**3c. Manure Loading**

If manure is applied to the crop, additional energy is required to load the material onto the equipment used to spread the product. No embodied energy is accounted for when manure is used as a fertilizer; however, the nitrogen content of the manure is important to account for as part of total N in the nitrous oxide component of the GHG metric. This is described in the GHG metric documentation.

Not all users will enter manure application. Manure is a possible data entry for all crops and is more likely for alfalfa and corn silage crops, or crops grown on an integrated crop/livestock operation.

REVISION NOTES: Edited 5-9-2018 to include semi-solid as a manure type option (Allison Thomson)

Edited 5-16-2018 to correct a type in the last example calculation (Allison Thomson)

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| **User Inputs:** |
| Yield *(Y)* |
| Manure Application Rate *(MART),* in pounds (solid; semi-solid) or gallons (liquid/slurry) per acre |
| Manure type (liquid, slurry, solid) |
| **Additional info needed:** |
| Manure loading energy use = .1285 gal diesel/cubic meter manure loaded (FTM assumption) |
| BTU/gal diesel *(BGD)*= 138,490 from Table 1 |
| Weight of manure in pounds (lbs) per cubic meter = 2203 lbs per cubic meter (MW) |
| Liquid manure water density = 8.34 lb/gal (MWD) |

In the current system, the user selects a range of weight of manure applied and the type of manure. Use the midpoint of MART range selected by grower in the energy calculation (e.g. 4,000 – 6,000 lbs selected, use 5,000). If the type is liquid or slurry, the weight needs to be adjusted by the water density factor (MWD).

**Calculation**: Manure loading energy is the application rate divided by the weight of manure, multiplied by the energy required in BTU.

Step 1: If type is liquid or slurry, first adjust the application rate for water content: MARTadj = MART (gal/ac)\*MWD (lb/gal) = lbs/acre

Step 2: Manure loading energy (**MLE**) = (Manure application rate (MART) / weight of manure) \* (Manure loading energy use \* BTU/gal diesel)

**Example #1 Solid manure**

A grower was able to grow 200 bu/acre corn on his or her field after applying 3,000 lbs./acre of solid manure on the field. How much energy was spent in BTU per bushel of corn?

Manure loading energy (**MLE**) = (3000/2203) \* (.1285\*138,490)

=24,234 BTU/acre

**MLEy** = MLE/Y = 121 BTU/bu

**Example #2** **Liquid manure**

A grower was able to grow 200 bu/acre corn on his or her field after applying 800 gallons per acre of liquid manure on the field. How much energy was spent in BTU per bushel of corn?

**MARTadj** = 800\*8.34 = 6672 lbs/acre

Manure loading energy (**MLE**) = (6672/2203) \* (.1285\*138,490)

=53,896 BTU/acre

**MLEy** = MLE/Y = 269 BTU/bu