Fertilizing Grass Pastures and Hay Lands

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Pastures are important to many livestock producers in Nebraska, but production from many pastures is low. Research shows fertilizing, weed control and rotational grazing increases grass production from pastures, resulting in greater livestock production.

Fertilizing and controlling weeds on hay lands also increases production. Since more nutrients are removed from the field when harvested as hay than when it is pastured, even more attention needs to be paid to fertilization for hay lands than pastures.

In addition to increasing grass production, fertilizing can improve forage quality. On-the-farm demonstrations show that fertilizing increases the amount of beef produced per acre, even in a dry year. This increased production is primarily a result of added carrying capacity, rather than an increase in average daily gain.

TABLE I. NITROGEN RECOMMENDATIONS FOR PASTURES AND HAY LANDS IN NEBRASKA

Zone	Pounds of nitrogen to apply per acre*			
	Cool-season grasses		Warm-season grasses	
	Pasture	Hay land	Pasture	Hay land
I	80–120	100–150	60–90	75–100
II	50–80	60–90	40–75	50–80

Zone I is southeast of a line running from Blair in Washington county, to Hebron in Thayer county and includes all of Lancaster County except the Branched Oak Lake area. Zone II is southeast of a line running from Niobrara in Knox county, to Alma in Harlan county, down to Zone I.
*Use the higher rate when a full profile of subsoil moisture is present.

TABLE II. PHOSPHORUS RECOMMENDATIONS FOR GRASSLANDS IN NEBRASKA

Relative Index Value	Soil Test Levels		Phosphorus Rate lbs P_2O_5/A
	Bray & Kurtz #1	Olsen P ($NaHCO_3$)	
	ppm		
Very Low	0–5	0–3	40
Low	6–15	4–7	20
Medium	16–25	8–14	10
High	25+	15+	0

Nitrogen Management on Grasslands

Apply nitrogen (N) fertilizer yearly to grass pastures and hay lands to maximize production. Nitrogen improves both grass yield and protein content. It also improves the vigor of grass plants, which can thicken stands and reduce weed invasion. When adequate soil moisture is present, economical rates of nitrogen can more than double forage production.

Note fertilization with nitrogen is most economical where weeds have been controlled and additional grass growth is needed for livestock. If additional forage can be purchased or pasture rented at a lower cost than fertilizer, these alternatives may be better choices than applying fertilizer to the pasture. Naturally, if one fertilizes to increase production but does not need the extra forage, fertilization will not be an economically sound practice.

Nitrogen fertilizer applied just prior to the period of most rapid grass growth assures the applied nitrogen is available to the plants.

Fertilizing Cool-Season Grasses

For cool-season grasses, such as smooth brome, maximum growth occurs in mid- to late-spring. These grasses grow very little in July and August. Growth resumes on cool-season grasses in late August and September if soil moisture is adequate and temperatures are favorable. Fall growth, however, is only a small portion of the total growth for the entire growing season.

Nitrogen can be applied in either fall or spring on cool-season grasses. The risk of losing applied nitrogen by either leaching or run-off is reduced if it is applied in early spring. Therefore, spring applications are preferred. Some people will apply two applications of nitrogen, this practice is known as split application of nitrogen. Split applications of nitrogen for production of cool-season grasses under dryland conditions are useful only when more than 100 pounds of nitrogen per acre are to be applied during the growing season and good growing conditions are anticipated during September and October.

Fertilizing Warm-Season Grasses

Apply fertilizer in mid- to late-May to pastures and hay lands containing warm-season grasses, such as Switchgrass, Indiangrass, Big bluestem and Little bluestem. Do not fertilize warm-season grasses in early spring. Early spring application increases the risk of leaching nitrogen fertilizer below the root zone and it will stimulate growth of cool-season species that compete with the warm-season grass species. Begin fertilizer application in mid-May in southern Nebraska and delay until late-May in the northern portion of the state.

Fertilizing Mixed Grass Pastures

Some pastures and hay lands contain a mixture of both cool- and warm-season grasses. Fertilizing these pastures with nitrogen in early spring stimulates the cool-season grasses which crowd out any warm-season grasses present. To maintain warm-season grasses in such a mixture, fertilize in late-May. It also may be necessary to apply herbicides or conduct prescribed burns to suppress the cool-season grasses.

Liquid and dry forms of nitrogen fertilizer are equally effective for increasing pasture production when certain precautions are taken. Do not apply urea nitrogen to pasture or hay lands on high pH calcareous soils when air temperatures are above 85 degrees F. Nitrogen losses from ammonia volatilization can be high under these conditions. Since urea supplies more than half the nitrogen in 28 percent liquid N (urea ammonium nitrate), be aware of the potential for volatilization losses from this nitrogen source as well.

Pasture production is highly dependent on rainfall, so nitrogen recommendations are adjusted accordingly. Suggested application rates for nitrogen are shown in *Table 1*. The lower rates listed are the minimum amounts recommended for average conditions and management situations. Even in years when summer rainfall is below normal, the use of 80 pounds of nitrogen per acre usually will increase production economically on pastures and hay lands in eastern and northeastern Nebraska. Use the higher rates listed for each zone when there is a full profile of subsoil moisture at the start of the growing season.

Phosphorus Fertilizer on Pastures and Hay Lands

In addition to nitrogen, phosphorus fertilizer also is needed on many pastures in Nebraska. Research in eastern and northeastern Nebraska shows the combination of nitrogen and phosphorus frequently produces higher yields than the application of either nutrient alone.

Phosphorus recommendations are based on the availability of phosphorus in the soil as measured by a soil test. Phosphorus recommendations for grasslands are listed in *Table II*. If legumes make up one-fourth or more of the stand, apply 50 percent more phosphate than for grass alone. Phosphate fertilizers can be applied with the nitrogen in either spring or fall.

Repeated applications of phosphate fertilizers may increase the level of available phosphorus in the soil. When soil phosphorus levels are in the high range, phosphate application can be eliminated until soil test levels fall below the high range. When grasslands are used as hay lands, sample soil more frequently. Phosphorus may need to be applied more often, since removal of nutrients will be greater than on grazed land.

Other Nutrients

Results of studies conducted throughout eastern and northeastern Nebraska indicate applying potash, sulfur and zinc does not improve pasture production. There is a small possibility some pastures and grasslands on sandy soils may require sulfur. This need for sulfur, however, has not yet been demonstrated in research trials.

What is an Acre?

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The unit of land area in the United States is the acre. An acre contains 43,560 square feet. Have you ever wondered why an acre is 43,560 square feet instead of a round number like 40,000 or 50,000 square feet? The story goes like this. When plowing with a yoke of oxen, it was standard practice to rest the animals (and the farmer) after plowing a furrow 1/8 mile (660 feet) long. An eighth of a mile became known as a furrow-long or furlong; (a furlong is a nearly forgotten term for distance, except at horse racing tracks where it remains in common use).

The usual practice after plowing a furlong was to turn the team around on a "land" and plow the other direction. Lands were laid out so the farmer would be able to finish a land every 10 rounds with a 10-inch plowshare (about 16.5 feet). One could imagine that perhaps farmers used a pole or rod that was 16.5 feet long when laying out lands because this measure of distance is still called a rod today.

By starting early in the morning, two lands could be finished before noon with a good yoke of oxen. At noon, the farmer stopped for his noon meal and to feed, water and rest his animals. After the noon break, another two lands could be finished before quitting time. Four lands, or 40 rounds (80 furrows) measured 16.5 x 4 = 66 feet across by 1/8 mile (660 feet) long and was considered a good days work with a walking plow. The area plowed was 43,560 square feet and became the standard unit of land area we call an acre.

By the way, a farmer who plowed 80 furrows an eighth of a mile long would have walked ten miles while wrestling with the hand-guided walking plow. Is it any wonder this measure of land area became known as an acre (ache-er)! Actually, the Webster's New Collegiate Dictionary states the name comes from the Old English 'aecer'; akin to Old High German 'ackar' (field), Latin 'ager' (field), Greek 'agros' (field) or Latin 'agere' (to drive).

HECTARE—In the metric system, the standard unit of land area is the hectare. A hectare is 10,000 square meters. Ten thousand square meters to a hectare is an intuitive quantity. It is easily remembered, measured and computed.

CONVERSIONS—To convert from hectares to acres, multiply hectares by 2.47. To convert from acres to hectares multiply acres by 0.4047.