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Changes in the microbial properties along succession from semi-natural mountain meadows to forest.

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Land use changes could affect soil properties such as organic carbon stocks (C stocks). The international policy agendas suggest increasing the forest area in the context of carbon sequestration. However, in some places, changing meadows into forest is not recommended. Such places are semi-natural meadows in mountain areas that are characterized by a high biodiversity. Extensive use is necessary to maintain diversity and promote the ecosystem service of mountains meadows.

The presented paper addresses the influence of succession from meadows to succession (25 years old forest) to forest on selected soil properties. The study aimed to answer the following questions: Does soil microbial activity (microbial carbon biomass (MBC) and dehydrogenases activity (DHA)) change during succession? Does succession cause changes in soil physical properties (such as porosity (P), soil bulk density (BD), macro-, meso- and micropores)? Where are the higher C stocks, in meadows, succession, or forest?

The research area was in Pieniny National Park in southern Poland. Three research areas, each containing old forest, young forest (succession) and semi-natural meadows, were investigated. Samples was taken in each area from two layers, at 0-10-cm and 10-20-cm. Selected soil biological, chemical and physical properties were tested.

The soil was silt or silty clay with pH ranging from 3.6 to 5.6. Investigated soil in the top layer (0-20-cm) stored from 39.4 to 63.7 t ha^{-1} organic carbon. Overall, the results indicated that soil properties such as pH, C stocks, microbial activity (MBC, DHA), and soil porosity are not significantly different between meadows, succession and forest. Nevertheless, when we took into consideration variables connected with microbial properties (DHA and MBC) and placed them into ordination space, we found that the 10-20 cm layers were significantly different between the three types.

Any discussion of land use in mountainous areas (semi-natural meadows or abandonment of use waiting for the climax forest) should take into account multiple aspects such as carbon sequestration or biodiversity and the presence of rare species of plants. Soil properties in such places are an inseparable element of such discussion. The researcher should make conclusions about changes caused by different land use based on all facets of soil properties – physical, chemical and biological. Only if we consider the soil as a whole will we capture the changes occurring in it.

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