# Dairy E-News

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## Soil Nutrient Management in Dairies

*Dirk Philipp, Associate Professor*

Dairy farmers usually import large amounts of nutrients to their operations, including feedstuffs and fertilizer. Even in grazing- or pasture-based dairies, nutrient loads are difficult to balance across fields due to uneven feces deposition and the inherently large soil nutrient variability. Nutrient loss isn't just a matter of environmental quality, it can be a serious financial drain as well. Only half of the nitrogen applied is being taken up by plants, and unlike phosphorus or potassium, nitrogen cannot be stored easily in the soil for later uptake and is prone to leaching. Conversely, phosphorus stays largely attached to soil particles, and losses of this mineral mainly result from soil erosion. The interconnecting objects that prevent soil from eroding and nutrients from leaching are forage crops and pasture plants grown for raising animals, and there's a great number of management solutions available to improve nutrient use efficiency.

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Most of these solutions are not rocket science, and with some effort, nutrient losses from pastures and facilities can be greatly reduced. The main forces of nutrient dislocation and transport are water and gravity, so maximizing water infiltration and retention and minimizing runoff are the first steps in fending off excessive losses. I recently witnessed a demonstration during which an NRCS representative showed how much water percolates the root zone and how much runs off depending on soil cover. What struck me was that even in soil with reasonable vegetative cover about 3 inches high, about half of the rain applied simply ran off from the model plots. This means maintaining vigorous forage growth and developing strong plant rooting patterns are imperative for making the most of precipitation that, in addition, is rarely abundant and evenly distributed throughout the year. Sure, pastures have to be defoliated frequently to maintain economic sustainability, but sensitive areas such as low-lying fields, former flood plains and buffer areas should be grazed accordingly, as these areas have important functions to fulfill in terms of nutrient retention and runoff filtering.

It is important to realize the redistribution of nutrients via grazing and fecal depositions is uneven at best. Nitrogen concentrations in feces and urine patches can easily exceed 5,000 lb/acre. Certain grazing methods, such as rotational stocking and strip grazing, help deposit nutrients more evenly due to higher stocking densities, but the soil and its microbes still have to do their part to make the nutrients available to the plants. The challenge is to redistribute nutrients of imported feedstuffs. As cattle excrete anywhere from 75% to 90% of the nutrients ingested, this is difficult to achieve. Using equipment to spread manure collected from barns or heavy-use areas will probably do a much better job than turning the animals out, as the above-mentioned problems apply.

It was a commonly recommended practice in the past to drag pastures in spring to break up and distribute cow patties. This might be a challenge in large grazing dairies, but it is certainly an option in smaller operations. Many producers maintain so-called "sacrifice pastures" for hay feeding to keep other pastures from deteriorating during the cold and wet months of the year. Keep those fields as far away from environmentally sensitive areas as possible. If the manure load is high there, it may even be possible to scoop out the manure and refused hay and spread the mixture across fields. Hay itself contains large amounts of nutrients and can add substantial amounts back to the soil if strategically placed in dormant pastures, either rolled out or in hay rings.

Lastly, the best way to fine-tune nutrient management is to take soil samples on a regular basis. The Cooperative Extension Service offers soil analyses for free, but producers have to sample their fields in a regular and systematic manner to receive meaningful results. This way, fertilizer applications and grazing management can be adjusted to benefit the bottom line and the environmental quality in surrounding communities.

## Comparison of Five Nontraditional Liquid Fertilizers for Dry Matter Yield of Stockpiled Bermudagrass and Tall Fescue

John Jennings, Kenny Simon, Leo Espinoza, Dirk Philipp, Shane Gadberry, Paul Beck, Paul Ballantyne and Ronald Lathrop

High commercial fertilizer prices cause many producers to look for lower-cost fertilizer alternatives. Many new liquid fertilizer products are marketed, but little research-based information is available to show their effectiveness for forage production. The objective of this study was to compare dry matter yield and nutritive value of late summer and fall-grown stockpiled bermudagrass and stockpiled tall fescue treated with five different nontraditional liquid fertilizers.

### METHODS:

Experiments were conducted at the Southwest Research and Extension center (SWREC-Hope) and the Watershed Research and Extension Center (WREC-Fayetteville) to compare five different nontraditional liquid fertilizer products for effects on dry matter yield of stockpiled bermudagrass and stockpiled fescue. Each liquid product was applied alone at rates according to manufacturer recommendations and in combination with commercial fertilizer based on soil test recommendations for each site for stockpiled forage. Only data from WREC are shown due to article length limitations.

Treatments were:

1. Unfertilized check
2. Commercial fertilizer (CF)
3. Monty's Plant Food
4. Sea mineral
5. Royal Grow
6. Grasshopper
7. AgriGro Foliar Blend
8. Monty's Plant Food +CF
9. Sea mineral +CF
10. Royal Grow +CF
11. Grasshopper +CF
12. AgriGro Foliar Blend +CF

### RESULTS:

**WREC Bermudagrass Dry Matter Yield:** Commercial fertilizer produced a significant yield response compared to the unfertilized check (2,271 vs. 1,320 lb/acre) (Table 1). DM for liquid fertilizers alone was not different than the unfertilized check, and DM for liquid fertilizers combined with commercial fertilizer was not significantly different than commercial fertilizer alone. No significant yield response was measured for liquid fertilizers applied alone or in combination with commercial fertilizer (Table 1).

**Table 1. Dry Matter Yield of Stockpiled Bermudagrass Treated With Commercial Fertilizer, Five Liquid Fertilizers or Combinations of Commercial and Liquid Fertilizers 2014 WREC, Fayetteville**

| Treatment | Dry Matter lb per acre |
|---|---|
| Unfertilized Check | 1,320 |
| Monty's Plant Food 8-16-8 @ 32 oz/acre | 1,363 † |
| Sea Mineral @ 5 lb/acre | 1,278 † |
| Royal Grow 32-0-30 @ 64 oz/acre | 1,227 † |
| Grasshopper 15-0-12-3 @ 2.5 gal/acre | 1,300 † |
| AgriGro Foliar Blend @ 32 oz/acre | 1,225 † |
| | |
| Commercial Fertilizer (CF) 50-0-110 | 2,271 |
| Monty's Plant Food 8-16-8 @ 32 oz/acre +CF | 2,341 ‡ |
| Sea Mineral @ 5 lb/acre +CF | 2,254 ‡ |
| Royal Grow 32-0-30 @ 64 oz/acre +CF | 2,423 ‡ |
| Grasshopper 15-0-12-3 @ 2.5 gal/acre +CF | 2,412 ‡ |
| AgriGro Foliar Blend @ 32 oz/acre +CF | 2,488 ‡ |
| LSD (0.05) | 316 |

†Not significantly different than unfertilized check
‡Not significantly different than commercial fertilizer

**WREC Fescue Dry Matter Yield:** Commercial fertilizer produced a significant yield response compared to the unfertilized check (2,676 vs. 1,350 lb/acre) (Table 2). Liquid fertilizer products alone did not significantly increase yield over the check treatment and did not improve yield when combined with commercial fertilizer compared to commercial fertilizer alone (Table 2).

## CONCLUSION:

Significant dry matter yield increases were measured for commercial fertilizer for both stockpiled bermudagrass and stockpiled fescue. Liquid fertilizer products compared in this study had no significant effect on forage dry matter yield of stockpiled bermudagrass or stockpiled fescue when applied alone or in combination with commercial fertilizer. Cost of liquid fertilizer products ranged from $11.00 to $36.00 per acre. Results indicate that the liquid fertilizer products used under conditions of this study were not effective for improving forage yield.

Table 2. Dry Matter Yield of Stockpiled Fescue Treated With Commercial Fertilizer, Five Liquid Fertilizers or Combinations of Commercial and Liquid Fertilizers 2014 WREC, Fayetteville

| Treatment | Dry Matter lb per acre |
|---|---|
| Unfertilized Check | 1,350 |
| Monty's Plant Food 8-16-8 @ 32 oz/acre | 1,679 † |
| Sea Mineral @ 5 lb/acre | 1,425 † |
| Royal Grow 32-0-0 @ 64 oz/acre | 1,764 † |
| Grasshopper 42-0-0 WSG @ 12.5 lb/acre | 1,642 † |
| AgriGro Foliar Blend @ 32 oz/acre | 1,600 † |
| | |
| Commercial Fertilizer (CF) 50-0-0 | 2,676 |
| Monty's Plant Food 8-16-8 @ 32 oz/acre +CF | 2,589 ‡ |
| Sea Mineral @ 5 lb/acre +CF | 2,497 ‡ |
| Royal Grow 32-0-0 @ 64 oz/acre +CF | 2,518 ‡ |
| Grasshopper 42-0-0 WSG @ 12.5 lb/acre +CF | 2,721 ‡ |
| AgriGro Foliar Blend @ 32 oz/acre +CF | 2,582 ‡ |
| LSD (0.05) | 449 |

†Not significantly different than unfertilized check
‡Not significantly different than commercial fertilizer

# Cattle Traffic Areas: Thinking and Planning Ahead for Wet Weather

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Winter is upon us, and cattle traffic areas that in the summer are bare hard-packed soil will, with the wet weather, become muddy. While muddy areas can't be completely avoided, they can be managed to reduce mastitis and production concerns associated with dirty cows and muddy conditions.

As the primary ingredients to mud are soil and water, the key concept to minimizing muddy conditions is to keep the amount of soil and water that mixes to a minimum. The first step is to lay out and size cattle traffic areas and lanes so cattle can move around the farm as needed while, at the same time, keeping the areas where grass does not grow due to cattle traffic as small as possible. Of course, this will likely require appropriate fencing to direct cattle traffic. When laying out fence lines and gates, consideration should also be given to equipment and human traffic patterns.

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Depending on soil conditions, some situations may require steps to increase the load-bearing capacity of the soil. While concrete is often an option, its expense may make other options, such as gravel with or without a geotextile or the use of coal plant fly ash, attractive. As with most decisions, initial cost, useful life and maintenance costs should be considered. Proper layout and management should minimize and potentially avoid the expense of increasing the load-bearing capacity of the soil.

A key component in traffic area layout is to divert as much water as possible away from travel lanes and loafing lots. Berms and surface drainage can be used to redirect surface water runoff. For roof runoff, gutters might need to be considered. In some cases, it may be appropriate to use culverts to direct clean water flows under traffic areas.

Even after appropriate water diversions are put in place, it will rain directly in the traffic areas. This means the traffic areas should be designed and managed to minimize water ponding and surface erosion. Ponding will increase mud problems. Erosion tends to increase the time and cost of traffic area maintenance. Ideally, the traffic areas should be sloped enough so that water flows off but not so much that erosion is a problem. The slopes should be oriented in such a way that water flows minimal distances while in the traffic area. In addition, the slopes should be designed and maintained to avoid low spots that will pond water.

Runoff water from traffic areas will likely contain some microorganisms, nutrients and sediment from its contact with manure and soil. The commonly accepted method to address environmental concerns is vegetative filtering. This runoff water is usually directed to flow as a broad uniform sheet of water into a vegetated filter strip. This provides the vegetation in the filter strip a chance to treat the runoff water to protect any potential downslope streams and ponds.

Often mud-related problems can be corrected with modest changes. The trick is to not only see the confinement and traffic areas as they are but to see what improvements can be made. This is followed by deciding the order and timing of the changes.

As with many farming practices, proper maintenance is important. The condition and effectiveness of diversions, fencing and vegetated filter strips should be monitored and maintained. Periodic scraping of the traffic areas may be needed to remove excessive amounts of manure solids. When scraping, care should be taken to maintain slopes and avoid creating low areas where ponding will occur. Any scraped material should be thinly applied as a soil amendment to growing vegetation well isolated from downslope water bodies. Ideally, to avoid handling the material twice, it should be left in place until suitable conditions exist for land application. If it must be stored prior to land application, it should be protected from the weather to avoid runoff to avoid being subject to liquid manure regulations.

For additional information, the publications *Runoff Water Management for Animal Production and Environmental Protection* (FSA1036); *Reducing Mud Problems in Cattle Heavy Use Areas With Coal Combustion By-Products (Fly Ash)* (FSA1043); and *Beef Cattle Management for Water Quality Protection in Arkansas* (MP375) are available at www.uaex.edu.

## Pregnancy Testing in Dairy Cows

Rick Rorie, Professor

Early detection of cows that fail to conceive after insemination is important in order to decrease the interval between inseminations and improve the pregnancy rate. Observation of cows for return to estrus (18 to 24 days after insemination) is a common, simple method for identifying open animals. However, a limitation of this method is that estrous detection efficiency is less than 50% on many dairy farms. Measure of progesterone in milk is an alternative to estrous detection for detection of open cows. If a cow does not become pregnant after breeding, the corpus luteum that forms after ovulation will regress, resulting in low progesterone in circulation starting about 18 days after estrus. Progesterone will then remain low until a new corpus luteum forms and becomes functional the following estrous cycle. Therefore, detection of low milk progesterone around 21 days after insemination indicates the cow is open. However, high progesterone at that time may not necessarily confirm a viable pregnancy. For instance, embryonic death can occur after initial pregnancy recognition, extending the corpus luteum lifespan and/or cycle to 30 days or more before return to estrus.

In the last few years, pregnancy tests have become available that detect proteins produced only during pregnancy (see table below). Pregnancy-specific protein B is such a protein that is currently measured in many commercially available tests. This protein is produced by placental cells, as early as 22 days of gestation, then continues to be produced throughout gestation. General test procedures require either a blood or milk sample (depending on the test) be collected about a month or more after insemination and mailed to a testing lab for analysis. Test results can indicate pregnant, open or may require recheck if the results are not definite. A recheck

**Currently Available Pregnancy Tests Based on Pregnancy-Specific Protein Detection**

| Pregnancy Test | Company | Sample Type to Collect | Minimum Days After Breeding to Test | Waiting Period after Calving |
|---|---|---|---|---|
| BioPRYN | BioTracking | blood | 28 days | 90 days |
| Pregnancy Test DG29 | Conception | blood | 29 days | 90 days |
| Bovine Pregnancy Test | IDEXX Labs | blood | 28 days | 60 days |
| EarlyPreg28 | Animal Profiling International | blood | 28 days | not specified; assume 90 days |
| Milk Pregnancy Test | IDEXX Labs | milk | 28 days | 60 days |
| EasyPreg | Animal Profiling International | milk | 28 days | not specified; assume 60 days |

result can be an indication of pregnancy loss due to early embryonic death. A precaution in using this type of pregnancy test is that the pregnancy-specific protein can remain detectable in the cow's circulation for two months or more after calving. Therefore, there is a minimum waiting period after calving before the test should be run. Normally, this should not be a problem if a 60-day voluntary waiting period is observed after calving before attempting to breed, and the test is run about 30 days after insemination.

Rectal palpation of the uterus for pregnancy can also be done as early as 30 days of gestation, but doing so runs the risk of causing embryonic loss/abortion. At 30 days of gestation, the fetus is one-half inch or less in length and essentially undetectable by palpation. Checking for pregnancy this early in gestation involves feeling for "placental membrane slip" when the uterine horn is grasped during palpation. During this process, the amnionic vesicle and/or the fetus can be crushed, resulting in pregnancy loss. Delaying palpation until 45 days of gestation or later will minimize the risk of injuring or aborting the fetus. Ultrasonography is a safer alternative to rectal palpation for early pregnancy detection. Ultrasonography not only has the ability to safely detect pregnancy as early as 28 to 30 days of gestation but can detect a fetal heartbeat to confirm that the fetus is alive. After 45 days of gestation, an experienced palpator is considered equally accurate to ultrasonography for detecting pregnancy.

Early fetal loss (i.e., before 45 days of gestation) in dairy cows is reported to be in the range of 10% to 12% or more. During the first 45 days of gestation, the developing fetus is differentiating into the various tissues, the major organ systems are developing and the placenta is establishing connections to the uterus. After this critical period in development, pregnancy loss is much less likely to occur. Due to the potential for pregnancy loss early, it would be advisable to confirm ongoing pregnancies at a later stage of gestation, when the initial pregnancy determination is made during the first month of gestation.