Geophysical Research Abstracts,
Vol. 11, EGU2009-11454-1, 2009
EGU General Assembly 2009

Conservation tillage practices for water conservation in the Chinese loess plateau

W.M. Cornelis (1), K. Jin (2), H.J. Wu (2), J.J. Lu (3), Y.Q. Yao (3), W. Schiettecatte (1), D.X. Cai (2), and D. Gabriels (1)

(1) Dept. Soil Management, Ghent University, Ghent, Belgium (wim.cornelis@UGent.be), (2) Soil and Fertilizer Institute, Chinese Academy of Agricultural Sciences, Beijing, PR China, (3) Luoyang Academy of Agricultural Sciences, Luoyang, PR China

Soil erosion by water is a severe problem in the eastern loess belt of northern China and is to a large extent associated with inappropriate farming practices including excessive tillage operations and routinely removing crop residue. Introduction of conservation tillage practices has been widely proved to reduce soil loss. However, they also affect the amount of water available for crop growth, which is of particular interest in rainfed farming systems in drylands.

A field study was carried out from 1999 till 2005 on a slope field in the dryland part of the Chinese Loess Plateau to evaluate the impact of five soil tillage practices on water conservation and crop yield of winter wheat (October till May). These tillage practices included conventional tillage (CT), no tillage (NT), subsoiling (SS), reduced tillage (RT), and an additional summer crop (peanuts) as cover crop (two-crop system, TC).

The annual precipitation within the study period varied between 387 and 1188 mm, which are both very extreme values for the area. From 1971 till 1999 the annual precipitation was about 700 mm and evaporation was about 1550 mm. The area is further characterized by very intensive rainstorms in summer (June-September), which coincides with the fallow period, and a dry season with generally less than 30 mm ranging from November till April. The soil texture at the experimental field station was silty loam.

It was shown that the effect of conservation tillage compared to conventional tillage was most pronounced during the driest and normal years. During those years, SS was the best practice in terms of conservation of water and crop yield. It showed the highest increase in water storage during the fallow period, and the highest yields, water use efficiencies (WUE) and precipitation use efficiencies (PUE). NT also showed relatively good results, followed by CT and RT. Differences between NT, CT and RT practices were not always significant over the whole study period. In the extremely wet year, no significant differences in WUE and PUE were found between NT, CT, RT ánd SS, although the latter showed a slightly higher, but significantly different, yield. During that wet year, increase in water storage at the end of the fallow period was highest for CT. A special case is the TC system. Although it performed worse when considering yields of winter wheat, it has the additional advantage that an additional crop can be harvested. When both yield of winter wheat and peanuts were taken into account, TC showed the highest overall PUE values in the three years with relative high precipitation during the fallow period (which coincides with the growing period of peanuts). In those year total TC yield (winter wheat + peanuts) was also highest compared to the other practices. In the three other years, yield of winter wheat in SS was higher than the total yield of winter wheat and peanuts in TC.