Geophysical Research Abstracts
Vol. 13, EGU2011-9491, 2011
EGU General Assembly 2011

Assessment of the carbon balance of conventional and no-tillage cropland in Central Italy

Raffaele Casa (1), Luca Belelli Marchesini (2), Dario Papale (2), Francesco Mazzenga (2), Paolo Stefani (2), Nicola Arriga (2), and Riccardo Valentini (2)

(1) Department of Crop Production, University of Tuscia, Italy (rcasa@unitus.it), (2) Department of Forest Environment and Resources (Di.S.A.F.Ri.), University of Tuscia, Italy

In order to clarify the effect of drivers such as climate and management, in the wider context of regional scale assessment of the greenhouse gas (GHG) budget of agro-ecosystems, more information on the carbon balance of a wide range of cropping systems is needed. The adoption of no-tillage or the cultivation of biofuel crops are among the options that have been suggested as a means for decreasing cropland GHG emissions. Many studies have investigated the GHG balance of these two options in different agroclimatic conditions, though mostly not in Mediterranean areas.
For these reasons, a paired experimental comparison of the C balance of conventional and no-tillage biofuel crops has been established in Central Italy since 2007 as part of the Carboitaly project.
Two adjacent fields, each having approximately an area of 15 ha, located in the Roccarespampani farm near Viterbo, were selected. One of the fields was managed conventionally using mouldboard ploughing and disk harrowing (TILL), while the other was managed as a no-tillage (NT) system. The climate of the site is Mediterranean temperate with a mean yearly temperature of 15.5 and rainfall of 876 mm, with warm dry summers. The soil has a clay loam texture with an average 10 g kg-1 organic C in the 0-30 cm layer.
At the centre of each field an eddy covariance (EC) system was installed since October 2007, complemented by soil moisture and temperature sensors.
In the 2007-2008 season a winter oilseed rape crop was grown and sunflower followed in 2009.
Leaf area index (LAI) and crop and weeds ground cover and above ground biomass were periodically monitored. A specific sampling of root biomass was carried out at flowering stage of rapeseed up to a soil depth of 1.6 m. C and N content of plant samples was determined. Soil respiration and soil organic content and bulk density were also measured occasionally.
The present contribution reports the results of the measurements of the different terms of the C balance for the TILL and NT fields covering the rapeseed growth cycle and the following fallow period until the beginning of the sunflower growth season.
There were marked differences in terms of crop growth between the two adjacent NT and TILL fields, with delayed crop establishment in the NT that resulted in a smaller biomass and LAI than TILL, for the first part of the growth season. Subsequently, the NT crop cached up with the one in the TILL field and achieved similar final yield. These differences in crop growth influenced C fluxes, with the TILL field having larger GPP values (C sink) than the NT during the crop growth periods. Conversely during the fallow periods, NEE was generally more positive (C source) for the TILL than for the NT field, in which weeds and crop re-growth had some influence on the C fluxes.