Geophysical Research Abstracts
Vol. 21, EGU2019-19006, 2019
EGU General Assembly 2019

Why soils are losing C after grazing abandonment? Effects of traditional pastoral activity on soil biochemical properties

Olga Gavrichkova (1,3), Gaia Pretto (1,4), Andrea Scartazza (1), Tommaso Chiti (2), Michele Mattioni (1), Maria Cristina Moscatelli (2), Roberto Pini (1), and Carlo Calfapietra (1)

(1) Research Institute on Terrestrial Ecosystems, National Research Council, office of Porano, Montelibretti and Pisa, Italy, (2) Department for Innovation in Biological, Agrofood and Forest Systems, University of Tuscia, Viterbo, Italy, (3) Agro-Technology Institute, Peoples Friendship University of Russia, Moscow, Russian Federation, (4) Department of Environmental Biology, Sapienza University, Rome, Italy

Alpine grasslands are the products of thousands of years of interaction between human activity and mountain harsh environmental conditions. Together, they inhibit development of woody vegetation, promoting meadow communities and short life cycles. Current trend in the land use in Italy is characterized by an intensification of the agricultural practices in the lowlands and abandonment of traditional pastoral activities in the mountains. According to the scientific literature, the last results in the loss of C from soil at least in the first decades after the pasture conversion to other land use types or complete abandonment.

In this study we attempted to unravel the causes of soil C depletion with grazing abandonment. The study site, Brocon, is a mountain alpine grassland located 1700 m above the sea level in the eastern Alps (Cinte Tesino, Italy). The site is historically used for the summer cattle grazing, *alpeggio*. Here, the local farmers apply different management regimes: short and more intensive grazing; long and less intensive grazing; and no grazing, where a portion of pasture has been fenced from cattle since 2002.

Soil and all plant species were sampled in the end of July in managed and abandoned plots. Diversity of plant species was assessed through Shannon and Simpson indices and species richness. Soil quality was evaluated by analyses of the following biochemical parameters: enzymes involved in C, N, S and P cycles, microbial C and N, microbial basal respiration and ecophysiological quotients: $q$mic, $q\mathrm{CO}_2$ and qN. Microbial functional diversity was assessed by means of Shannon index. Plant and soil samples were analyzed for their δ^{13}C and δ^{15}N in order to quantify changes in nutritional status, water and carbon use efficiency. Changes in soil structure were evaluated by means of aggregate stability and size distribution.

The results demonstrated considerable changes in plant nutritional status and plant species richness with loss of numerous plant species in plots excluded from grazing. Changes in ecosystem C and N cycles were confirmed at the soil biochemical level. 15 years of grazing abandonment resulted in the deterioration of the soil chemical and physical properties with ongoing and future tendency to loss of C from the system. Lowering of the labile C inputs combined with soil acidification affected negatively the microbial biomass pool in abandoned plots. On one hand, it slackened the biochemical cycles, on the other hand, it shifted microbial community to decomposition of older and more protected SOM. Impoverishment of the area and accumulation of the nitrogenous forms favored the development of nitrophilous and synanthropic species, not allowing for more demanding plant species to colonize the area. Prolonged and less intensive grazing appeared to be the most appropriate management practice for both, vegetation compartment and soil.