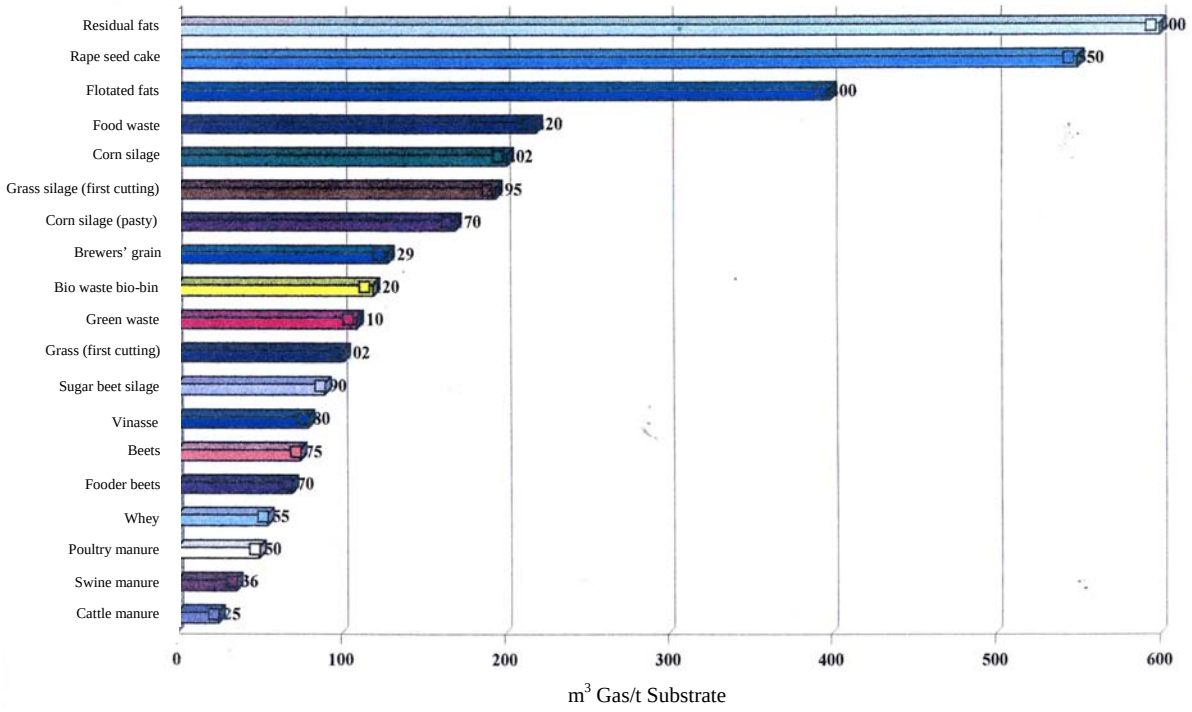
WHY MIX FEEDSTOCKS?

Studies have indicated that the use of a variety of feedstocks in a digester will enhance energy production. This results not only in stabilization and better nutrient utilization for a variety of agricultural byproducts but also increased biogas production. Biogas is produced when volatile solids are used by fermenting bacteria to produce organic acids and hydrogen – compounds that are "food" for methanogens to produce methane. It therefore stands to reason that digesters should receive feedstocks high in volatile solids for maximum biogas production. Figure 2-2.1 points out that feedstocks vary in their potential to produce biogas. Fats, which are high in volatile solids, generate the greatest biogas while manures, by comparison, generate the lowest.

Figure 2-2.1 Biogas Yield of Different Feedstocks[1]



A study conducted in Europe found that diet, performance and age influence methane yields from cattle manure. For example, manure from heifers has higher methane production potential than older cattle. Methane production potential varied in manure from dairy cattle with contrasting milk yields and feed rations. The highest methane yield came from dairy cows fed a well balanced diet producing a medium volume of milk.[2]

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[1] Lusk, Philip D (2005). Establishing Credibility. PowerPoint presentation given at Fifth Annual BioCycle Conference on Renewable Energy From Organics Recycling, September 2005, Madison, Wisconsin. http://www.jgpress.com/Energy05/Lusk_T.pdf

[2] Kryvoruchko, V., Amon T., Amon B., Gruber L., Schreiner M., and Zolitsch W. (Date unknown). Influence of nutrient composition on methane production from animal manures and co-digestion with maize and glycerine. http://www.nas.boku.ac.at/fileadmin/_/H93/H931/AmonPublikationen/Influence_of_nutrient_composition_on_methane_production_from.pdf

Co-digestion means processing different streams of agricultural feedstocks in an anaerobic digestion facility. Most anaerobic digesters in the agriculture industry handle a single feedstock, primarily manure and wasted feed. The European study referenced in the preceding paragraph noted that the addition of 3 to 6 percent glycerin to a mixture of swine manure and energy crops resulted in the highest methane yield. Given that the biogas yield for various manures in Table 2-2.1 is the lowest as compared to other feedstocks, this suggests that mixing feedstocks with manure (co-digestion) is needed to increase biogas production and therefore would greatly improve the profitability of an anaerobic digester.

Vegetable fats and oils, such as cooking oils, are readily decomposed in anaerobic digesters, but mineral oils such as fuel oil, automotive oils and greases, and paraffin will cause toxicity problems. Long-chain fatty acids can also inhibit bacterial growth and methanogenesis[3].

Materials, such as plastics, wood chunks, and metals, cannot be used as food and remain unchanged in the digester.

[3] Angelidaki, I. & Ahring, B.K. (1992): Effects of free long-chain fatty acids on thermophilic anaerobic digestion. Appl. Microbiol. Biotechnol. 37, 808-812.