The National Academies of SCIENCES • ENGINEERING • MEDICINE

CONSENSUS STUDY REPORT

NUTRIENT REQUIREMENTS OF DAIRY CATTLE

Eighth Revised Edition

ANIMAL NUTRITION SERIES

NFFS, which have been used to lessen both fNDF maintaining DMI and milk Dann et al., 2015). When peNDF is calculated by fraction of the diet over a threshold particle F of the entire diet, the resulting value will inany source of NDF, even if its physical effec-This problem could be solved by calculation the NDF concentration of the fractions above (e.g., what is retained on an 8-mm screen), Zebeli et al. (2012). Data have not been adthis time to evaluate this, be rapidly and routinely measured on farms. For the DM consumed is also affected by sorting, with excessive large particles, particularly in Leonardi and Armentano, 2003; Kmicikewycz For these reasons, peNDF should be considered range to target rather than a minimum that can without potential negative consequences.

ENDATIONS

the effective fiber concept was limited because and to establish requirements. Progress has that published research reporting the particle size dietary NDF needed for a robust implementation for estimating physical form adequacy mobination with other factors.

Detergent Fiber

recommended as a primary consideration for rather than total NDF because of a greater and a electronship with ruminal pH (Allen, 1997) and a relationship with DMI (Allen, 2000). The DIF likely varies from 15 to 19 percent of diet starch, and NDSC in the diet. The average effective value nonforage sources was set to 50 percent of that forage. For every 1 percentage unit decrease forage (as a percentage of dietary DM) below the recommended concentration of total NDF 2 percentage units, and maximum starch was The second are units (see Table 5-1). Data are needed whether concentrations of WSC and NDSF requirements. The minimum total NDF was set based on studies cited in the previous edition and comes with caveats (i.e., the forage was have adequate particle size, dry ground corn was ant starch source, and cows were fed a TMR). fNDF concentration of diets to maximize is higher than the minimum to reduce risk of

TABLE 5-1 Recommended Minimum Forage and Total NDF and Maximum Starch Concentration of Diets for Lactating Cows When a Diet Is Fed as a TMR, the Forage Has Adequate Particle Size, and Dry Ground Corn Is the Predominant Starch Source

Minimum fNDF	Minimum Total NDF	Maximum Starch
19	25	30
18	27	28
17	29	26
16	31	24
15	33	22

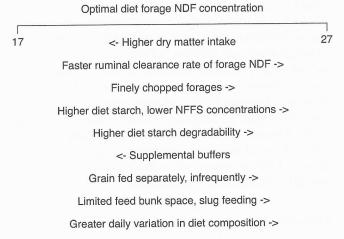


FIGURE 5-2 Factors affecting the optimal forage NDF concentration of diets for lactating cows. Clearance rate of forage NDF from the rumen is affected by rate of degradation, forage fragility, and rate of passage.

SOURCE: Adapted from Allen (1995).

acidosis. Optimal fNDF for lactating cows likely ranges from 17 to 27 percent of diet DM and is a function of milk yield and the cows' drive to eat as well as other factors shown in Figure 5-2. Less-filling diets will likely benefit cows with high milk yield with DMI limited by ruminal distention by allowing greater feed intake while maintaining rumen fill. However, the greater energy concentration of the diet might result in less rumen fill for cows with lower milk yield and DMI limited by metabolic mechanisms (Allen, 2000). The filling effect of fNDF is not constant but is affected by the initial size and fragility of forage particles, which affect ruminal retention time and formation of the rumen mat (Allen, 2000). The optimal fNDF concentration of diets also depends on diet fermentability (Allen, 1997), which is highly dependent on the concentration and fermentability of starch. At a given fNDF concentration, diet fermentability can be decreased by substituting grains (i.e., starch) with NFFS or by substituting sources of starch that are less fermentable such as dry ground corn for highmoisture corn, wheat, or barley. Diet fNDF concentration must increase when high percentages of highly fermentable starch