

Animal Unit Equivalent for Beef Cattle Based on Metabolic Weight

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Should producers allocate more grass to large cows than to cows of average size during planning of grazing management strategies?

Body size affects the quantity of dry matter intake. Large cows eat more forage than do cows of average size. Numerous methods have been devised to predict or plan for livestock demand for forage. As a rough guideline, daily dry matter intake can be estimated relatively quickly by using 2% of body weight (Holechek et al. 1989). This technique is useful for general decisions, but when used to estimate forage needs in a grazing system, it tends to underestimate the forage needs of lighter animals and overestimate the forage needs of heavier animals.

A more accurate estimate of daily or monthly forage demand of livestock on a grazing system can be reached by using the metabolic weight of the livestock rather than the live weight of the animals. It has been found that metabolic weight accounts for significant variation in dry matter intake among animals of different size (NRC 1996). Metabolic weight is the live weight to the 0.75 power. Beef cattle animal unit equivalents can be determined for animals of different sizes by calculating their metabolic weight as a percentage of the metabolic weight of a 1000 pound cow. A 1000 pound cow with or without a calf is defined as 1.00 animal unit, which has a daily dry matter allocation of 26 pounds of forage.

Method to calculate Animal Unit Equivalent (AUE) for beef animals of different weights based on metabolic weight (live animal weight ^{0.75}) with a 1000 pound cow equal to 1.00 Animal Unit (AU). This method requires a calculator with [y^x] function and memory.

$$\frac{(\text{Live animal weight})^{0.75}}{1000^{0.75}} = \text{Animal Unit Equivalent (AUE)}$$

Enter Data

$$1000 [y^x] 0.75 = \{177.827941\} \text{ store memory}$$

$$(\text{Live animal weight}) [y^x] 0.75 = \{ \quad \} \div \text{recall memory} = \text{AUE}$$

Table 1 lists the calculated animal unit equivalents based on metabolic weight for a wide range of live animal weights. Calculating the animal unit equivalent for each cow in a herd would yield an accurate estimate of the quantity of forage required by grazing livestock; however, this does not seem practical or necessary for proper management of a grazing system. But increasing the accuracy of the forage demand estimate by grouping similarly

sized animals of a herd into a few size categories and assigning appropriate animal unit equivalents to each group does seem practical and beneficial. This would enable the manager to allocate the pasture forage resources more accurately. Table 2 suggests a few beef cattle size categories and corresponding animal unit equivalents that could be used for planning grazing management strategies.

Table 1. Animal Unit Equivalent (AUE) based on metabolic weight (live animal weight^{0.75}).

Animal Live Weight (lbs)	Animal Unit Equivalent y ^{x 0.75} (% of 1000 lbs)
600	0.682
650	0.724
700	0.765
750	0.806
800	0.846
850	0.885
900	0.924
950	0.962
1000	1.000
1100	1.074
1200	1.147
1300	1.217
1400	1.287
1500	1.355
1600	1.423
1700	1.489
1800	1.554
1900	1.618
2000	1.682
2200	1.806
2400	1.928
2600	2.048
2800	2.165
3000	2.280

Table 2. Suggested practical application of Animal Unit Equivalent based on metabolic weight (live animal weight^{0.75}).

Beef Animal Category	Animal Unit Equivalent
Weaned animal lighter than 800 lbs	0.75
Young animal 800-900 lbs	0.85
Cow 900-1100 lbs with calf	1.00
Cow 1100-1300 lbs with calf	1.15
Cow heavier than 1300 lbs with calf	1.25
Bull lighter than 2000 lbs	1.50
Bull heavier than 2000 lbs	2.00

Definitions from Society for Range Management Glossary, Jacoby, Chair., 1989.

Animal-unit. Considered to be one mature cow of approximately 1,000 pounds, either dry or with calf up to 6 months of age, or their equivalent, based on a standardized amount of forage consumed.

Animal-unit-month. The amount of dry forage required by one animal unit for one month based on a forage allowance of 26 pounds per day.

Literature Cited

Holechek, J.L., R.D. Pieper, and C.H. Herbel. 1989. Range management principles and practices. Prentice Hall, NJ.

National Research Council. 1996. Nutrient requirements of beef cattle. Seventh revised edition. National Academy Press, Washington DC.