1974

# EC74-862 Revised Fertilizing Native Range - Production Costs and Returns

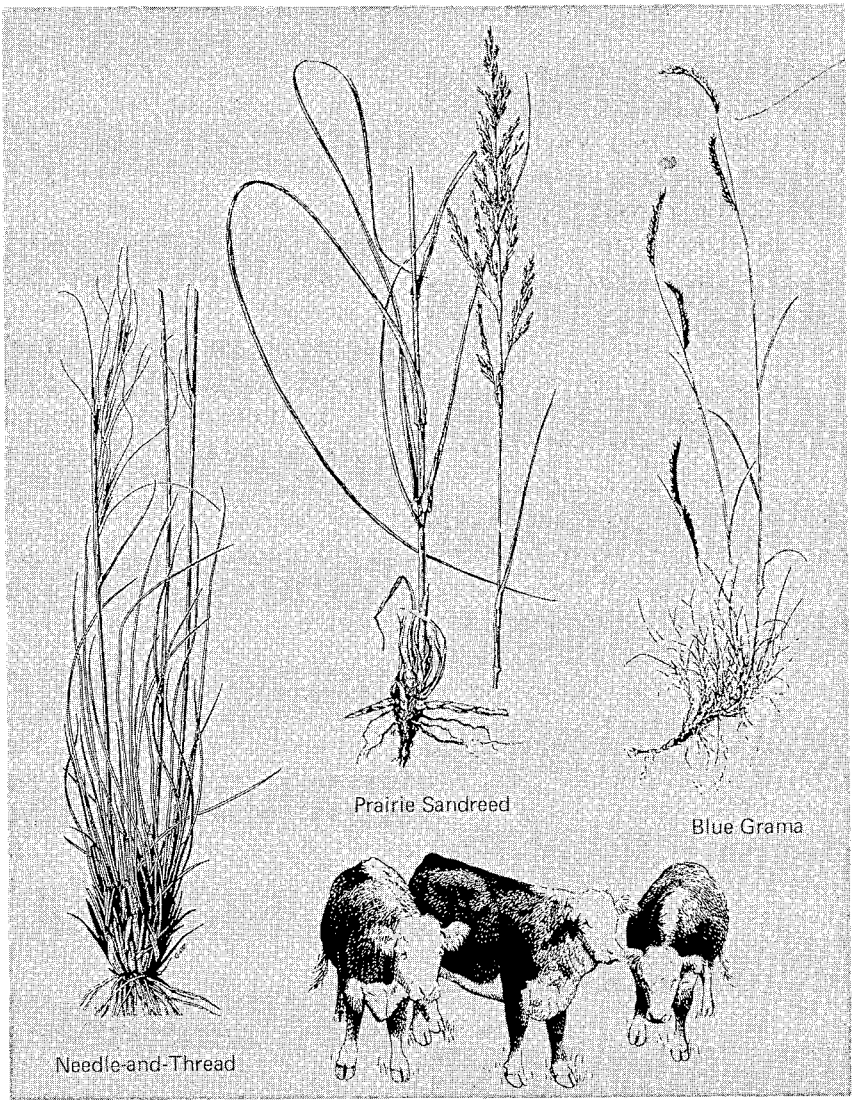
Robert E. J. Retzlaff

L. A. Daigger

W. J. Moline

EC 74-863
Revised

# Fertilizing Native Range — Production Costs and Returns




Extension work in "Agriculture, Home Economics and Subjects relating thereto,"
The Cooperative Extension Service, Institute of Agriculture and Natural
Resources, University of Nebraska-Lincoln, Cooperating with the
Counties and the U. S. Department of Agriculture
J. L. Adams, Director

# FERTILIZING NATIVE RANGE PRODUCTION COSTS AND RETURNS

Robert E. J. Retzlaff, L. A. Daigger and W. J. Moline[1/]

Five years research on fertilizing a native sands range site in Sioux County has shown that this practice can be profitable.

The four grazing systems compared (1969-1973):

1. Continuous grazing—no fertilizer.
2. Continuous grazing plus 30 pounds of nitrogen per acre.
3. Rotational grazing—no fertilizer.
4. Rotational grazing plus 30 pounds of nitrogen per acre.[2/]

Five-year average daily beef gains were 1.82 pounds per day where steers were grazed on fertilized range, compared to 1.65 pounds per day gained on unfertilized range. Steer gains averaged 49 pounds per acre for the five-year period where nitrogen was applied each year on continuously grazed range, compared to 32 pounds per acre on unfertilized range.

Five-year average gains for rotational grazed pastures were 49 pounds per acre when fertilized and 40 pounds per acre when unfertilized. Table 1 shows average gains for the four grazing systems each year in terms of pounds per day per acre.

## Stocking Rates, Grass Response, and Management

Stocking rate is the number of acres allotted per steer for the grazing period. Stocking rates were determined at the start of the grazing season before cattle were turned onto the range. No adjustments in these rates, determined by evaluating the grass utilization and stocking rates of previous years, were made during the grazing season.

[1/]District Extension Specialist (Farm Management) University of Nebraska Panhandle Station, Mitchell, Nebraska. District Extension Specialist (Soils), University of Nebraska, Panhandle Station, Mitchell, Nebraska. Extension Agronomist (Forage Crops), University of Nebraska, Lincoln.

[2/]Thirty pounds of nitrogen was obtained from ammonium nitrate. This was broadcasted in February of each year for five years. Ten pounds of phosphate was applied per acre for the first four years.

Table 1. Beef production from 120 days of continuous grazing or rotational grazing—fertilized and unfertilized pastures in the Nebraska Panhandle, 1969-1973.

| | *Continuous fertilizer* | *Continuous no fertilizer* | *Rotational fertilizer* | *Rotational no fertilizer* |
|---|---|---|---|---|
| 1969 | | | | |
| Lb gain/day | 1.72 | 1.73 | 1.69 | 1.58 |
| Lb gain/acre | 37 | 31 | 44 | 41 |
| Stocking rate acres/steer | 5.4 | 6.5 | 4.5 | 4.6 |
| 1970 | | | | |
| Lb gain/day | 1.70 | 1.43 | 1.79 | 1.61 |
| Lb gain/acre | 38 | 27 | 35 | 38 |
| Stocking rate acres/steer | 5.4 | 6.5 | 6.0 | 5.1 |
| 1971 | | | | |
| Lb gain/day | 1.68 | 1.50 | 1.64 | 1.45 |
| Lb gain/acre | 44.5 | 31 | 61[a/] | 33 |
| Stocking rate acres/steer | 4.7 | 6.0 | 4.5 | 5.5 |
| 1972 | | | | |
| Lb gain/day | 1.90 | 1.75 | 1.74 | 1.62 |
| Lb gain/acre | 56.9 | 35.5 | 49.6 | 39.6 |
| Stocking rate acres/steer | 4.1 | 6.0 | 4.3 | 5.5 |
| 1973 | | | | |
| Lb gain/day | 2.12 | 1.83 | 2.03 | 1.94 |
| Lb gain/acre | 70.4 | 37.0 | 54.3 | 48.4 |
| Stocking rate acres/steer | 3.6 | 5.9 | 4.5 | 4.8 |
| 5-year average | | | | |
| Lb gain/day | 1.82 | 1.65 | 1.78 | 1.64 |
| Lb gain/acre | 49.4 | 32.3 | 48.8 | 40.0 |
| Stocking rate acres/steer | 4.6 | 6.2 | 4.7 | 5.1 |

[a/] *Pastured 18 additional days to remove heavy growth.*

Steers weighing about 500 pounds were placed on pasture for 120 days (May 15-Septemer 15). Under continuous grazing, cattle were allowed to graze the full season on one pasture. Under rotational grazing, the range was divided into four pastures and steers were rotated under a predetermined schedule. Each year a different pasture was grazed first. Thus, after four years, steers would start the rotation on the original piece.

The stocking rate for 1973 was 3.6 acres per steer on the continuous grazed—fertilized, and 5.9 acres per steer on the continuous grazed—unfertilized range.

Stocking rate for the rotational grazed—fertilized and the rotational grazed—unfertilized in 1973 was 4.5 and 4.8 steers per acre, respectively. Stocking rates for the four systems (1969-1973), plus the five-year average, are listed in Table 1.

Two noticeable grass responses were evident in the five-year period. First, nitrogen fertilzer increased cool season grasses, principally needleandthread, at the expense of blue grama. Blowouts could result with the absence of blue grama. However, western wheatgrass expanded with nitrogen fertilization. This could aid in reducing erosion potential.

The second observation (Table 1) is that where the range was fertilized, beef production continued to increase through the five-year period. Beef production increased from 37 pounds per acre on the continuous grazed—fertilized range in 1969 to 70 pounds per acre in 1973. The continuous grazed—unfertilized pasture produced 31 pounds and 37 pounds of beef per acre in 1969 and 1973, respectively.

## Economic Analysis

Economic analysis is based on five-year average beef production per acre. The assumptions (Table 2) were:

1. Data converted to a 640-acre (one section) basis.
2. Fences to cost $800 per mile.
3. Veterinarian services and medicine at $1.50 per head; mineral and salt at $1 per head.
4. Interest at 8.5 percent for four months on cattle, minerals, salt, veterinarian services, fence repairs, purchasing, selling and transportation.
5. Fence repairs 5 percent per year.

6. Fence depreciation 20 years with no salvage value.

7. Death loss at .5 percent with steers weighing 625 pounds (the approximate average weight for the grazing period).

8. Interest on fixed costs at 6 percent for the 12-month period.

9. Taxes at $.50 per acre.

10. Land charge calculated using $110 per acre and $70 per acre with the interest rate at 6 percent.

11. Cost of labor at $2.50 per hour. An estimate of labor was made on the basis of one hour per day for pasture visits. Extra labor was added for sorting, loading and herding. Thirty hours of labor was needed to apply the fertilizer.

12. Fertilizer at two levels of $.10/lb and $.20/lb plus a $3/ton applicator charge.

13. Fuel at $.30/gal and oil at 15 percent of fuel cost.

14. Cattle purchased at 500 pounds at $60/cwt. At the end of the 120-day grazing period cattle weighed about 700 pounds and sold for $56/cwt. Hence, a $4/cwt charge was made as a cost incurred on the first 500 pounds, due to the heavier weight.

Table 2. Total cost for continuous grazing—fertilizer, continuous grazing—no fertilizer, rotational grazing—fertilizer, and rotational grazing—no fertilizer, Nebraska Panhandle.[a/]

| *Item* | *Continuous—fertilizer 139 head/section 31,616 lb beef/section* | *Continuous—no fertilizer 103 head/section 20,672 lb beef/section* | *Rotational—fertilizer 136 head/section 31,232 lb beef/section* | *Rotational—no fertilizer 125 head/section 25,600 lb beef/section* |
|---|---|---|---|---|
| A. Interest - No. of hd x 500 lb/hd x $60/cwt $300/hd x no. of hd x .085 x 4/12 = | $ 1,181.50 | $ 875.50 | $ 1,156.00 | $ 1,062.50 |
| B. Cost incurred due to heavier wt. 5 cwt x $4/cwt x no. of hd | 2,780.00 | 2,060.00 | 2,720.00 | 2,500.00 |
| C. Veterinarian & medicine @ $1.50/hd | 208.50 | 154.50 | 204.00 | 187.50 |
| D. Mineral & salt @ $1/hd | 139.00 | 103.00 | 136.00 | 125.00 |
| E. 30 lb Nitrogen @ $.10/lb x 640 acres | 1,920.00 | -- | 1,920.00 | -- |
| F. Fert. spreader rent - $3/ton x 29 tons | 87.00 | -- | 87.00 | -- |
| G. 30 hours labor @ $2.50/hr | 75.00 | -- | 75.00 | -- |
| H. Fuel - 2 gal/hr x $.30/gal x 30 hrs | 18.00 | -- | 18.00 | -- |
| I. Oil - 15% of fuel cost | 2.70 | -- | 2.70 | -- |
| J. Death loss (.5%) no. hd x $56/cwt x 625 lb/hd | 243.25 | 180.25 | 238.00 | 218.75 |

| | | | | |
|---|---|---|---|---|
| K. Fence repairs - $3,200 x 5% | 160.00 | 160.00 | 240.00 | 240.00 |
| L. Purchasing, transport & selling - $5/hd | 695.00 | 515.00 | 680.00 | 625.00 |
| M. Labor - sorting, moving & checking No. hours x $2.50 | 375.00 | 370.00 | 390.00 | 385.00 |
| N. Depreciation - tractor $\frac{5,000 - 500}{10}$ (.1) [b/] | 45.00 | -- | 45.00 | -- |
| fence $\frac{3,200}{20}$ | 160.00 | 160.00 | 240.00 | 240.00 |
| O. Taxes - $.50/acre x 640 | 320.00 | 320.00 | 320.00 | 320.00 |
| P. Land charge value/acre x 6% x 640 acres $110 | 4,224.00 | 4,224.00 | 4,224.00 | 4,224.00 |
| Q. Interest on items C,D,E,F,G,H,I,K,L @8.5% for 4 months | 93.64 | 26.42 | 95.28 | 33.36 |
| R. Total Cost | $12,727.59 | $9,148.67 | $12,790.98 | $10,161.11 |

[a/] *Based on five year data.*

[b/] *10 percent of tractor used on the pasture for fertilizing.*

Table 3. Cost per pound of beef produced and returns above specified cost for four grazing systems.[a/]

| *Cost or return* | *Continuous fertilizer* | *Continuous no fertilizer* | *Rotational fertilizer* | *Rotational no fertilizer* |
|---|---|---|---|---|
| Land @ $110/A<br>Fertilizer @ $.10/lb<br>Cost/lb of gain | $ .40 | $ .44 | $ .41 | $ .40 |
| Return above specified cost/sect. | $ 4,977.37 | $2,427.65 | $4,698.94 | $4,174.89 |
| Return above specified cost/A | $ 7.78 | $ 3.79 | $ 7.34 | $ 6.52 |
| Land @ $70/A<br>Fertilizer @ $.10/lb<br>Cost/lb of gain | $ .35 | $ .37 | $ .36 | $ .34 |
| Return above specified cost/sect. | $ 6,513.37 | $3,963.65 | $6,234.94 | $5,710.89 |
| Return above specified cost/A | $ 10.18 | $ 6.19 | $ 9.74 | $ 8.92 |
| Land @ $110/A<br>Fertilizer @ $.20/lb<br>Cost/lb of gain | $ .46 | $ .44 | $ .47 | $ .40 |
| Return above specified cost/sect. | $ 3,012.37 | $2,427.65 | $2,733.94 | $4,174.89 |
| Return above specified cost/A | $ 4.70 | $ 3.79 | $ 4.27 | $ 6.52 |

| | | | | |
|---|---|---|---|---|
| Land @ $70/ A<br>Fertilizer @ $.20/lb<br>Cost/lb of gain | $ .42 | $ .37 | $ .42 | $ .34 |
| Return above specified cost/sect. | $ 4,548.37 | $3,963.65 | $4,269.94 | $5,710.89 |
| Return above specified cost/A | $ 7.11 | $ 6.19 | $ 6.67 | $ 8.92 |
| 1973 data only<br>Land $110/A<br>Fertilizer $.10/lb | $ .31 | $ .39 | $ .36 | $ .33 |
| Return above specified cost/sect. | $11,224.36 | $4,128.50 | $6,806.49 | $7,223.84 |
| Return above specified cost/A | $ 17.53 | $ 6.45 | $ 10.64 | $ 11.28 |

*a/Return above specified cost: from these returns the cost of or the reward to management must be paid. Any remaining returns would be profits.*

Cost per pound of gain, returns above specified costs per section, and returns above specified costs per acre, using land values at $70 and $110 per acre, and fertilizer costs at $.10 per pound and $.20 per pound for the four grazing systems are shown in Table 3.

Costs per pound of gain varied from 2 to 4 cents lower to 1 to 2 cents higher with fertilizer valued at $.10 per pound. Costs per pound of gain for continuous grazed—fertilizer, continuous grazed—no fertilizer, rotational grazed—fertilizer, and rotational grazed—no fertilizer, were $.40, $.44, $.41 and $.40 respectively for $110 per acre land and $.10 per pound nitrogen. Returns above specified costs per acre were $7.78, $3.79, $7.34 and $6.52.

Costs per pound of gain, with fertilizer at $.20 per pound and land at $70 and $110 per acre were 1 to 7 cents higher with the use of fertilizer. Returns above specified costs were higher for continuous fertilizer compared to continuous—no fertilizer.

With rotational grazing, the use of fertilizer at $.20 per pound cannot be justified. The expense of fertilizer is not recovered from the response of extra beef production. With fertilizer costs at $.20 per pound nitrogen, the potential of rotational grazing should be reemphasized. By proper management of the rotational grazing system, the cost per pound of gain remains competitive and favorable to the cost per pound of gain with the use of fertilizer.

Economic analysis depends, to a large extent, upon:

1. Cost of the inputs of land and fertilizer.
2. Amount of forage available that can be converted into beef.
3. Price received for the steer.
4. The long-term effect upon the grassland resource.

The price of fertilizer has changed and the decision and justification of nitrogen use must be continuously reevaluated by the range beef producer.

## Acknowledgment

The authors wish to express their appreciation to those professionals who reviewed this publication in the departments of Agriculture Economics and Agronomy.

The authors refer the reader to an article in the Farm, Ranch and Home Quarterly, Spring 1972, University of Nebraska Experiment Station, page 19, "Fertilizing Native Range," by D. F. Burzlaff and L. A. Daigger. This article gives a more detailed description of the project, which Dr. Burzlaff, former University of Nebraska range management specialist, developed and supervised the first four years.

This experiment will be conducted for three more years, at which time final results will be made available.