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The effect of fertilization on water-stable soil aggregates

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Soils with a stable structure offer a suitable growth environment for plants even if the soil is under physical-mechanical stress caused by heavy rainfall, wind erosion or by regular drought-wet cycles. Good structure helps to absorbs nutrients more efficiently and therefore has a direct economic impact for the land user. That is important, because nowadays farmers are increasingly interested in a sustainable soil management, which in the long-term can increase their profit. The soil condition nowadays is mainly evaluated by chemical properties and less emphasis is directed to soil physical. Such approach does not give the full overview of the soil. Soil water-stable aggregate stability (SWA) is one of the most important physical parameter. Also the type of fertilizers is changing by time – the use of farmyard manure (FYM) is steadily decreasing and the use of nitrogen fertilizer (NF), especially in precision farming is increasing. Both fertilizers have a different impact on SWA and for the soil overall. To get a better understanding how different fertilization, by type and applied rates, affect in Baltic climatic conditions especially SWA this study was carried out. The study was conducted in 2014–2015 on the Estonian long-term nitrogen fertilization experiment (IOSDV) (established 1989) located in Tartu with a three-year crop rotation (potato-barley-spring wheat). The soil is a sandy loam Stagnic Luvisol (WRB). Soil samples from potato, barley and near-by grassland were taken on both years in autumn. To determine the soil water-stable aggregate stability from less than 2 mm air-dried soil the Eijkelkamp's Wet Sievering Apparatus was used. Our study found that: 1) SWA has a high seasonal variability on arable land; 2) SWA was nearly constant (70.59 → 70.07%) on permanent grassland; 3) there is a unique "plot effect" for every plot; 4) growing potato causes higher soil degradation than cereal; 5) increasing rates of NF decrease SWA and 5) FYM increases SWA, soil organic carbon and decreases pH level.