

SUPPLEMENTAL INFORMATION***Diet Rations Summary***

The Langhill cows used in the calibration dataset are part of a long term (approaching 50 years) selection experiment with a general high vs low energy diet overlaid in a 2*2 design (introduced in the 1980s). Over the time period that data were extracted from the Langhill database (2005 – 2018) the diets used in the GXE experiment were altered. Diets were changed from a Low vs. High Forage (LF, HF) system to a By-products vs. Home-grown (BP, HG) system in 2011. Following this, in 2016, diets were further altered to a High vs Standard Energy (HE, SE) system.

For the LF-HF system there was an energy differential between the two; this was kept at around 12.3-12.5 MJ/kg DM for the LF and 1 MJ lower per kg DM for HF. For the BP-HG system the target energy was 12 MJ/kg DM and 11.8 MJ/kg DM for BP and HG, respectively. Finally, the target energy for the current system is 12.5 MJ/kg DM and 11.9 MJ/kg DM for HE and SE, respectively.

Supplemental Table S1. Food Analysis. Average values of the 6 diets fed to cows between 2005 and 2018.

Diet	DM	CP	OM	NDF	Sugar	Starch	ME
LF	399.93	180.37	924.40	358.86	38.29	157.87	11.71
HF	328.94	168.56	919.60	436.67	21.95	92.02	10.80
BP	498.31	177.76	924.88	403.63	32.28	99.46	10.96
HG	333.45	144.06	924.22	361.70	26.39	168.54	11.90
HE	399.75	180.50	929.35	328.60	55.75	163.42	12.53
SE	319.15	179.15	918.10	378.95	48.55	103.84	11.88

DM = Dry matter

CP = Crude protein

OM = Organic matter

NDF = Neutral Detergent Fibre

ME = Metabolizable energy