

A7 Appendix 7: Use Biomass Rule

To provide an alternative conversion from the grid currency of potential energy intake rate into actual biomass consumed, a contingency rule was developed that could operate under low levels of resource grid heterogeneity. It also needed to be independent of energy intake rate. The solution was to redefine the grid currency in terms of forage biomass by simply allocating a portion of a cell's forage biomass for consumption if there was insufficient grid heterogeneity. This contingency conversion mechanism was called the "Use Biomass Rule", or *UBRule* for short.

To ensure that the *UBRule* would not unduly bias model performance, a sensitivity analysis using 100 day long simulations was carried out to investigate the elasticity of the threshold parameter for CV of grid heterogeneity (h) and the parameter for the fraction of biomass consumed (n).

To test the effect of the *UBRule* on dry matter intake moderated by digestive constraints, comparisons were made of model response using the ratio between daily intake and predicted intake for the herd as a measure of foraging efficiency (Table A7.1). To test the effect of the *UBRule* on metabolic energy intake moderated by metabolic constraints, comparisons were made of model response using the ratio between daily metabolic energy intake and predicted metabolic energy intake for the herd as a measure of foraging efficiency (Table A7.2). Both tables show that foraging efficiency is unaffected (highest values) for $h \geq 1\%$ and maximal n. The *UBRule* was implemented using $h = 1\%$ and $n = 50\%$.

h%	n%				
	0	0.01	1	10	50
0	0.952*	0.952	0.952	0.952	0.952
0.01	0.952	0.859	0.989	0.993	0.992
1	0.952	0.247	0.985	1.000	1.000
10	0.952	0.201	0.983	0.999	1.000
50	0.952	0.200	0.987	1.000	1.000

* Equation 3.8 conversion factor exclusive

Table A7.1: Effect of *UBRule* parameters on foraging efficiency of dry matter intake. The *UBRule* was inactive for $h=0$ and $n=0$. The *UBRule* was exclusive for $h=0$ (shaded).

h%	n%				
	0	0.01	1	10	50
0	0.208*	0.208	0.208	0.208	0.208
0.01	0.208	0.149	0.232	0.241	0.248
1	0.208	0.021	0.222	0.251	0.271
10	0.208	0.013	0.217	0.246	0.270
50	0.208	0.013	0.220	0.248	0.272

* Equation 3.8 conversion factor exclusive

Table A7.2: Effect of *UBRule* parameters on foraging efficiency of metabolic energy intake. The *UBRule* was inactive for $h=0$ and $n=0$. The *UBRule* was exclusive for $h=0$ (shaded).