BALANCED DAIRYING

-Production-

Texas Cooperative EXTENSION
The Texas A&M University System

Selecting Forage Systems to Improve Phosphorus Cycling

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The average dairy cow produces 40 pounds of phosphorus per year in her manure, which can be applied to cropland to improve soil fertility. However, improper application may increase the risk of surface water runoff contamination to nearby waterways by direct runoff or erosion of soils containing high levels of P.

Forage systems are an important part of balance cycles for farm nutrients. When developing cropping schemes for nutrient utilization plans (**NUP**), the land area requirement (**LAR**) for manure and wastewater dispersal is affected by the choice of forage systems. For example, Texas A&M University research indicates that a NUP in north-central Texas may require up to 2.7 acres per dairy cow when applying manure to a dryland bermudagrass hay meadow. However, intensifying production, with both winter and summer silage crops under irrigation, may reduce the area required to near one acre per cow.

Whether long-term build-up of soil P occurs on application fields is primarily a function of two factors. The first factor is crop uptake of P. Phosphorus concentration in plant tissue can be as high as 0.44 percent in tall fescue or as low as 0.06 percent in corn silage (dry matter basis). The second factor is forage yield. Forage yield can be affected by soil fertility, cultivation practices and soil moisture.

Forage trials conducted in Stephenville, TX (1992–2000) evaluated alternative forage systems for dairy cows. All trials were conducted on a Windthorst fine, sandy loam. Trials evaluated varieties of both warm-season dicots ('India' kenaf, 'Tecomate' lablab, sunflower, combine cowpea or iron-clay cowpea) and monocot silages (corn, forage sorghum, grain sorghum, forage millet, a sorghum-sudan hybrid and 'Nutrifeed,' a *Pennisetum* spp. hybrid) under irrigation with manure application. Cool-season annual grasses were evaluated under dryland

TABLE 1. AVERAGE SEASONAL PHOSPHORUS CONCENTRATIONS AND YIELDS OF VARIOUS SILAGE CROPS (NORTH-CENTRAL TEXAS).

Species	Forage Yield, tons DM / acre	P Concentration, %	P Harvested, lbs per acre
Cool Season Grasses			
Barley (D)*	2.7	0.39	21.1
Oats (D)	2.9	0.32	18.8
Rye (D)	2.2	0.25	14.9
Triticale (D)	2.7	0.29	15.7
Wheat (D)	2.6	0.27	14.2
Warm Season Annuals			
Forage sorghum (I)	6.2	0.14	17.4
Sorghum-sudan (I)	7.6	0.17	26.1
Forage millet (I)	6.1	0.28	33.8
Pennisetum hybrid (I)	5.5	0.25	27.4
Grain sorghum (I)	4.4	0.21	18.8
Corn (I)	8.3	0.24	40.7
Warm Season Perennials: Legumes			
'India' kenaf (I)	6.5	0.22	28.8
'Tecomate' lablab (I)	3.7	0.28	20.8
Sunflower (I)	2.4	0.18	8.8
Combine cowpea (I)	1.3	0.28	7.1
Iron-clay cowpea (I)	2.2	0.30	13.1
Warm Season Perennials: Grasses			
Coastal bermudagrass (D)	3.2	0.23	14.4
Coastal bermudagrass (I)	5.5	0.20	22.0
Double Cropping System			
Coastal + wheat (D)	2.9	0.23	13.3
Coastal + ryegrass (I)	5.0	0.33	33.3

* I = irrigated, D = dryland

conditions. Grasses included: barley, oats, rye, triticale, Coker wheat and wheat. Data indicate that combinations of yield and forage-P concentration vary considerably among species (Table 1). This variation in P removal may be useful for producers trying to reduce field soil P below the required 200 ppm or to lower LAR for manure application.

Choice of forage systems may influence the LAR necessary for a long-term, sustainable nutrient utilization plans for dairy producers. Current LAR estimates are based on a single cropping scheme. These may require as much as three acres per milking cow, based on a phosphorus utilization system. Data summarized from the above experiments

TABLE 2. LAND AREA REQUIREMENTS (LAR) FOR MANURE DISPERSION WITH DIFFERENT FORAGE SYSTEMS (NORTH-CENTRAL TEXAS).

Forage system	Irrigated/Dryland	P Removal (pounds per acre)	LAR (acres)
Coastal bermudagrass	Dryland	14.4	2.78
Lablab	Irrigated	20.8	1.92
Coastal bermudagrass	Irrigated	22.0	1.82
Sorghum-sudan	Irrigated	26.1	1.53
Coastal + ryegrass	Irrigated	33.3	1.20
Millet silage	Irrigated	33.8	1.16
Corn silage	Irrigated	40.7	0.98

show that LAR should be based on actual historical forage yields and plant-P concentrations from the acreage receiving manure.

Table 2 shows example cropping schemes and their calculated LAR for sustainable manure and wastewater application. Land area requirements are calculated using an average excretion of 40 pounds P per cow per year.

Selecting forages or forage systems with higher yields and/or higher P concentrations should decrease LAR. Intensifying production, especially with irrigation, should also decrease LAR, thereby saving concentrated animal operations the cost of land purchase, lease or access for waste application.

Cooling Pond Update

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As many of you are aware, the Texas Department of Health issued an information release on October 30, 2001 requiring that the use of cooling ponds cease immediately "until such time as they have been replaced with an approved design."

Over the course of the last several months, information regarding the use of cooling ponds in Texas and somatic cell count information from herds using those cooling ponds has been collected. On February 22, 2002 a meeting was held at the Texas A&M Research and Extension Center in Dallas to develop a consensus regarding design and maintenance standards for cooling ponds. Producers, veterinarians, industry representatives, Texas Department of Health representatives and a Food and Drug Administration representative were in attendance.

On February 25, 2002 a letter was submitted to the Texas Department of Health outlining the design and maintenance standards developed in that meeting and requesting that the continued use of cooling ponds be allowed in Texas based on those standards. A decision was requested by April 1. Whether those standards will be accepted and cooling ponds permitted now rests with the Texas Department of Health and the Food and Drug Administration.

TEXAS COOPERATIVE EXTENSION
UNITED STATES DEPARTMENT OF AGRICULTURE
THE TEXAS A&M UNIVERSITY SYSTEM
COLLEGE STATION, TEXAS 77843

CALENDAR OF EVENTS

March 19, 2002 — Texas DHIA Annual Meeting
Cook's Fish House, Comanche
Contact: (979) 845-5709

April 24-25, 2002 — Mid-South Ruminant Nutrition Conference
Hilton Arlington, Arlington
Contact: (972) 952-9210

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