Carbon Balance of No-Till Soybean with Winter Wheat Cover Crop in the Southeastern United States.

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The southeast is an important agricultural region in the U.S. and key component of the continental carbon budget. Croplands in the region store a substantial amount of soil organic carbon (C). However, their C sink status may be altered under the projected changes in precipitation pattern for the region. The study was conducted at Winfred Thomas Agricultural Research Station, Hazel Green, Alabama (2007-2009). We investigated the seasonal and interannual variation in net ecosystem exchange of CO_2 (NEE) of winter wheat (Tricticum aestivum) and soybean (Glycine max) using the eddy covariance method. Annual C balance ranged from the highest source in 2007 (NEE = 100 g C m-2 y-1) to sink (-20 g C m-2 y-1) in 2009. Annual ecosystem respiration (Re) ranged between 750 and 1013 g C m-2 y-1, while gross ecosystem productivity (GEP) was 650-1034 g C m-2 y-1. Seasonal NEE for soybean ranged between 42 and -66 g C m-2. Stronger winter wheat NEE (-80.0, -80.4, -40.0 g C m-2 for 2007, 2008 and 2009) than soybean suggested the importance of winter C uptakes offsetting summer C losses. Re was controlled by air temperature, and it varied between 286 and 542 g C m-2 for soybean, and between 160 and 313 g C m-2 for winter wheat. Precipitation was key determinant of C balance implying larger C release during drought periods. During fallow months, the site was C source. If we include removal of grain off site, this system could become a C source under all conditions.