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NE and MP versus TDN – more complexity than value?

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This issue asks whether the added predictive value of net energy and metabolizable protein justifies their complexity under commercial beef conditions.

Total digestible nutrients (TDN) is often treated as a historical metric that modern beef nutrition has outgrown. Net energy (NE) and metabolizable protein (MP) unquestionably describe more of the biology. The question here is different: does that additional detail improve predictions of gain, feed efficiency, ration choice, or feeding cost enough to justify the extra information, assumptions, and effort required under commercial conditions?

TDN has a substantial scientific history, not merely the advantage of familiarity. It grew from 19th-century European work on proximate analysis and digestible nutrients and was consolidated in the United States in 1915 by Henry and Morrison in Feeds and Feeding. Decades of measurements, feed comparisons, and commercial experience followed. That body of work should not be dismissed simply because the metric is old. The fair comparison is not TDN versus MP, because TDN does not describe protein supply. It is the older TDN-plus-crude-protein approach versus formulation based on NE and MP. The purpose is not to declare a winner, but to ask whether complexity has earned its commercial place. That question deserves testing, not dismissal by either side. The answer must come from practical trials under commercial feeding conditions.

TDN was designed to be practical

TDN combines digestible crude protein, crude fiber, nitrogen-free extract, and digestible fat, with fat multiplied by 2.25. Its strength is transparency: it remains closely tied to measured digestibility, and ingredient values are readily compared and combined. Its limitations are also real. TDN does not adequately distinguish methane and urinary losses, heat increment, or differences in the efficiency with which absorbed energy supports maintenance and gain. Simplicity should therefore be counted as an advantage, but never mistaken for completeness.

NE added biology, but also assumptions

The California NE system published by Lofgreen and Garrett in 1968 was a genuine advance. It separated NEm from NEg because metabolizable energy is not used with equal efficiency for maintenance and gain. Yet many tabular NE values still begin with TDN and pass through DE and ME before reaching NEm and NEg. An alternative ME = DE – 0.39 Mcal/kg of dry matter has since been proposed for growing and finishing cattle. The issue is not that efficiency varies; NE was designed to represent that. The commercial concern is the uncertainty accumulated through the inputs and equations used to estimate it.

Protein became even more complicated
The MP system separates ruminally degraded protein, ruminally undegraded protein, microbial protein, intestinal digestibility, and absorbable supply. The biology is sound, but the inputs remain difficult to predict in cattle. One recent evaluation reported RUP estimates for the protein ingredients studied averaging 37% below NASEM values, although estimates for grains and roughages did not differ. Urea recycling is represented in some equations, but its prediction and integration remain incomplete. These uncertainties do not invalidate MP; they define the accuracy that must be actually delivered by the added detail.

TDN remains competitive for MP
NASEM 2016 predicts microbial crude protein largely from TDN or fat-free TDN intake. A recent comparison found similar accuracy and precision among the existing equation, newer equations, and the simple assumption that microbial crude protein equals approximately 10% of TDN intake; prediction error remained near 29% of mean supply. That finding does not prove that TDN predicts animal performance better than NE and MP. It does show that TDN remains competitive for this important rumen-level task.

Commercial value must be demonstrated
More biological detail is valuable when it changes a feeding decision. The test is whether it alters ingredient selection, protein supplementation, expected performance, or ration cost by enough to matter. Beef cattle retain less daily nutrients than a high-producing dairy cow exports in milk, but that difference alone does not prove that precision has little value. The proper question is empirical: under which commercial beef conditions does finer partitioning improve the final feed formulation decision, and by how much and at what cost?

Revisit TDN without turning back
The alternative is not a return to old TDN tables. TDN could be taken forward from its digestibility foundations using modern feed analyses, animal-response data, and direct commercial validation—not reconstructed backward from NE assumptions. The result should be compared with NE-plus-MP systems on both prediction and information cost.

In Brief, this is not an argument to discard NE and MP or revive old TDN unchanged. It asks whether a modernized, directly validated TDN system can retain simplicity while improving predictability—and the commercial decision made at the feed bunk.

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