Soil organic matter is the largest carbon pool in most ecosystems, and CO2 fluxes from microbial breakdown of SOM are a major portion of the global C budget. However, this flux is difficult to quantify because although soil CO2 flux is easily measured, it comes partly from breakdown of stored SOM by microbes ("heterotrophic respiration") and partly from respiration of recently-fixed C by plant roots ("autotrophic respiration") (Kuzyakov, 2006). In agricultural settings, one approach to partition these fluxes is to exploit the isotopic differences between C3 and C4 plants (Dawson et al. 2002). The soils at the Energy Farm were formed under a mixed C3/C4 prairie, and have more been recently managed under a corn/soy rotation scheme, resulting in SOM with approximately equal C3 and C4 origins and a δ13C of approximately -17‰ (relative to the PDB standard). Maize, *Miscanthus* and switchgrass are all typical C4 grasses with root δ13C of -12 to -13‰. The prairie mix is more variable but root mass is apparently C3-dominated, with δ13C of about -22‰. This 5‰ difference between soil and root in each crop allows us to use a vacuum-flask sampling method similar to that used by Trueman and Gonzalez-Meler (2005) to obtain the δ13C of respired CO2, then use a two-member mixing model (Phillips and Gregg 2001) to quantify measurement uncertainties and assess what fraction of the respired CO2 originates from SOM.

Dawson TE, Mambelli S, Plamboeck AH, Templer PH, Tu KP. Stable isotopes in plant ecology. Annual Review of Ecology and Systematics (2002) vol. 33 (1) pp. 507-559

Kuzyakov Y. Sources of CO2 efflux from soil and review of partitioning methods. Soil Biology & Biochemistry (2006) vol. 38 (3) pp. 425-448

Phillips DL and Gregg JW. Uncertainty in source partitioning using stable isotopes. Oecologia (2001) vol. 127 (2) pp. 171-179

Trueman RJ and Gonzalez-Meler MA. Accelerated belowground C cycling in a managed agriforest ecosystem exposed to elevated carbon dioxide concentrations. Global Change Biology (2005) vol. 11 (8) pp. 1258-1271