{Yield} \left(\frac{\text{lb}}{\text{ac}} \right) \times \text{Utilization (\%)} = \text{Available Forage} \left(\frac{\text{lb}}{\text{ac}} \right)$$
 - ii. Example: $1,559 \text{ lb/ac} \times 0.5 = 779 \text{ lb/ac}$
 - iii. Available Forage = 779 lb/ac

4. Calculate the number of Animal Units:

- a. Animal Units (AU) are a standardized unit for grazing animals, calculated based on weight.
- b. In western Canada, the following Animal Unit Equivalents (AUE) are standard rule of thumb:
 - i. Cow/calf pair: 1.3 AU
 - ii. Yearling: 0.85 AU
 - iii. Bulls: 1.5 AU
- c. To calculate total animal units, multiply the AU by the number of head.
 - i. Example: $1.3 \text{ AUE/pair} \times 50 \text{ pairs} = 65 \text{ AU}$
 - ii. Animal Units can be added together. For example, if there are 2 bulls in the above herd, $2 \text{ bulls} \times 1.5 \text{ AUE/bull} = 3.0 \text{ AU}$. For a total of $65 \text{ AU} + 3 \text{ AU} = 68 \text{ AU}$.

5. Calculate the amount of forage required by the herd.

- a. One Animal Unit requires 26 pounds of dry matter forage per day.

$$AUE \times head \times \frac{26lb}{AU \times day} = Forage\ Required \left(\frac{lb}{day} \right)$$

c. Example:

$$1.3AUE \times 50head \times \frac{26lb}{AU \times day} = 1690 \left(\frac{lb}{day} \right)$$

d. Forage required = 1,690 lb/day

6. To calculate the number of days per pasture:

a. Formula:

$$Pasture\ Size\ (ac) \times Available\ forage \left(\frac{lb}{ac} \right) \div Forage\ Required \left(\frac{lb}{day} \right) = Days$$

b. Example:

$$40\ (ac) \times 779 \left(\frac{lb}{ac} \right) \div 1690 \left(\frac{lb}{day} \right) = 18\ Days$$

c. Total days on pasture = 18 days

7. To calculate the number of acres for a given amount of time:

a. Formula:

$$Days \times Forage\ Required \left(\frac{lb}{day} \right) \div Available\ Forage \left(\frac{lb}{ac} \right) = Area\ (ac)$$

b. Example for three days:

$$3\ Days \times 1690 \left(\frac{lb}{day} \right) \div 779 \left(\frac{lb}{ac} \right) = 6.5\ ac$$

c. For three days, these 50 cows need 6.5 ac

Calculate Stocking Rate

Record keeping of your grazing plan each year helps to build future grazing plans. Keeping grazing records in Animal Units (AU) and Animal Unit Days (AUD) makes it easier to change between class of animal (pairs to yearlings or vice versa). A record of yearly grazing will show patterns of forage availability due to moisture variation, variability in grazing pressure by year, and help in creating future grazing plans. Stocking rates include a unit of time and a unit of area, and can be recorded in AUD/ac.

1. To calculate the number of Animal Unit Days (AUD):

a. Formula:

$$AUE \times head \times days = AUD$$

b. Example:

$$1.3AUE \times 50head \times 18days = 1,170AUD$$

c. There was 1170 AUD on the above 40 ac pasture.

2. To calculate your stocking rate (AUD/ac):

a. Formula: AUD ÷ ac

b. Example: 1,170 AUD ÷ 40 ac = 29.25 AUD/ac

i. Stocking rate is 29.25 AUD/ac