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Reduced soil cultivation and organic fertilization on organic farms: effects on crop yield and soil physical traits

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A continuous investment in soil fertility is necessary to achieve sustainable yields in organic arable farming. Crucial factors here besides the crop rotation are organic fertilization and the soil tillage system. On this topic, an operational group (Project BIOBO*) was established in the frame of an European Innovation Partnership in 2016 consisting of organic farmers, consultants and scientists in the farming region of eastern Austria. The aim of this group is the development and testing of innovative, reduced soil cultivation, green manure and organic fertilization systems under on-farm and on-station conditions to facilitate the sharing and transfer of experience and knowledge within and outside the group.
Possibilities for optimization of the farm-specific reduced soil tillage system in combination with green manuring are being studied in field trials on six organic farms. The aim is to determine, how these measures contribute to an increase in soil organic matter contents, yields and income, to an improved nitrogen and nutrient supply to the crops, as well as support soil fertility in general.
Within a long-term monitoring project (MUBIL), the effects of different organic fertilization systems on plant and soil traits have been investigated since 2003, when the farm was converted to organic management. The examined organic fertilization systems, i.e. four treatments representing stockless and livestock keeping systems, differ in lucerne management and the supply of organic manure (communal compost, farmyard manure, digestate from a biogas plant). Previous results of this on-station experiment have shown an improvement of some soil properties, especially soil physical properties, since 2003 in all fertilization systems and without differences between them. The infiltration rate of rainwater has increased because of higher hydraulic conductivity. The aggregate stability has shown also positive trends, which reduces the susceptibility to soil erosion by wind and water. The improvements are attributed to the crop rotation with two-year lucerne and other crops with a dense root system. In autumn 2015, the soil tillage in the trial was converted from an intensive use of the plough to a reduced tillage system with a chisel. With this change, further improvements in soil properties, especially in connection with organic fertilizers, are expected and are further examined. Plots in which the previous tillage with the plough is continued, allow a comparison of the effects of the different soil tillage systems.

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