Agronomy #32

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Subject: GRAZIERS ARITHMETIC

A grazing system will produce a certain amount of forage. To have a sustainable system, it is important to have a stocking rate that will balance the required forage with the available forage. It is important for the producer to know the estimated appropriate stocking rate for a system. The producer then needs to be given alternatives to manage surplus or deficiencies in forage production.

The carrying capacity of a system is the economical and environmentally sustainable stocking rate for the system throughout the entire grazing season. It is determined by four factors: 1) annual forage production, 2) seasonal utilization rate, 3) average daily intake, and 4) the length of the grazing season. The carrying capacity is shown in the following formula:

$$\text{Carrying Capacity} = \frac{\text{Annual Forage Production} \times \text{Seasonal Utilization Rate}}{\text{Average Daily Intake} \times \text{Length of Grazing Season}}$$

Annual Forage Production is the total amount of forage produced per acre annually, expressed in lbs./acre.

Seasonal Utilization Rate is the percent of total annual forage production actually harvested by the grazing animals.

Average Daily Intake needs to be set at the level required to give the desired animal performance. This can be affected by forage quality. The needs of the animal vary according to animal species and the requirements of the animal due to their size, milking ability, and the stage of their yearly cycle. Routine numbers, based upon the body weight of the animal, are: beef cows 3%, dairy cows 4% (however, normally only about 3% will come from forage and the remainder from a TMR), stocker animals 3%. Horses, sheep and goats eat more than cattle, so should use 4% of their body weight.

Length of Grazing Season is just the number of days the animals will be in the grazing system.

Carrying Capacity in this formula, will be expressed in pounds of live weight per acre, so the numbers of animals can vary depending upon the weight of the animals.

EXAMPLE

$$\text{Carrying Capacity} = \frac{8000\text{\# forage/acre x .50 (utilization)}}{.03\text{ lb. forage/lb. liveweight x 150 days}} = \frac{4000}{4.5}$$

= 889 lb. liveweight/acre or .74 cows/acre or 1.34 acres/cow
(assuming cows weigh 1200 lb.)

This provides a guideline for carrying capacity. However, during any particular grazing period, this information may not be accurate. Forages do not grow uniformly throughout the growing year. They each have their own growth curve. So while there may be adequate forage produced for a particular carrying capacity for the total of the growing year, there might be a surplus or deficit of forage during a particular period of the growing year. To determine an appropriate **Stock Density**, modify the carrying capacity equation to the following:

$$\text{Stock Density} = \frac{\text{Available Forage} \quad X \quad \text{Grazing Period Utilization Rate}}{\text{Average Daily Intake} \quad X \quad \text{Length of Grazing Period}}$$

Available Forage is the quantity of forage dry matter that is allocated to the grazing animals for the grazing period.

Grazing Period Utilization Rate is the rate the forage will be utilized during the grazing period expressed in a decimal. This may or may not be the same as the season utilization rate.

Average daily Intake is expressed in decimal form as the percent of body weight of the grazing animal.

Length of Grazing Period is expressed as the number of days the grazing animals will be in this grazing area.

$$\text{Stock Density} = \frac{\text{2300 lb. forage/acre x .50 utilization rate}}{\text{.03 lb. forage/lb. liveweight x 7 day grazing period}} = \frac{1150}{.21}$$

= 5,476 lbs. liveweight/acre or 4.5 cows/acre (assuming 1200# cows) or
.22 acres/cow

The following table can be used to assist in estimating a full season utilization rate.

Rotation Schedule	**Utilization Rate**
Continuous Grazing	30 – 35%
14 grazing days	35 – 40%
7 grazing days	45 – 55 %
3 – 4 grazing days	55 – 65%
1 day of grazing	65 – 70%
1/2 day of grazing	70 – 75%

Associated with each grazing rotation is a proper rest period. On the average during the grazing season, each pasture (paddock) should get 30 – 35 days' rest between grazing periods. However, the length of the rest period depends upon how fast the forage regrows. The following can be used as a guideline.

How many paddocks are needed in a rotational grazing system?
This is a common question and it actually depends upon several things. To assist in actually calculating how many paddocks, the numbers of days rest between grazing periods needs to be determined. The days of rest needed can vary because of the type of forage and the weather. The other component in this calculation is the length of the grazing period. This can vary due to the desired level of management, availability of labor, and the desired performance of the livestock.

The formula for determining the minimum number of paddocks is:

$$\text{Number of Paddocks} = \frac{\text{Rest Period (in days)}}{\text{Grazing Period (in days)}} + 1$$

$$\text{Number of Paddocks} = \frac{45}{3} + 1$$

Number of Paddocks = 15 + 1 = 16 paddocks, so 16 would be the number of paddocks needed in this system.

Information used from the 1996 Missouri Grazing Manual and the Iowa NRCS FOTG