

Managing Soil Fertility in Beef Cattle Pastures

Dennis Hancock

Extension Forage Specialist

The University of Georgia

When hay is removed from a hayfield, it makes sense to think that a substantial amount of nutrients are being carted off in each bale. However, when cattle graze in a pasture, it is reasonable to expect that most of those nutrients are recycled back to the pasture. After all, a 500 lb calf only contains about 12 lbs of nitrogen, 3.5 lbs of phosphorus, and 0.75 lbs of potassium. But, like most things in life, it's more complicated than that.

Grazing animals do, in fact, return most of the nutrients that they consume back to the pasture. Unfortunately, these nutrients are taken from large areas (grazed area) and deposited in concentrated patches on small areas of the pasture. Often times, we see this problem because of disproportionate growth around urine and dung patches.

Several years ago, some New Zealand researchers found that pastures grazed under continuous stocking at one cow/acre resulted in the nutrients from the total grazed area being concentrated on about 17% of the pasture. So, just how concentrated can these nutrients be? Well, studies have shown that nutrients can become so concentrated in the urine that a single urination by a typical cow is equivalent to fertilizing that area at a per acre rate of 3000 lbs of ammonium nitrate and 2000 lbs of murate of potash! When that much nitrogen is applied in one place, about 60-80% of it will volatilize (turn into nitrogen gas) and be lost to the atmosphere. In addition, nitrogen and potassium can be lost when water carries these nutrients down through the soil (i.e., leaching) or in runoff.

Manure patties also contain concentrated nutrients. For example, the great majority of the phosphorus that is consumed becomes concentrated in the dung. About 80% of the phosphorus in the dung is in an inorganic form, which is readily available to plants. However, the plants can not possibly take up that much phosphorus at one time. Fortunately, phosphorus does not volatilize or leach. It can, however, become fixed on iron and aluminum oxides in some of our clayey soils, especially when soil pH is low. This fixation renders that amount of phosphorus lost. The phosphorus that remains available, however, is stored on the soil particles and typically stays with that soil. However, if that soil is prone to erosion, having phosphorus concentrated in a small area can lead to a major environmental problem. That's because phosphorus is otherwise the limiting nutrient to algae and aquatic plants that grow in freshwater lakes, streams, and rivers. When enough phosphorus is present, the water becomes eutrophic and can lead to fish kills and loss of aquatic habitat.

These problems with concentrated nutrients are a major reason to implement rotational grazing. Properly planned grazing paddocks contain strategically placed shade, water sources, hay rings, and mineral feeders (i.e., the areas that cattle frequent most). By rotating cattle between several of these pastures, a cattleman can exercise a lot of control over where the cattle deposit those concentrated nutrients. Studies in Missouri have shown that if grazing is managed with frequent rotations between properly planned paddocks, urine and dung will be applied to every square yard of the pasture within 2-3 years. By comparison, pastures that are poorly

planned and continuously grazed can result in over 40% of the area not receiving any redistributed nutrients, even after 5 years.

However, frequent rotations among properly planned paddocks WILL NOT make for a sufficient nutrient management plan. No matter how well planned the grazing system may be, the concentration of nutrients within pastures still occurs and will lead to nutrient loss via volatilization, leaching, and runoff. Therefore, it is critical to periodically (once every 2-3 years) pull a soil sample from permanent pastures. Of course, it is important to avoid pulling soil samples from within 100 ft of those areas where cattle tend to congregate and deposit these nutrients.

For more information on accounting for nutrient redistribution within pastures, contact your local University of Georgia Cooperative Extension Service office or visit our website at www.georgiaforages.com.