

Determining Pasture Rental Rates for North Dakota

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Livestock producers and landowners have asked for a simple and fair method to determine pasture rental rates. This tends to be a difficult question to answer as prices can vary from region to region due to market demand and supply. However, several methods are available for computing a pasture rental rate. Before computing a pasture rental rate, there are a variety of factors influencing rental rates that are important to understand.

Pasture rental rates vary based on:

- Forage quantity and quality
- Forage species and composition – rangeland, improved pasture¹, annual cover crop, crop residue
- Condition of fence
- Water quality and availability
- Management practices required by landowner
- Presence of a grazing system on rangeland and improved pastures
- Fertility practices on improved pastures
- Supply and demand

¹ Improved pasture usually refers to seeded pastures and may include tame grass species such as crested wheatgrass, brome grass, wheatgrass mixtures and expired conservation reserve program lands in the Northern Plains.

Pasture Rental Rate Options

There are many options available to calculate pasture rental rates as a starting point for negotiations between landowner and tenant. Since North Dakota is primarily a cow-calf producing state, the best rental rate options that fit our region are based on:

1. Rental Rate by Acre

- Current market rates based on annual surveys – USDA, National Agricultural Statistics Service
- Return on pasture investment – return based on value of land

2. Rental Rate by Animal Unit Month (AUM)

- Rent per head of livestock (animal unit equivalent) per month

Other pasture rental rate options or methods to calculate a rental rate value are available.

3. Performance Method

This is an option used when payment is made based on livestock performance. This method is **NOT** recommended for permanent pasture types such as native rangeland or improved pastures grazed with cow-calf pairs in the Northern Plains. Performance method is calculated based on weight gain of livestock.

- Used primarily with yearling cattle
- Based on break-even rate for cost/lb of gain x pounds gained on pasture per head
 - The break-even rate for cost/lb of gain is extremely variable across a region and the country, thus leaving a wide range of potential rental rates. Publications throughout the country list a range of \$0.30 to \$0.60 as a breakeven rate for cost/lb of gain (1, 2).

4. Pasture Quality Factors

This is a method recommended for annual forage pastures such as cover crops, crop residue and annuals planted for grazing.

- Uses current market value for hay price per ton x pasture quality factor x animal unit equivalent
- This method does not work effectively for rangeland and will undervalue rental rates, especially with good cattle prices and lower hay values (i.e. \$60/ton grass hay x 0.15 x 1.15 (1,200 lb cow with calf = \$10.35/AUM).

Pasture rental rates are often influenced by commodity prices such as commercial hay, corn, barley, by-products and alternative land uses. Pasture rental rates need to be competitive with the production values of these crops that are typically fed to cattle as alternative feeds.

Water quality, the forgotten metric on the value of a pasture:

A pasture can have all the grazable forage needed to sustain a livestock herd, but if water quantity is low or quality is poor, then it truly has no value unless the tenant is willing to haul water. Pasture rental rates should include both water quantity and quality.

- If water quantity and quality are adequate, then rental rates should be based on the local value – or demand – within your area.
- Water quantity may be sufficient for part of the grazing season, so assessing a value should be determined based on grazing period. Paying by the AUM would be recommended for this type of arrangement.
- When it comes to water quality, the tenant needs to ask if there has been any history of water toxicity in the pasture and should request a livestock water quality screening be completed prior to the grazing period. The value of the pasture needs to be adjusted if water quality is a concern, especially if seasonal.

Responsibilities

The responsibility of tenant and landowner must be considered when negotiating rental rates. In most cases, unless specified in a written contract, the **tenant is responsible** for those activities related to livestock production and management. These activities include:

- Checking livestock
- Checking/maintaining water sources
- Providing salt, mineral and fly control
- Fence repair
 - Often negotiated between tenant and landowner
 - Material typically provided by landowner, but can vary from region to region

The **land owner is typically responsible** for those activities related to land production. These activities include:

- Fence
 - Responsibility for material and repair may vary, and is often negotiated between landowner and tenant
- Water
- Weed and brush control
 - Negotiable, but landowner provides chemical
- Fertilizing and reseeding improved pasture
 - Negotiable, but landowner provides fertilizer and/or seed

Landowner and Tenant Considerations

A **landowner** typically expects rental rates to cover the real estate taxes, cost of land maintenance (fence repair, water source costs, weed control/management, etc.), insurance and any interest in the investment if purchased land from the rental payment. A landowner should be able to cover all out-of-pocket expenses from the rental payment; however, in some cases this may be unrealistic due to current range and pasture values

A **tenant** should determine the level of affordability to rent a pasture based on current livestock market values, availability and costs of alternative feeds, and availability of other pastures within a reasonable distance. Basically, tenants needs to know what they can afford based on their return per head or herd and projected annual budget.

Renting by the Acre

Renting by the acre is the simplest option because it creates a direct payment rate for each acre of land grazed and is most familiar to livestock producers and landowners. However, this method has the greatest potential for economic and land conservation efforts.

Leasing pasture by the acre sets a value on the land for the entire operating year (*based on North Dakota Century Code*) and is usually not tied to livestock numbers unless specified in a contract. This method usually benefits, economically, the tenant as that person can add more livestock without adding payment.

This method can also increase the risk of overgrazing because adding more livestock doesn't add more expense to the tenant. Increased livestock numbers reduce the direct costs per head of livestock and potentially create overgrazed pastures if too many livestock are added over a period of time. The livestock producer may experience poor livestock performance and land owner resource degradation when overgrazing occurs.

Current Market Rates — Survey Data

The USDA National Agricultural Statistics Service for North Dakota provides average pasture rental rates and range/pasture land values that are created based on annual surveys of farmers and ranchers. Approximately 8,000 North Dakota agricultural producers responded to the 2021 survey. Table 1 shows county-level data for range and pastureland average and most frequently reported rental rates per acre, and average value of rented pasture and rangeland in 2022 (North Dakota Department of Trust Lands 2022). We advise the reader to exercise discretion when using these county averages and use these values as one factor to establish rental arrangements.

Return on Investment

Landowners can determine rental value based on the desired return of investment from their estimated value of the pastureland or rangeland. This is a fairly simple method to estimate the base rental rate per acre. The base rate can then be used to negotiate the final rate depending on contributions by each party.

To determine the base rate, multiply the estimated value of the land (Table 1; or the value of the land if known) by an accepted rent-to-value ratio and divide by 100 (i.e. 3.5 % / 100 = 0.035).

Rent-to-value ratios will vary from year-to-year based on typical returns you would expect from a bank or investment. These numbers can vary from 1.5% to 8%, depending on county, region, area and state.

Table 1. Average rental rates, most frequently use average rental rate, and average value of land for rangeland and non-irrigated pastureland in North Dakota in 2022.

County	Average Rental Rate	Most Frequently Reported Rental rate	Average Value of Rented Pastureland
----- dollars/ac -----			
Adams	18.10	20.00	849.00
Barnes	26.10	20.00	1,418.00
Benson	20.90	25.00	669.00
Billings	17.80	15.00	1,034.00
Bottineau	18.40	20.00	1,007.00
Bowman	14.40	14.00	867.00
Burke	10.00	10.00	597.00
Burleigh	21.80	15.00	1,168.00
Cass	20.90	25.00	1,322.00
Cavalier	13.70	10.00	1,130.00
Dickey	35.90	40.00	1,600.00
Divide	10.60	10.00	543.00
Dunn	19.40	20.00	1,083.00
Eddy	16.90	15.00	660.00
Emmons	23.60	25.00	1,120.00
Foster	24.20	25.00	1,121.00
Golden Valley	13.80	18.00	704.00
Grand Forks	21.70	20.00	1,244.00
Grant	17.40	14.00	888.00
Griggs	23.40	20.00	1,187.00
Hettinger	18.90	20.00	982.00
Kidder	22.80	25.00	1,029.00
LaMoure	31.60	30.00	1,442.00
Logan	24.20	25.00	1,277.00
McHenry	20.00	20.00	914.00
McIntosh	32.90	30.00	1,319.00
McKenzie	9.60	10.00	755.00
McLean	18.20	15.00	904.00
Mercer	17.30	20.00	1,020.00
Morton	22.10	20.00	1,185.00
Mountrail	11.60	10.00	951.00
Nelson	20.20	25.00	1,120.00
Oliver	17.30	16.00	1,129.00
Pembina	26.00	20.00	1,038.00
Pierce	20.10	25.00	983.00
Ramsey	30.80	30.00	1,148.00
Ransom	31.10	40.00	1,660.00
Renville	19.40	20.00	998.00
Richland	41.40	40.00	1,932.00
Rolette	19.90	25.00	686.00
Sargent	40.90	40.00	1,844.00
Sheridan	20.00	18.00	934.00
Sioux	19.09	20.00	980.00
Slope	16.10	15.00	780.00
Stark	22.20	22.00	1,550.00
Steele	17.90	15.00	1,200.00
Stutsman	25.80	25.00	1,313.00
Towner	17.10	10.00	790.00
Traill	24.80	27.00	988.00
Walsh	20.40	20.00	802.00
Ward	17.70	20.00	808.00
Wells	18.00	20.00	920.00
Williams	9.30	10.00	704.00

Based on published reports, pasture rent appears to range from 1.5% to 2% percent of market value in the Midwest (Hofstrand and Edwards 2015) and 3.5% to 6% percent of market value reported in the West (Hendrix 2015). The landowner and tenant should determine what ratio-to-value return they are comfortable with when starting negotiations.

Landowner can determine a starting point for return on investment based on land value and calculate a return on investment they are comfortable with. They can compare with the North Dakota NASS report and compare rental values of calculated rents versus survey rental reports for their county.

Landowners should be open to negotiate based on supply and demand, trust and positive relationship with potential tenants, current livestock market values and trends, and acceptable contributions by both parties on the management of the livestock herd and upkeep of the pasture infrastructure.

$$\text{Formula: } \frac{\text{\% desired return}}{\text{\% desired return}} \div 100 \times \frac{\text{Value of land/ac}}{\text{Value of land/ac}} = \frac{\text{Rental rate/acre}}{\text{Rental rate/acre}}$$

Example 1

Rangeland in Mercer County

Average land value in 2022 at \$1,020/acre

Fair market return at 2 percent: $0.020 \times \$1,020 = \$20.40/\text{acre}$

Fair market return at 3.5 percent: $0.035 \times \$1,020 = \$35.70/\text{acre}$

North Dakota NASS 2022 average rental rate: \$17.30, most frequent rate: \$20

Renting by the Animal Unit Month (AUM)

Renting by the animal unit month (AUM) provides the most equitable option for the landowner and tenant while reducing the risk for overgrazing or under-stocking. Overgrazing reduces the long-term ecological function of the plant community, reducing plant vigor and forage production potential in future years, and impacts overall livestock performance of the herd (gain per day and gain per acre), especially for future years.

Under-stocking leads to reduced income potential for the landowner, as the tenant only pays for that number of animal units grazed.

Under-stocking may be desirable in some cases, for example, when improved wildlife habitat is desired to increase wildlife populations.

Caution should be noted that under-stocking over a period of many years (two years or longer, depending on location) will create a build-up of litter and a cooler, wetter micro-climate that favors invasion of exotic, cool-season grasses in the northern Plains, thereby negatively impacting plant communities on native rangelands.

Calculating AUMs — Stocking Rate

Using the AUM rental method, the tenant pays rent based on the number of animals grazed and length of time the pasture is used. To determine AUMs, you first must convert the livestock class to an animal unit equivalent (see Table 2). An animal unit (AU) is based on forage consumption of a 1,000-pound cow with a calf up to 6 months of age, or daily consumption of 26 pounds/day of oven-dry forage or 30 pounds/day of air-dry forage. An AUM is the amount of forage consumed by one AU for one months (M).

Stocking Rate Formula:

$$\frac{\text{\# of head}}{\text{\# of head}} \times \frac{\text{AUE (table 2)}}{\text{AUE (table 2)}} = \frac{\text{Animal units (AU)}}{\text{Animal units (AU)}} \times \frac{\text{Months (M)}}{\text{Months (M)}} = \frac{\text{AUMs}}{\text{AUMs}}$$

Example 1

100 1,200-pound cows with calves with a planned grazing schedule of May 15 - Nov. 1. Four mature bulls grazed from July 1 - Sept. 15

$100 \times 1.15 = 115 \text{ AU} \times 5.5 \text{ M} = 632.5 \text{ AUMs}$

$4 \times 1.40 = 5.6 \text{ AU} \times 2.5 \text{ M} = 14.0 \text{ AUMs}$

Total 646.5 AUMs

Example 2

250 sheep with lambs with a planned grazing schedule of June 1 - Nov. 1. Five rams from Sept. 1 - Nov. 1

$250 \times 0.20 = 50 \text{ AU} \times 5 \text{ M} = 250.0 \text{ AUMs}$

$5 \times 0.25 = 1.25 \text{ AU} \times 2 \text{ M} = 2.5 \text{ AUMs}$

Total 252.5 AUMs



Calculating AUM Rental Rate — Carrying Capacity

The value for pasture rental rates using the AUM method can be highly variable and driven by supply and demand. Little to no survey data is available in North Dakota that provides an average or most frequently used AUM rate. However, once you have calculated your rental rate by the acre, you can convert that value to an AUM rate.

Calculating the AUM rate requires that the average carrying capacity for your pasture be determined. For landowners who do not know the carrying capacity of their pasture or rangeland, Table 3 is included to provide an estimated stocking rate guide for different regions (see Figure 1 for multiple land resource areas) of North Dakota.

The landowner and tenant agree upon a per-acre rental rate and determine total payment for pasture using the assumption the livestock will graze for the entire planned grazing season (even if they don't). Then the landowner estimates the carrying capacity of the pasture to be rented. Determining actual carrying capacity using a current or past conservation plan is highly recommended.

The landowner must categorize all acres within the pasture by upland and lowland vegetation types (also includes soil type). Each vegetation type is multiplied by the recommended stocking rate from Table 3 to determine AUMs available. Finally, you divide total payment by AUMs available in the pasture to determine AUM rental rate.

By using this value, the tenant only pays for the number of animal units grazed for the given time period. Refer to NDSU Extension publication "Determining Carrying Capacity and Stocking Rates for Range and Pasture in North Dakota" for more information on estimating carrying capacity.

Table 3. Estimated carrying capacity guide in animal unit months per acre (AUM/ac) by site and multiple land resource areas (MLRA) for reference plant communities¹.

Vegetation Type	53A&B	54	55A&B	56	58C&D
Upland					
Loamy	0.66	0.66	0.71	0.85	0.57
Sandy	0.68	0.66	0.77	0.85	0.55
Clayey	0.63	0.57	0.66	0.82	0.52
Shallow	0.60	0.38	0.52	0.60	0.36
Very shallow/ Thin claypan	0.30	0.24	0.37	0.43	0.22
Lowland					
Overflow	0.96	0.87	1.01	1.15	0.57
Wet meadow	1.23	1.16	1.28	1.37	0.92

² Animal unit months/acre by vegetation type are based on a 0.25 harvest efficiency.

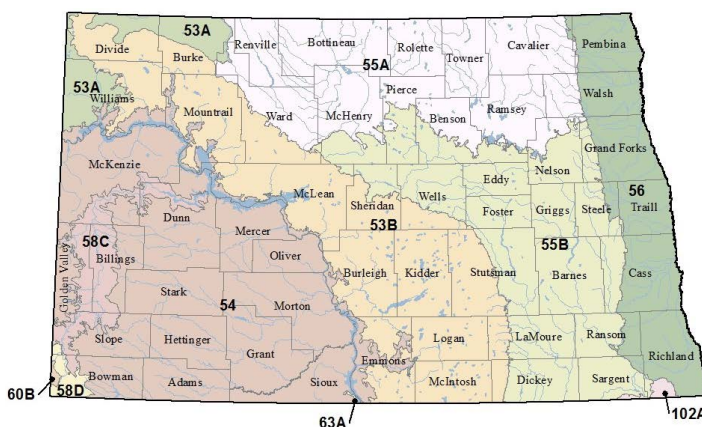
Table 2. Animal unit equivalents (AUE) guide¹.

Kinds/Classes of Animals	Animal Unit Equivalent (AUE)	Forage Consumed in Pounds (air-dried ²)	
		Day	Month
1,000-lb cow, dry	0.92	28	851
1,000-lb cow, with calf	1.00	30	913
1,200-lb cow, with calf	1.15	35	1,064
1,400-lb cow, with calf	1.29	39	1,186
Cattle bull, mature	1.40	42.5	1,295
Weaned calves to yearling	0.60	18	547
Yearling cattle (600-800 lbs)	0.70	21	638
Two-year old cattle (800-1,000 lbs)	0.90	27	832
Bison cow, mature	1.00	30	913
Bison bull, mature	1.50	45	1,368
Horse, mature	1.25	38	1,155
Sheep, mature with lamb	0.20	6	182
Sheep ram	0.25	7.5	228
Goat, mature	0.15	5	152
Deer, white-tailed, mature	0.15	5	152
Deer, mule, mature	0.20	6	182
Elk, mature	0.60	18	547
Antelope, mature	0.20	6	182
Sheep, bighorn, mature	0.20	6	182
Jackrabbit, white-tailed	0.02	0.6	18
Prairie dog	0.004	0.1	3

¹ Adapted from NRCS National Range and Pasture Handbook (1997) and Montana State University Range and Pasture Records (1993).

² Air-dried weight refers to forage that is allowed to dry under natural environmental conditions during an extended period of time, such as plants harvested for hay production. This value is approximately 87 % dry matter versus oven-dry weight, which depicts 100 % dry matter.

Figure 1. Major land resource areas of North Dakota.



Carrying capacity formula: $\frac{\text{_____}}{\text{\# of acres}} \times \frac{\text{Recommended AUM/ac}}{\text{_____}} = \frac{\text{AUMs (Table 3)}}{\text{_____}}$ (Repeat for all vegetation types)

AUM rental rate formula: $\frac{\text{Total payment based on agreed per-acre rental rate}}{\text{Total AUMs from combined vegetation types using carrying capacity formula}} = \text{AUM rate}$

Recommended head to graze formula: $\frac{\text{Total AUMs}}{\text{Months of planned grazing}} = \text{Max. \# of animal units to graze}$

Example 1

1,000-acre pasture in Mercer County (MLRA 54¹) with an agreed rental price of \$17.30/acre for a total payment of \$17,300. The planned grazing season is May 15 – Nov. 1 (5.5 months). Pasture contains 70 % sandy vegetation type, 20 % shallow vegetation type and 10 % overflow vegetation type.

Sandy: 700 acres x 0.66 AUM/ac² = 462 AUM
 Shallow: 200 acres x 0.38 AUM/ac² = 76 AUM
 Overflow: 100 acres x 0.87 AUM/ac² = 87 AUM

Total: 625 AUM

Rental rate = \$27.68/AUM (\$17,300 ÷ 625 AUMs)

Number of recommended animal units (AU) = 113.6 AU (625 AUM ÷ 5.5 months)

Number of recommended 1,200-pound cows with calves = 99 head (113.6 AU ÷ 1.15 AUE³ - 1,200-pound cow with calf) for 5.5 months

¹ Shown in Figure 1.
² Taken from Table 3.
³ Taken from Table 2.

Example 2

1,000-acre pasture in Ransom County (MLRA 55B¹) with an agreed rental price of \$31.10/acre for a total payment of \$31,100. The planned grazing season is May 15 – Nov. 1 (5.5 months). Pasture contains 70 % sandy vegetation type, 20 % shallow vegetation type and 10 % overflow vegetation type.

Sandy: 700 acres x 0.77 AUM/ac² = 539 AUM
 Shallow: 200 acres x 0.52 AUM/ac² = 104 AUM
 Overflow: 100 acres x 1.01 AUM/ac² = 101 AUM

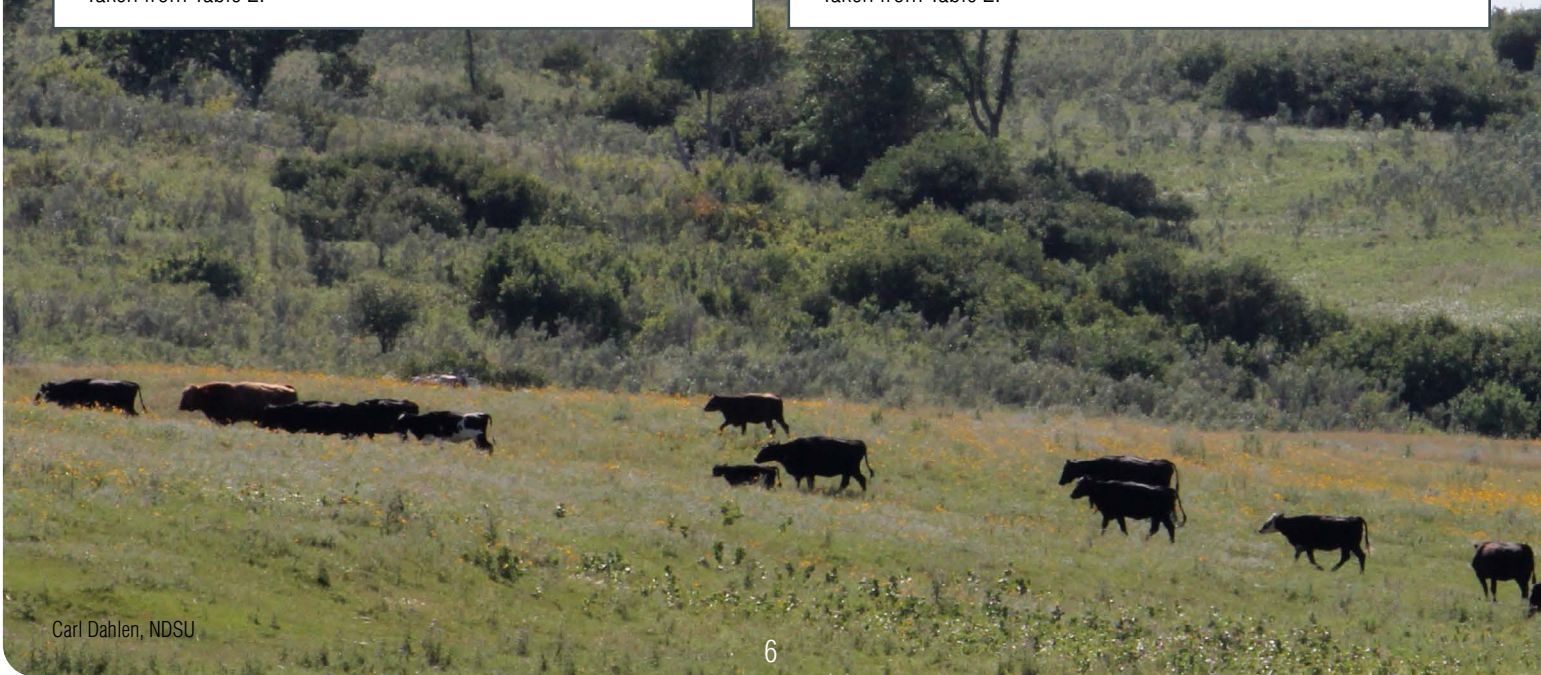
Total: 744 AUM

Rental rate = \$41.80/AUM (\$31,100 ÷ 744 AUMs)

Number of recommended animal units (AU) = 135.3 AU (744 AUM ÷ 5.5 months)

Number of recommended 1,200-pound cows with calves = 118 head (135.3 AU ÷ 1.15 AUE³ - 1,200-pound cow with calf) for 5.5 months

¹ Shown in Figure 1.
² Taken from Table 3.
³ Taken from Table 2.



Renting Using Pasture Quality Factors

(Use for annual forages such as cover crops and crop residue)

Pasture Quality Factors (PQF) is a method recommended for annual forage and improved pastures. This method is commonly used on improved pastures such as orchard grass and tall fescue in the east-central regions of the United States. However, it may provide a base price for annual crops and residues in the northern regions.

The PQF method uses current market value for hay price per ton. This hay price is multiplied by the PQF that best described the pasture type (Table 4). NOTE: the hay price should represent average price of good-quality grass hay or best representation hay that is equal to forage type, whichever is larger.

This value is then multiplied by the animal unit equivalent (AUE) for the class and size of livestock grazed (Table 2). The rental rate will be represented by a dollars per AUM rate.

AUM grazing rate formula using PQF:

$$A \times B \times C = \text{Pasture rent per animal unit month}$$

- A = market price per ton of hay
- B = pasture quality factor,
- C = animal unit equivalent (AUE)

For this method, the market value of baled hay and the quality of the pasture are entered into an equation with the appropriate AUE. "A" in the equation is hay market price per ton. "B" is a pasture quality factor. "C" is the AU conversion factor.

This formula works because the renter pays for the forage crop (hay) harvested with livestock as an alternative to machinery. The AUM grazing formula is adapted for forage moisture content, pounds consumed, forage volume within the pasture and plant population.

Example 1

Calculating AUM rental rate for high-quality, lush-growth pasture planted to a cover crop

Market price for equivalent hay is \$160 a ton (**A** = 160)
 Pasture quality is lush-growth, cover crop (**B** = 0.22)
 Cow/calf pairs (1,200-pound cows - 1.15 AUE) (**C** = 1.15)

$$160 \times 0.22 \times 1.15 = \$40.48/\text{AUM}$$

Example 2

Calculating AUM rental rate for pasture consisting of wheat crop residue with some regrowth

Market price for hay is \$100 a ton (**A** = 100)
 Small-grain residue pasture with some (limited) regrowth (**B** = 0.12)
 Cow-calf pairs (1,400-pound cows) (1.29 AUE) (**C** = 1.29)

$$100 \times 0.12 \times 1.29 = \$15.48/\text{AUM}$$

Example 3

Calculating AUM rental rate for very good quality pasture with some seed heads and green

Market price for equivalent hay is \$100 a ton (**A** = 100)
 Very good-quality pasture and green (**B** = 0.20)
 Cow-calf pairs (1,400-pound cows) (1.29 AUE) (**C** = 1.29)

$$100 \times 0.20 \times 1.29 = \$25.80/\text{AUM}$$

Table 4. Pasture quality factors and hay type to use for fair market value for determining rental rates by pasture type and quality.

Type of Pasture	PQF ¹	Hay Type to Use for Fair Market Value ²
Lush, green, high-protein pasture, cover crops and new-growth annuals	0.22	Good-quality alfalfa hay (RVF ~ 150)
Very good pasture with limited seed heads; excellent meadows with grass and legumes	0.20	High-quality grass hay or mid-quality alfalfa hay (RVF 100 – 140)
Good pasture, more grass than legumes, plants headed but still green	0.18	Good-quality grass hay (RVF 80 – 100)
Fair to good pasture, dominated by grass in the heading stage	0.15	Good-quality grass hay (RVF 80 – 100)
Unimproved, poor or weedy pasture; small-grain residue with limited but some regrowth	0.12	Good-quality grass hay (RVF 80 – 100)
Cornstalks, small-grain residue with no regrowth	0.10	Good-quality grass hay (RVF 80 – 100)

¹ Hofstrand and Edwards, 2015. Computing a pasture rental rate, Ag Decision Maker File C2-23. Iowa State University, www.extension.iastate.edu/agdm

² Fair market value can be determined through local auctions, advertised rates or contacting your local county Extension agent.

Citations

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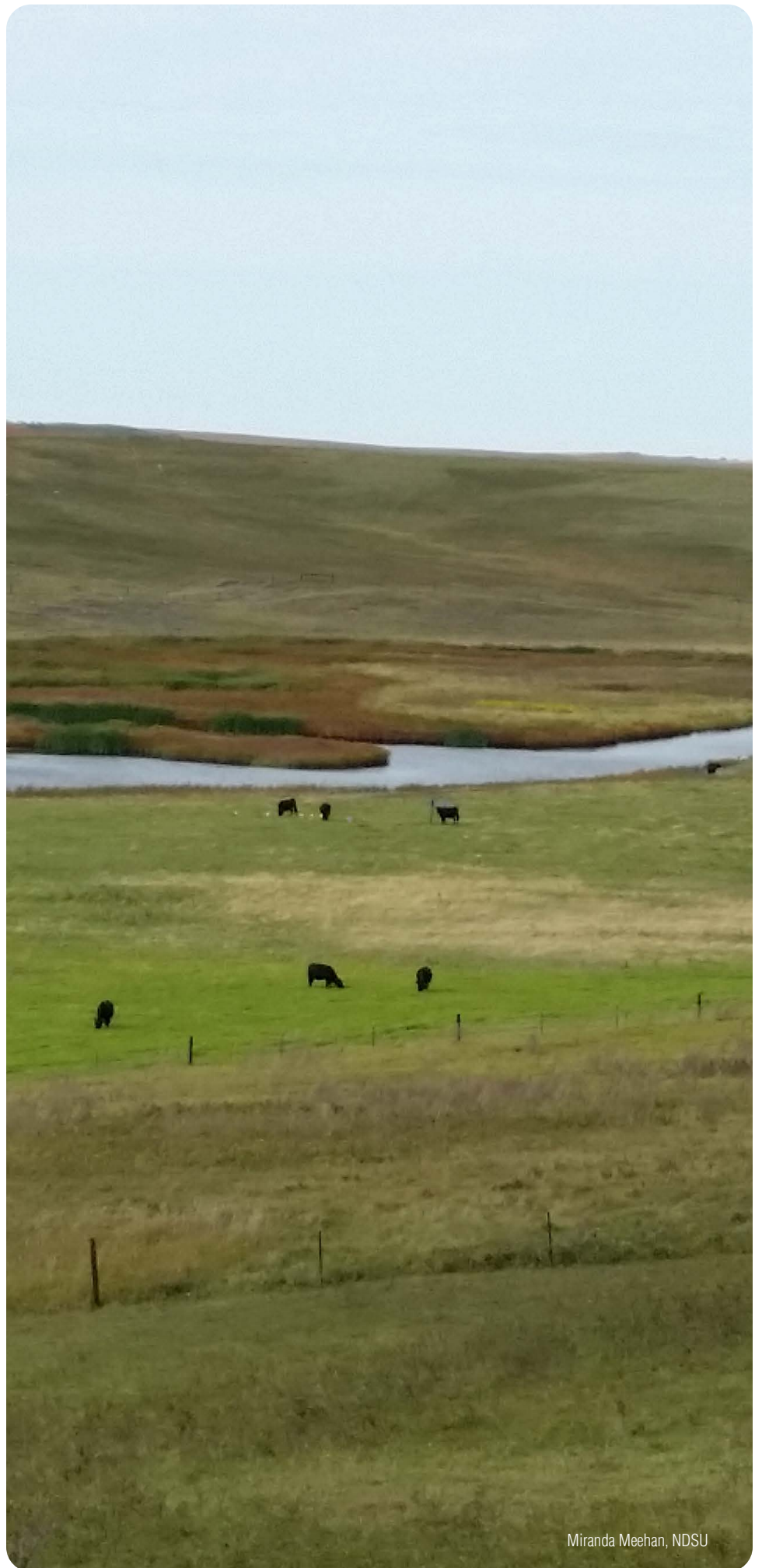
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