# Fertilizer Scheduling Improves Yields and Quality, Plus Water and Nutrient Use Efficiency of Coastal Bermudagrass

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*First year data from a Texas study indicate that fertilizer application for Coastal bermudagrass two weeks prior to each harvest can significantly increase yield and forage quality. This concept needs further study at other locations for additional confirmation. Based on these results, this management technique can substantially improve farmer profits without increasing costs.*

**MORE TONNAGE** of Coastal bermudagrass is harvested for hay in the Southern U.S. than any other warm season perennial grass cultivar. Coastal is a deep rooted, drought tolerant, high-yielding bermudagrass hybrid.

In a majority of hay meadows, growers harvest 2 to 4 cuttings annually on 28-day intervals for seasonal harvests of 3 to 5 tons per acre. Most soil testing laboratories and forage professionals recommend applying nitrogen (N) at about 50 lb/A plus other nutrients for each ton of hay to be harvested. Normal application is about 100 lb N/A in the spring, followed by the remainder in equal increments immediately after each harvest. In addition to N, bermudagrass also needs significant amounts of potassium (K), as well as phosphorus (P), sulfur (S), magnesium (Mg), copper (Cu), manganese (Mn), zinc (Zn) and boron (B).

Research, Extension and industry forage workers report that one ton of dry matter can be produced from about 3 inches of seasonal rainfall, if adequate nutrients are available. Thus, a potential 4 tons/A yield would result from 8 to 12 inches of rainfall when nutrient supply and other conditions are favorable.

A study was initiated to compare the conventional method of applying fertilizer immediately after harvesting with a fertilize-before-the-harvest application 2 weeks before harvest in a 28-day harvest cycle.

An established Coastal bermudagrass meadow on a Lufkin fine sandy loam soil was the test site. Soil pH was 6.4. A blended fertilizer with the analysis of 18N-5 $P_2O_5$-13$K_2O$-11S-2Mg-0.05Cu-0.1 Mn-0.1 Zn-0.02B was used throughout the season. Potassium was also applied in the previous fall at a rate of 180 lb $K_2O$/A.

Treatments included: (1) the conventional method of applying fertilizer at spring green-up, followed by topdress application immediately after each harvest, and (2) applying fertilizer at spring green-up followed by topdress fertilization 14 days before (FB) each 28-day planned harvest. Both treatments received equal amounts of nutrients and were harvested on the same dates. Dates of application and harvest for the conventional and the before-harvest application treatments are reported in **Table 1**.

Yield, percent protein and protein produced per acre are shown for the four harvest dates in **Table 2**. Seasonal yields of the treatment fertilized before harvest (FB) were 1,706 lb/A or 17.6 percent

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**CONVENTIONAL fertilization effects are shown on first-cut Coastal bermudagrass.**

**BERMUDAGRASS fertilized two weeks before cutting . . . notice that plant color is deeper green and leaf density is greater.**

**Table 1. Fertilizer application and harvest dates.**

| Fertilizer application dates | | |
|---|---|---|
| Conventional | Fertilized before harvest | Harvest date |
| May 25 | May 25<br>June 9 | June 22 |
| June 27 | July 8 | July 21 |
| July 25 | Aug. 5 | Aug. 31 |
| Sept. 7 | | October 14 |

greater than the conventional treatment, with second and fourth harvest yields 28 percent greater. Protein production was increased by 454 lb/A, 37 percent more than the conventional treatment.

The effects of fertilizer scheduling on water use efficiency (WUE) are shown in **Table 3**. Average seasonal water use efficiency was 639 lb hay per inch of rainfall in the conventional treatment compared to 752 lb/inch in the FB treatment, a 17.7 percent increase. During the driest period, rainfall was only 0.63 inches in the 28 days prior to the July 21 harvest. Water use efficiency was improved 28 percent by fertilizing before harvest.

The effects of fertilizer scheduling on apparent nutrient use efficiencies are

**(continued on page 19)**

**Table 2. Effects of fertilizer scheduling on Coastal bermudagrass yield, protein content and protein production.**

| | Conventional | | | Fertilized before harvest | | |
|---|---|---|---|---|---|---|
| Harvest date | Yield, lb/A | Crude protein, % | Protein, lb/A | Yield, lb/A | Crude protein, % | Protein, lb/A |
| June 22 | 3,942 | 12.1 | 475 | 4,790 | 15.6 | 748 |
| July 21 | 1,309 | 8.4 | 109 | 1,681 | 8.9 | 150 |
| Aug. 31 | 2,709 | 14.1 | 382 | 2,700 | 16.0 | 433 |
| Oct. 14 | 1,753 | 15.1 | 264 | 2,247 | 15.7 | 353 |
| Total | 9,713 | | 1,230 | 11,419 | | 1,684 |

**Table 3. Effects of fertilizer scheduling on water use efficiency of Coastal bermudagrass.**

| | | Water use efficiency, lb/in | |
|---|---|---|---|
| Harvest period | Rainfall accumulation, in/harvest | Conventional fertilization | Fertilized before harvest |
| May 25-June 22 | 4.12 | 957 | 1,163 |
| June 22-July 21 | 0.63 | 2,078 | 2,668 |
| July 21-Aug. 31 | 5.02 | 540 | 538 |
| Aug. 31-Oct. 14 | 5.42 | 323 | 415 |
| Total | 15.19 | – | – |
| Average | – | 639 | 752 |

native of Tribune, KS. The tentative title of his dissertation is "Denitrification Dynamics in Fragipan Soils of Kentucky." The purpose of his research is to see how manure and cover crops influence denitrification above a fragipan under controlled conditions. After receiving his Ph.D. degree, Mr. Fairchild plans to work in a less developed country where he can teach better farming methods to the people . . . including better use of fertilizers and environmentally sound practices. He would also like to conduct research to support his teaching. ■

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shown in **Table 4**. Both N and K showed the greatest increases from fertilizing before the harvest (11 percent and 10 percent, respectively). Phosphorus use efficiency increased slightly, but S showed no response and Mg use efficiency decreased by 5 percent.

**Table 4. Effects of fertilizer scheduling on apparent nutrient use efficiencies.**

| | Seasonal nutrient use efficiency– lb/A harvested/lb/A applied | | | | |
|---|---|---|---|---|---|
| | N | $P_2O_5$ | $K_2O$ | S | Mg |
| Total amt. applied, lb/A | 360 | 100 | 440 | 220 | 40 |
| Conventional fertilization | 0.63 | 0.47 | 0.55 | 0.12 | 0.54 |
| Fertilized before harvest | 0.74 | 0.49 | 0.65 | 0.12 | 0.49 |

### Summary

For the farmer/rancher, the advantages of fertilizing before harvest compared to the conventional method include:

- Improved forage quality.
- Higher forage crude protein content (greater than 15 percent throughout the season except for the drought harvest on July 21).
- Increased seasonal yield (17.6 percent).
- Increased protein production/A (37 percent).
- Increased nutrient use efficiency.
- Improved water use efficiency (over 17 percent).

Advantages of this system for fertilizer dealers include:

- Spreader tracks visible and easily discerned by applicator driver, aiding in achieving even spread pattern.
- Fields can be fertilized without delays caused by hay baling and removal.

**The bottom line is that timing fertilizer applications before harvest can boost Coastal bermudagrass yields, quality and profits.** ■

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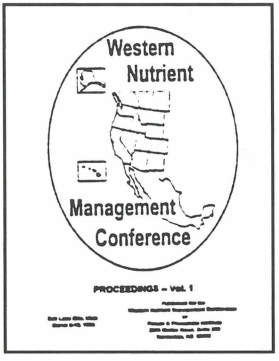


**THE FIRST** Western Nutrient Management Conference was held in Salt Lake City, UT, March 9-10, 1995. This conference provided a forum for discussion of nutrient management for all types of crop production with emphasis on environmental protection. A total of 33 oral and poster papers were presented on subjects including implementing nitrogen fertilizer best management practices, potassium fertility guidelines for California crops, chloride nutrition of wheat, predicting wheat protein increases from topdressed N, and fertility management for high density apple orchards.

The United States, Canada and Mexico were represented by presentations at the Conference. States and provinces covered by the Conference included Saskatchewan, Alberta, British Columbia, Alaska, Washington, Idaho, Montana, Oregon, Wyoming, California, Nevada, Utah, Colorado, New Mexico, Arizona, Hawaii and northern Mexico.

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