Cattle Type	Fresh cow	High Cow	Low Cow	Far-Off Dry	Close-Up Dry	Replacement Heifer	Notes
DMI % Predicted	98-110%	98-112%	98-112%	98-102%	98-102%	95-105%	For lactating cows, DMI should be within the min/max expected range. Which end of the range depends upon the local roughage quality. The given range for lactating cows is a percent of the MIN expected. Values are for Large Breeds. For heifers, DMI depends upon the stage of growth. For small breeds, reduce by 15-20%
DMI kg/d	16.8 - 19.1	23.5 - 27.2	20.4 - 22.7	12.7 - 14.5	12.2 - 13.6	3.6 - 13.6	
DMI lbs/d	37-42	52-60	45-50	28-32	27-30	8 - 30	
peNDF %DM	22 - 25	22 - 25	22 - 25	22 - 35	22 - 35	22 - 35	With extremely high management, the min. can drop to 21.
rumen ammonia, %rqd	105 - 200	105 - 200	105 - 200	105 - 200	105 - 200	105 - 200	Peptides ideally would be >100%, but can drop to 85% and remain acceptable. Pasture based diets typically will be > 200% ammonia balance. While acceptable, reducing this may have cow health and repro benefits. NOTICE: we are talking about Ammonia as a limiting factor. Peptides are usually well in excess thus are not discussed.
MP from bacteria	>40%	>40%	>50%	>50%	>50%	>50%	Due to changes in the core biology (kps, kds, microbial yield, etc.), 6.1 biology yields much lower microbial mass then previous versions. On average, MP from bacteria has been reduced 10-15%, matching observed values much more closely.
Lactic Acid %DM	n/a	n/a	n/a	<3	<3	<3	Lactic acid levels over 4% have been shown to increase fat deposition in growing animals.
NFC %DM	35-40	35-40	35-40	<27	20 - 25	<37	
Sugar %DM	0 - 12	0 - 12	0 - 12	0 - 12	0 - 12	0 - 12	Sugar, Starch and Sugar + Starch Levels are highly dependent upon local conditions. In places where starch is readily available, diets will rely more on starch for NFC sources vs. locations where sugar and soluble fiber sources are more available and economically feasible. Thus, a global recommendation is difficult. Regardless, a mix of NFC sources is better then sole source to offer a mixed release rate of NFC in the rumen.
Starch %DM	20 - 30	20 - 30	20 - 30	<25	<25	15-25	
Sugar + Starch %DM	25 - 35	25 - 35	25 - 35	15-27	15-27	15-27	
EE % DM	2 - 4.5	3.5 - 6.0	3.5 - 4.5	<4	<4	<4	While fats are an excellent energy source, overfeeding fats can reduce diet digestibility. Typically, once diets exceed 5.5% fat (DM basis), by-pass fats are preferred. However, in diets borderline on peNDF (<21%), higher NFC (>40), and pasture diets, Unsataturated FA levels should be tracked. In these situations, UFA levels >500 g/d have been shown to reduce milk fat via increased CLA production (or basal feed levels in the case of pasture). The presence of monensin can magnify this problem and can reduce milk fat to below 2.7% quickly.
Total Unsaturate FA g/d intake	<500	<500	<500	n/a	n/a	n/a	
roughage % of diet	45-85	45-85	45-85	>60	>60	>60	Roughage levels are dependent upon on-farm roughage availability and quality. Lower levels can be fed as long as diet peNDF levels are maintained.
roughage NDF % BW	0.80 - 1.00	0.80 - 1.00	0.80 - 1.00	0.80 - 1.00	0.80 - 1.00	0.80 - 1.00	While not a requirement, Roughage NDF as a percent of body weight is an excellent value to track to determine if roughage levels are adequate and roughage quality. Lower roughage quality (higher NDF) will result in higher % BW values. Diets <0.80% can safely increase roughage levels (slowly--1-2 point increase in roughage levels every two to three weeks). Additionally, pasture based diets (with no additional roughage fed) typically will be 1.1 - 1.4 roughage NDF % Body weight. We have also seen that total DMI improves in pre-fresh cows fed higher forage NDF% BW levels (0.85 - 0.95%). Targeting lower quality roughages to heifers also allows them to eat to fill and we have observed lower fat deposition while maintaining desired ADG.
ME % Required	95-100	98 - 102	100 - 105	100 - 105	100 - 105	100 - 105	Maintaining these ME balances will ensure minimal BCS change. With Pre-Fresh cattle, it is critical to maintain a positive energy balance to minimize fresh cow disorders.
MP % Required	100 - 105	100 - 105	100 - 105	100 - 105	100 - 105	100 - 105	Early lactation cows tend to be MP limited. Thus, do not short these cows. Additionally, with replacement heifers, ensure that MP gain > ME gain else excess fat deposition will occur. Try to keep MP gain 100-250 g greater than ME gain.
Fat Digestibility	See note-->						6.1 biology calculates a fat digestibility based upon the fatty acid composition of the feed and fatty acid digestibility coefficients developed by Adam Lock et. al. Instead of a set 95% as was v5, new values will range from the low 60s to mid-80s. This reduces ME supply. Diet NE values, while still shown, are further complicated if a high fat (>50% fat content) product is fed as the efficiency of use is different for these fats. The next release of AMTS software will no longer report NE values following the lead of Cornell with CNCPS6.1
days to change BCS	>80	>100	>100	>100	>100	>100	If ME balance is >0, then this is days to increase one score. If ME balance <0, then it is days to lose one score.
MP % microbial	>45	>45	>45	>45	>45	>45	This goal has been adjusted to represent the updated biology in the core model. Previously, >50% was the goal. It is very difficult to meet >50% as microbial yield has been reduced in the core biological model.
MUN, mg/dl	8 - 14	8 - 14	8 - 14	n/a	n/a	n/a	
Productive:Urinary N	> 1:1	> 1:1	> 1:1	> 1:1	> 1:1	> 1:1	This is a new tracking value to determine the efficiency of N utilization. Most diets will be 0.65:1 or slightly higher. Achieving 1:1 is a major step towards increasing N efficiency. Research has shown that excess N is excreted via urine, thus, either reducing N intake or improving N utilization by the animal will result in reducing urinary N. Given that urinary N is highly volatile and leachable, reducing urinary N can improve air and water quality.
LYS and MET, % rqd	>100	>100	>100	>100	>100	>100	Amino acid values should be viewed as three different criteria. First, LYS and MET should be >100% of factorial requirements, regardless of the ratios. Additionally, AAs should only be evaluated when MP balance is >0. This ensures adequate supply of other EAA and NEAA. Ratio (%MP) values for non-lactating cattle are based upon experience and tissue amino acid composition. They are general guidelines only. For lactating cattle, the use of the ratios is dependent upon how milk is priced. Under component pricing, increasing LYS and MET as a % MP will generally increase milk volume and milk protein. If milk is priced strictly on volume, MET supplementation is NOT economically feasible. Generally, LYS increasing LYS %MP will improve total milk yield. Under component pricing, if LYS %MP <6.5, milk protein response to additional MET will NOT occur.
LYS % MP	>6.3	>6.3	>6.3	>6.0	>6.0	>6.0	
MET % MP	>2.2	>2.2	>2.2	>1.9	>1.9	>1.9	
LYS:MET	2.8 - 2.95 :1	2.8 - 2.95 :1	2.8 - 2.95 :1	n/a	n/a	n/a	
CHO C, %DM	<10	<10	<10	<10	<10	<10	Again, this is based upon observations globally. It appears that diets >10% CHO C reduce DMI.
DCAD, meq/kg	?	?	?	n/a	<100	n/a	Limited data suggests that lactating cows should have DCADs >300 but no clear recommendations can be made. Pre-fresh DCAD balance is dictated by dietary K (%DM). If pre-fresh diets contain >1.2% K, reducing DCAD will reduce milk fever incidence.
Anionic salts and Ca (g/d) intake levels	n/a	n/a	n/a	n/a	<60 or >180	n/a	A metaanalysis from Australia (published in Journal of Dairy Science) has shown that clinical and sub-clinical milk fever can be minimized in diets very low in Ca (<60 g intake) or very high (>180 g/d intake). Milk fever incidence was MAXIMUM when Ca intake was between 100 and 120 g/d. There is no global recommendation, however, it may be safer to control high Ca intakes with DCAD balances near zero or negative (however, total DMI could also be depressed). We have found that both styles (low and high Ca levels) work when DCAD is 0 - 100 and prefer the low Ca intakes (52-60 g/d)
Acceptable ADGs, g/d (lbs/d)	0 - 125 (0 - 0.27)	0 - 200 (0 - 0.44)	0 - 200 (0 - 0.44)	0 -100 (0 - 0.22)	0 -100 (0 - 0.22)	125 - 1,250 (0.27 - 2.75)	Younger cows (first lactation) may require up to 200 g/d ADG to meet the target weight of the second lactation. Regardless, in mixed groups, inputting 100 g/d ADG should cover most gain requirements and provides a small safety factor in ration formulation. In the pre-fresh and fresh cow (-21 to +21 d calving), mammogenesis is added in the model (1 Mcal NE and 80 g Net Protein) to the growth requirement. Heifer gains are dependent upon: breed, age of first calving, and stage of growth. As a reminder, MP gain should > ME gain for heifers in ensure frame growth. Gains shown here are body gain only and do not include the ADG of the conceptus.
target BCS at various stages	2.75 - 3.00	2.75 - 3.00	3.00 - 3.25	3.00 - 3.25	3.00 - 3.25	3.00 - 3.25	1 - 5 scale.
Feed efficiency	>1.7	>1.65	>1.4	n/a	n/a	5 - 7 :1 (G:F)	Feed efficiency values should only be used to track WITHIN herd over time. Generally, these values are shaky due to differences in feeding management. We really don't like looking at Feed Efficiency. For lactating cows, the values are MILK:DMI. For heifers, they are DMI:ADG.

Max inclusion rates of (% diet DM):	Applicable to all	
Maize (Corn), Barley	40	excessive starch
Total Silages	80	Acid load and total intake may be limited on ration DM
Urea	1	unpalatable and rapidly degraded
Whole Cottonseed	15	high fat and prone to mycotoxins and must watch gosypol levels at higher intakes
Fish Meal	2	unpalatable and can be high PUFA
Gluten 20	25	low starch and low LYS and low peNDF
Gluten 60	5	Low LYS
Brewers Grains	25	Palatability and fats
Raw Soybeans	9	High fat, difficult to handle, rancidity post grinding
Roasted Soybeans	12	High fat
Animal fats	2	Palatability and fats
Distillers Grains	25	Variability, low LYS and low peNDF
other by-products	25	Variability, low LYS and low peNDF