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Usage of computed tomography for investigation of the soil porosity in disturbed grassland

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Soil disturbance will remarkably alter physical properties of the soil and the recovery of the structure as well as mechanical strength recovery will take years. Typically deforestation works, e.g. needed for the establishment of open military training areas, seriously influences soil mechanical state. Deforestation works involve processes like felling of trees, uprooting of stumps followed by levelling of ground. For the establishment of more favourable conditions for grass cover development, tree stumps and felling residues are mixed into the soil with a rotary thriller. Therefore, the final disturbed ground has low density and high porosity resulting in low mechanical strength. On the contrary, military training includes high intensity movement by soldiers and trafficking by vehicles. Thus, these types of activities presume stable soil conditions with a high mechanical strength. The aim of our research was to investigate soil density status of disturbed grassland with computed tomography. The soil samples were collected from the undisturbed area and from the grassland which was treated with the rotary thriller 2 years ago. The undisturbed soil samples were collected using plastic cylinders (of 10 cm diameter and 20 cm height) in 3 repetitions. For comparison, smaller soil samples (5.3 cm diameter and 4 cm height) were obtained at 0, 5, 10, 15, 20, 30 cm depths for determining the soil bulk density. In the laboratory, the high resolution industrial computed tomography system Yxlon FF 35 CT was used with the larger soil samples. The soil samples were analyzed using the software Volume Graphics VGSTUDIO MAX 3.2. Our results indicated the possibility of determination of distribution of pores in the soil and the changes in the porosity of soils depending on the soil treatment and the type.