

# peNDF supply: Making forage last until the next harvest

Tim Snyder for *Progressive Dairyman*

Will you have enough forage until next harvest? Drought in the Southwest, late planting, delayed harvest and flooding all contributed to limit current forage supplies across various areas of the country. Dr. St- Pierre, in the December 2011 *Buckeye Dairy News*, states that “effective NDF prices are historically high, 4 cents per lb over the six-year average.” What strategies can be used to make the most of forage availability?

## Feeding less while still meeting needs – peNDF

While the goal in most cases is to use as much quality forage as possible in the ration, when supplies are limited or expensive, a better alternative may be to reduce use. Cows have a requirement for physically effective fiber (peNDF). This concept, developed by Dr. Mertens years ago, was based on the size of the typical feed particle that leaves the rumen after chewing. It is used to determine the recommended minimum and maximum quantity of “chewable” material needed for animal health and productivity. Some refer to a need for “scratch factor” or “to maintain a rumen mat.” They may monitor forage-to-grain ratios, forage percentage or forage NDF in the ration, or other determinations to recommend forage amounts. The peNDF procedure allows for a more definitive measurement and is used in ration modeling programs like CPM and CNCPS, etc.

The Penn State Particle Separator box system is an on-farm tool used by nutrition advisers to help determine peNDF. By properly weighing and shaking the forage, one determines the proportions remaining on different-size screens. Larger particles stimulate more chewing (unless they are sorted out and not eaten). An alternative device is the Z box developed more recently by the Miner Institute in New York. That device was calibrated to provide a value that can be directly incorporated in modeling software.

We compared these two devices several years ago with a summer intern project on dozens of farms. From this we developed equations to convert the PSU box values for use in CPM. Cotanch at the Miner Institute also compared peNDF from the Z box vs the PSU box and published the values in a paper at the 2010 ADSA meeting.

The physically effective length factor for particles is typically from 80 to 100 percent. However, by observation and research, we know that some forages, even if long

enough, require less chewing than others – compare lush pasture or haylage vs straw. Miner Institute researchers, working from earlier designs, attempted to develop a ball mill procedure to mimic chewing. The goal was to determine if that could be used to distinguish “fragility” of forage types – the ease of breakdown by chewing.

While not completely satisfactory, the procedure did provide direction. At the same time, they correlated “fragility” with NDF digestibility (NDFD) and found a relationship. We have used that relationship to modify peNDF, allowing lower use of less fragile, more effective forage and requiring higher use of more fragile forage.

Typically, minimum peNDF is 22 to 23 percent of diet dry matter (around 0.8 percent of animal bodyweight). This can be lowered to around 20 percent with care. Cows must have forage or TMR always available, bunk space should not be limited, and sorting should be minimal to be successful with lower peNDF levels. Also, lower fermentable starch in the diet should be part of a lower peNDF ration.

Generally, lower peNDF diets encourage more total dry matter intake (DMI) and support good production. However, if too low, rumen upsets, poorer digestion, lower production and health problems occur. Physically effective NDF measured in the storage structure may be higher than in the

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Physically effective NDF is too valuable to waste. Follow good harvest and storage principles. Fill fast, pack thoroughly in lined and covered bunkers and use a proven inoculant to reduce fermentation and feedout losses. Wrap and/or cover bales. Photo by PD staff.

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feed trough. Don't overmix batches, which can reduce peNDF and cause these problems. High peNDF diets (>1.05 percent of bodyweight) can limit intake, restricting peak and full lactation production.

Combinations of byproducts

higher in digestible fiber, often referred to as non-forage fiber sources, may increase peNDF supply. They can also lower the peNDF amount needed in the diet since fermentable starch is typically lower when using these ingredients. Whole

cottonseed, pulps, hulls, high-moisture corn with cobs, gluten feed and brewers grains, among others, contribute to physically effective fiber.

### Take a peNDF inventory

A common method to estimate

inventory is to mark the current level of forage and feed it out for one to two weeks while weighing the amount fed. Re-mark the forage level and calculate the weight per volume removed. Use that value to calculate the remaining amount.

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The University of Wisconsin forage website provides numerous tools to plan and measure forage inventory at <http://www.uwex.edu/ces/crops/uforage/storage.htm>. DairyOne offers a density testing tool that allows calculation of pounds of forage per cubic foot of volume to determine inventory. Be safe if working at the bunker face. <http://www.dairyone.com/Forage/DensityCalculators/>

A useful planning strategy is to create a forage map. Identify on paper the location of the available forages. Include the description, quantity and a forage analysis on the map. The analysis should include the usual nutrients and the peNDF value. If bags or bunkers are used, you can sample remaining forage ahead of use. If the forage is stored in upright silos, sample when filling next year and mark between layers with plastic strips. By having this info, your nutrition adviser can make the best recommendations about where and when to use the available forage.

Two areas that typically have the most flexibility in forage use are the heifer and dry cow rations. Usually, forage too low in digestibility to support good milk production is directed there. However, perhaps one pound of the coarse hay or straw can spare 2-3 lbs of forage used for peNDF in the lactating group. Research at Penn State and the University of Wisconsin have shown that heifers do well on precision-fed, lower-forage rations. Reducing heifer rations from 90+ percent forage to under 50 percent can spare a lot of peNDF for lactating cows. Another option is to sell excess heifers or cull cows now rather than later.

### Control peNDF loss

Physically effective NDF is too valuable to waste. Follow good harvest and storage principles. Fill fast, pack thoroughly in lined and covered bunkers and use a proven

inoculant to reduce fermentation and feedout losses. Wrap and/or cover bales. Feed to maintain a clean forage face from the right size structure. Reduce loss when moving forage to the mixer. Feed any forage fed separately from the TMR in a closed-bottom feeder. These practices can reduce losses from over 30 percent to under 5 percent. At the University of Wisconsin forage website, Dr. Holmes has a spreadsheet useful for "Determining the Value of Improved Silage Management." What would 25 percent more forage be worth to you?

For next year, plan to harvest more than enough. Consider keeping the cob with the corn in snaplage or

high-moisture ear corn. Harvest as corn silage instead of grain. Plant an emergency, drought-tolerant BMR sorghum forage or corn variety. Plant a cover crop that can be harvested in fall, spring or both.

### Summary

◆ Calculate minimum peNDF required till next harvest

◆ Lower the peNDF precision-fed to heifers, or sell excess heifers now and cull cows harder

◆ Measure, inventory and map available on-farm peNDF; make

purchase agreements now if short

◆ Reduce feedout waste on the way to the mixer, in feed troughs, mangers and hay rings

◆ Reduce TMR forage length to 2-3 inches max to reduce sorting/wasting; *but* don't overmix and lower peNDF available

◆ For next year – plant, harvest and preserve more peNDF

Managing peNDF supply will return significant profits, especially when supplies are limited and costs are high. **PD**



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