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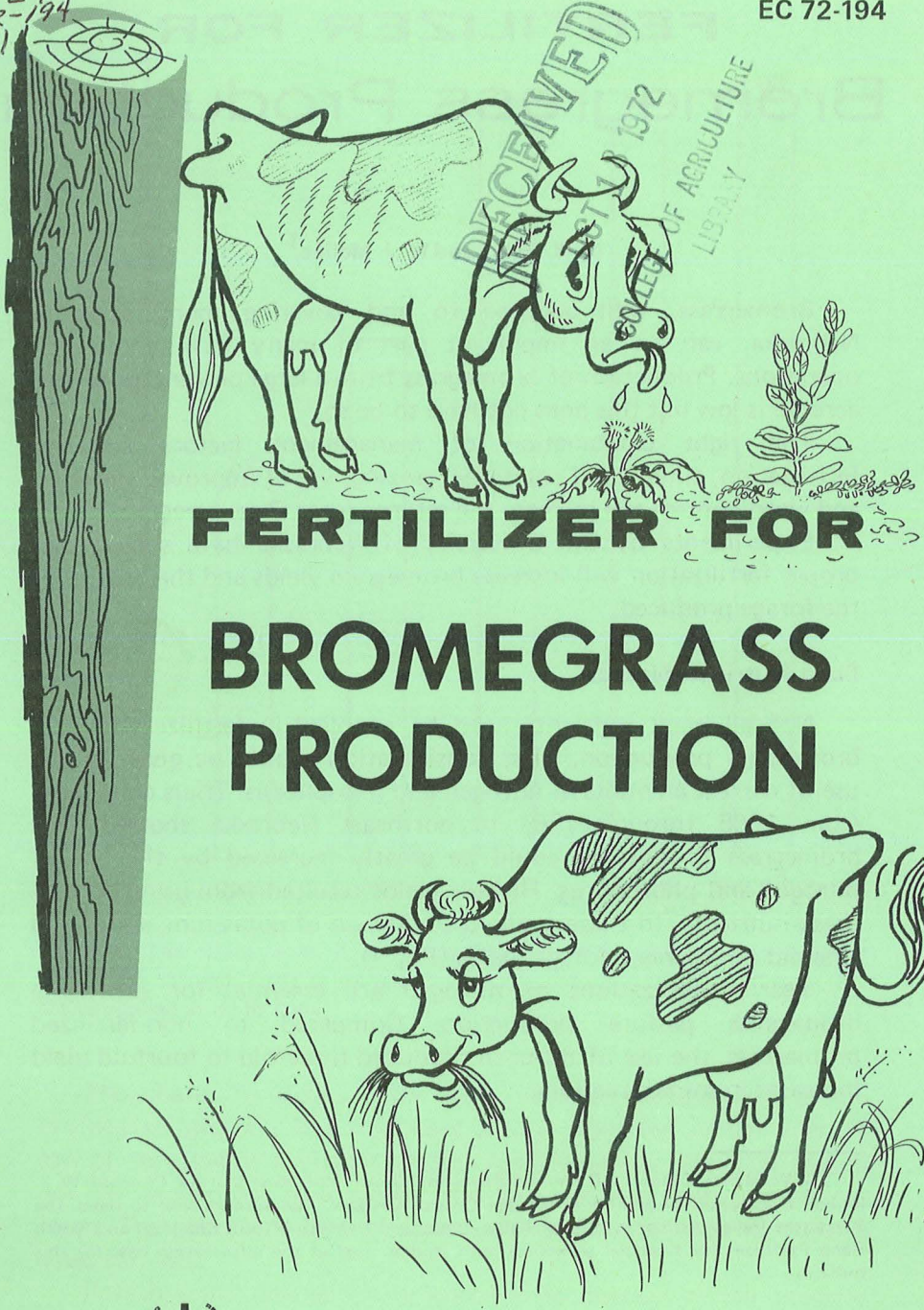

FERTILIZER FOR BROMEGRASS PRODUCTION

Extension Service
University of Nebraska-Lincoln College of Agriculture Cooperating with the
U. S. Department of Agriculture and the College of Home Economics
E. F. Frolik, Dean J. L. Adams, Director

FERTILIZER FOR
Bromegrass Production

G. W. Rehm and W. J. Moline[1]

Bromegrass, well adapted to and covering many acres in Nebraska, can be an important part of many farm and ranch operations. Production of bromegrass from a large percentage of this acreage is low but this does not have to be so.

The right combination of management factors such as fertilization, timely and rotational grazing, use of improved varieties, and weed control can increase the returns from these acres.

Experiments by the University of Nebraska have shown that proper fertilization will increase bromegrass yields and the quality of the forage produced.

Plant Nutrients Needed

Not all plant nutrients need be supplied in fertilizers for top bromegrass production. First consideration should be given to the use of correct amounts of nitrogen and phosphorus. Trials conducted from 1965 through 1967 in northeast Nebraska showed that bromegrass production could be greatly increased by the use of nitrogen and phosphorus. Highest yields resulted from using both of these nutrients. In these trials, the addition of potassium, sulfur and zinc did not increase forage yields (Fig. 1).

Yearly applications of nitrogen are essential for profitable bromegrass pasture production. Compared to non-fertilized bromegrass, the use of nitrogen produced threefold to fourfold yield increases in some situations.

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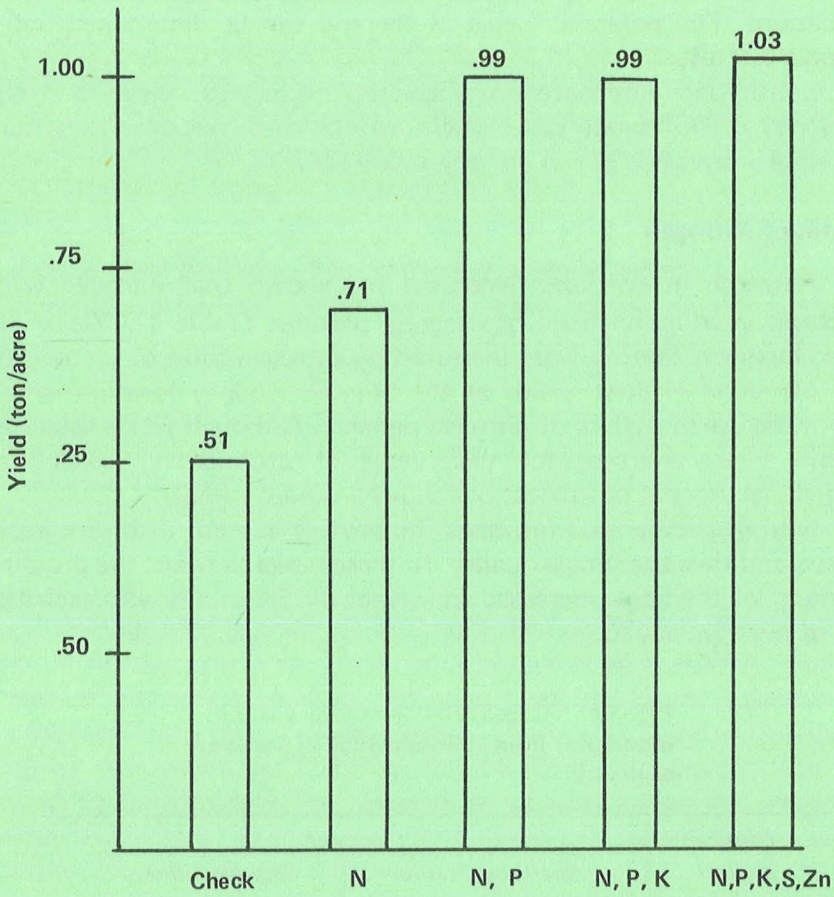

Figure 1. The effect of N, P, K, S and Zn on the average yield of bromegrass from 1965 through 1967 at six locations in northeast Nebraska. In all cases, the N was applied at 40 lb./acre.

Phosphate fertilizers may not increase production of all bromegrass pastures but responses can be expected where soils are low or very low in available phosphorus. Phosphate fertilizers should not be needed for soils which have high or very high phosphorus levels. The phosphate level of a particular soil can be determined by a good soil test.

Potash is not needed for bromegrass production on the majority of non-sandy soils in Nebraska. Some sandy soils may be low in

potassium and a response to this nutrient could be expected in these situations. The potassium level of the soil can be determined only from a soil test.

Sulfur and zinc have not increased bromegrass yields on the majority of non-sandy soils. There may be some response to sulfur when bromegrass is grown on very sandy land.

Rates of Nitrogen

Research in northeast Nebraska has shown that nitrogen will increase production from bromegrass pastures (Table 1). Yields at the Northeast Station were increased by nitrogen rates of up to 160 lb. per acre. Highest yields at the Stanton County location came from the use of 120 lb. of nitrogen per acre. Although yields listed in Table 1 are averages for two years of production, yields for individual years at both locations showed similar trends.

Nitrogen usage also increases the protein content of bromegrass tissue and thus the forage quality. In these research trials, the protein content of the tissue increased an average of .3% to .6% with each 10 lb. of nitrogen added.

Table 1. Effect of nitrogen rates on average yields of bromegrass from 1966 and 1967 in northeast Nebraska.

Nitrogen applied	*Location*	
	Northeast Station	*Stanton County*
lb./acre	ton/acre	
0	.43 a[1]	.53 a
40	1.02 b	.97 b
80	1.45 c	1.24 c
120	1.90 d	1.54 d
160	2.23 e	1.60 d
240	2.40 e	1.67 d

[1]Differences between treatment averages at either location followed by the same letter are not due to the treatment applied but are due to variation in the field. Differences between treatment averages followed by different letters are the result of the applied nitrogen.

Fertilizer and Beef Production

Since the majority of bromegrass acreage is used for pasture, the end result of fertilized bromegrass should be an increase in beef production. Grazing trials with yearling steers in northeast Nebraska in 1968 and 1969 showed that a pound of beef could be produced from the use of a pound of nitrogen (Table 2).

Table 2. Beef production from fertilized bromegrass pastures.

	Lb. beef/acre			*Av. daily gain*		
	1968	*1969*	*Av.*	*1968*	*1969*	*Av.*
	----------lb./acre----------			----------lb.----------		
Unfertilized	34	88	61	.77	1.63	1.20
Fertilized @ 60 lb.N/acre	72	205	139	1.15	2.07	1.61

Average beef production was more than doubled by the use of 60 lb. of nitrogen per acre. If the price of beef is set at $.25/lb. and the cost of nitrogen at $.10/lb., an additional $19.50 per acre can be produced from the fertilized pasture. This is a $3.25 return for every dollar invested in fertilizer. The rate of 60 lb. nitrogen per acre was used to demonstrate the importance of fertilization for increased beef production. Greater beef production can be anticipated when higher rates of nitrogen are used.

Fertilizer Recommendations

Nitrogen rates listed in Table 3 should serve as general guidelines for three broad areas of the state. Base decisions as to the actual rate of nitrogen to use on several factors including slope of pasture land, soil moisture level, soil organic matter content, current rainfall and the use of sound pasture management practices.

Seasonal rainfall has an important influence on nitrogen usage. The major portion of bromegrass growth occurs in the spring and fall. With ample rainfall throughout the growing season, higher rates of nitrogen should be used.

In eastern Nebraska, for example, 80 to 100 lb. of nitrogen per acre can be applied in early spring. With fall rains an additional 60 lb.

Table 3. Suggested rates of nitrogen for bromegrass pastures in Nebraska.

Area of the state	*lb. nitrogen/acre*
East	80 - 160
Central	60 - 80
West	40 - 60

per acre might be applied in late August or early September to stimulate fall growth. With a shortage of fall moisture, yield responses from a fall application of nitrogen may be rather limited and this application should probably be omitted.

Management practices such as rotational grazing and pasture weed control should be followed to get the greatest benefit from the higher rates of nitrogen. Similar reasoning would apply to bromegrass pastures in the central and western portions of the state.

Slope of the land in the pasture may also influence rate of nitrogen to be used. In general, soils on hilltops and steep slopes have a lower organic matter content than soils at the bases of slopes and those along stream bottoms. Some nitrogen can be supplied to the bromegrass through mineralization of this organic matter.

Also, organic matter can increase the water-holding capacity of soil. In some years, the moisture content of these soils in the fall may be sufficient for a fall application of nitrogen while the moisture content of soils on the slopes may not be high enough to justify a fall application of nitrogen.

Lower rates listed for each area are the minimum amounts recommended for average conditions and management situations. Even in years when summer rainfall is below normal, the use of 80 lb. nitrogen per acre would increase production from bromegrass pastures on the steep slopes of eastern Nebraska.

Phosphate recommendations for the three areas are based on the amount of available phosphorus in the soil as indicated by a soil test (Table 4). Repeated use of phosphate may increase the level of this nutrient in the soil. When this occurs, phosphate applications may be reduced or eliminated. Nitrogen should be applied each year. The suggested rates of phosphate should be sufficient for two years of production.

Table 4. Suggested rates of phosphate for bromegrass pastures in Nebraska.

Area of the state	*Soil test level for P*	*lb. P_2O_5/acre*
East	very low or low	40-60
	medium	20-30
	high or very high	0
Central	very low or low	30-40
	medium	15-20
	high or very high	0
West	very low or low	20-30
	medium	10-15
	high or very high	0

Use of potassium, sulfur, zinc and other trace elements is not recommended for the majority of bromegrass pastures. There may, however, be some local or specialized situations where application of one or more of these nutrients may increase yields. These situations will be the exception rather than the rule.

Timing the Fertilizer Application

Fertilizers can be applied in early spring or fall. There may be some advantage to dividing the application between spring and fall when the higher rates of nitrogen are used. At present, there appears to be little advantage in using this practice with the lower rates. At these rates, it may be difficult to justify the cost of the extra trip over the field.

Spring applications should be made as early as possible. Fertilizer applied in April and early May may be more beneficial than that applied in late May and June.

Fertilizer Sources

Remember that all fertilizer sources or carriers of nitrogen and phosphate are equally effective. This is true if the carriers are applied properly. Nutrients, especially nitrogen, may be lost if the carriers are not applied correctly.

Nitrogen can be supplied in liquid or dry form or as anhydrous ammonia. When anhydrous ammonia is used, knives must be spaced

at close intervals. This close spacing increases the power requirement. In addition, there is a good possibility that some of the ammonia may be lost and the disturbed sod in the knife openings may encourage weed growth.

Liquid and dry nitrogen carriers are nearly always equal in effectiveness when broadcast on the surface. There is some possibility that small amounts of nitrogen may be lost from liquid sources broadcast on large amounts of existing residues. This is especially true in dry situations when temperatures are high.

Urea is not recommended for surface application without incorporation on soils with pH's over 7.0 when temperatures are high and the relative humidity is low. For this reason, you might want to choose the dry ammonium nitrate source of nitrogen for early fall applications. In early spring with frequent rains, the liquid and dry carriers should be equally effective.

Your decision on the carrier to use should be based on the cost of the material, preference of handling, availability of equipment, etc.

Conclusions

1. Bromegrass production can be increased by use of nitrogen and phosphorus. In most cases, potassium, sulfur, zinc and other micronutrients will not be needed for top production.

2. Nitrogen at rates up to 160 lb./acre in northeast Nebraska has increased the yield as well as the protein content of the forage.

3. Grazing trials in northeast Nebraska have shown that fertilization will increase beef production. A pound of added nitrogen produced an extra pound of beef.

4. Nitrogen recommendations are based on location of the pasture, soil properties and seasonal rainfall. Phosphorus recommendations are based on rainfall and the level of soil phosphorus as indicated by a soil test.

5. Fertilizers may be applied in early spring or fall. When larger rates are used, a split application may be beneficial.

6. The decision as to which carrier or source to use should be based on cost of material, ease of handling, availability of equipment, etc.