0570 Predicting dry matter intake by growing and finishing beef cattle: evaluation of current methods and equation development. U. Y. Anele*[1], E. M. Domby[2] and M. L. Galyean[3], *[1]Lethbridge Research Centre, Agriculture and Agri-Food Canada, AB, [2]Cargill Animal Nutrition, Amarillo, TX, [3]Texas Tech University, Lubbock.*

The NRC (1996) equation for predicting DMI by growing-finishing beef cattle, which is based on dietary NEm concentration and average $BW^{0.75}$, has been reported to over- and underpredict DMI depending on dietary and animal conditions. Our objectives were to: 1) develop more robust equations for predicting DMI from BW and dietary NEm concentration; and 2) evaluate the use of NE requirements and dietary NE concentrations to determine the DMI required (DMIR) by feedlot cattle. Two DMI prediction equations were developed from a literature data set that covered a wide range of dietary NEm concentrations, which represented treatment means from published experiments from 1980 to 2011. Predicted DMI from the two equations, which were based on NEm concentration and either the ending BW for a feeding period or the DMI per unit of average BW (End BW and DMI/BW, respectively), accounted for 61 and 58% of the variation in observed DMI, respectively, vs. 48% for the 1996 NRC equation. When validated with four independent data sets that included 7751 pen and individual observations of DMI by animals of varying BW and feeding periods of varying length, DMI predicted by the 1996 NRC equation, the End BW and DMI/BW equations, and the DMIR method accounted for 13.1 to 82.9% of the variation in observed DMI, with higher r^2 values for two feedlot pen data sets and lower values for pen and individual data sets that included animals on lower-energy, growing diets, as well as those in feedlot settings. The DMIR method yielded the greatest r^2 values and least prediction errors across the four data sets, but mean biases ($P < 0.01$) were evident for all the equations, ranging from as high as 1.01 kg for the DMIR method to -1.03 kg for the 1996 NRC equation. Negative linear bias was evident in virtually all cases, suggesting that prediction errors changed as DMI increased. Despite an expanded literature database for equation development, other than a trend for lower standard errors of prediction with the DMI/BW equation, the two new equations did not offer major advantages over the 1996 NRC equation when applied to the validation data sets. The DMIR method accounted for the greatest percentage of variation in observed DMI and had the least RMSE values in all data sets evaluated, indicating that this approach should be considered as a means of predicting DMI.

Key Words: beef cattle, dry matter intake prediction, feed intake

0571 Optimizing concurrently dairy farm profitability and environmental performance. D. Liang* and V. Cabrera, *University of Wisconsin, Madison.*

The objective of this analysis was to assess economic and environmental impacts of a dairy farm milk production using the Integrated Farm System Model (IFSM, version 4.0, University Park, PA). The IFSM was applied to integrate crop growth, feed storage, machinery usage, and herd management to simulate the highest possible milk production with the available on-farm resources and purchased feed. A representative Wisconsin dairy farm system was defined as a typical farm with 100 milking cows and 247 acres of cropland. Farm performance was then simulated using 25 yr of daily weather data (1986 to 2010). A sensitivity analysis was conducted by increasing the input target milk production starting at 9837 kg/cow per yr. The fat-protein-corrected milk production (FPCM) increased linearly as the target milk production was increased to 10,457 kg/cow per yr. Followed, the FPCM increased nonlinearly (at a decreasing rate) until the target milk production was increased to 10,980 kg/cow per yr. Thereafter, FPCM remained flat regardless of higher target milk production input. The per-kg FPCM net return ($/kg FPCM) showed a similar trend, increasing from $4.08 ± 2.32 to $6.20 ± 2.19, and then to $6.78 ± 2.18, respectively. Given the farm carbon footprint (kg CO_2eq/kg FPCM) as the result of dividing the net greenhouse gas emission (including methane, nitrous oxide, and carbon dioxide) by the FPCM, it decreased from 0.69 ± 0.04, to 0.67 ± 0.04, and then to 0.65 ± 0.04, respectively, as the FPCM and the net return increased. We concluded that increasing productivity using only farm available resources would elevate the net return and decrease carbon footprint at the same time. Further research is required to explore management strategies that determine increased productivity within farm-specific conditions.

Key Words: whole-farm simulation model, farm profit, greenhouse gas emission

Table 0571.

Input target milk production (kg/cow per yr)	Simulated actual milk production (kg/cow per yr)	Fat-protein-corrected milk production (FPCM; kg/cow per yr)	Net return per kg of FPCM (FPCM; $/kg FPCM)	Carbon footprint (kg CO2 eq/kg FPCM)
9834	9834 ± 0.00	9079 ± 0.00	4.80 ± 2.32	0.69 ± 0.04
10,457	10,455 ± 9.54	9652 ± 9.54	6.20 ± 2.19	0.67 ± 0.04
10,980	10,748 ± 96.82	9922 ± 89.54	6.78 ± 2.18	0.65 ± 0.04
11,457	10,746 ± 87.27	9921 ± 80.45	6.78 ± 2.15	0.65 ± 0.04