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Influence of straw residue cover on the sprouting and yield of spring cereals in direct seeding on clay soil in Southern Finland

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To examine the influence of straw residue cover on the sprouting and yield of spring cereals in direct seeding on clay soil, an experimental trial was carried out in the South West Finland Research Station in 2003–2005. The trial fields were direct seeded continuously starting from the mid-1990s. Straw residues were spread on the soil in four different quantities. The lowest amount was 2 t/ha, and the amount of residues increased by 2 t increments up to 8 t/ha. The cultivated cereals varied from year to year: spring wheat in 2003, winter wheat and oats in 2004, and barley in 2005. In 2005, an experiment took place in the Agricultural Engineering Research unit to study the effects of the amount of straw residue, weed and disease control and stubble cultivation. The straw residue management methods were ploughing, stubble tilling and direct seeding.

In the experimental year 2003, the yield of spring wheat was highest with the largest amount of straw residue on soil. In this growth season, May was the only rainy month (rainfall 105 mm). Starting from the middle of June, there was a rainless period of seven weeks. In this period, the straw residue sheltered soil from excessive evaporation. In the plot with the lowest (2 t/ha) amount of residue, the yield was 2660 kg/ha, while in the plot with the highest (8 t/ha) amount, the yield was 50 % higher.

In year 2004, the rainfall in May was less than usual and evaporation was excessive. Again, the straw residue cover served as a shelter against evaporation. The larger the straw residue mass, the higher the yield of oats. In contrast, however, the yield of winter wheat decreased when the amount of straw residues was 4 t/ha or more. Winter damages were more severe and the plant stand became more open when the amount of straw residues was higher. Open space in winter wheat became colonized by weeds, especially *Matricaria inodora* and *Agropyron repens*.

In year 2005, the highest yield of spring barley was gained when the amount of straw residue was 4 t/ha. The yield was slightly lower with either less or more residues. The number of sprouts decreased by 12% when the residue cover increased from 0 t/ha to 4 t/ha. By 6 t/ha, the number of sprouts decreased by 44%, and finally, at 8t/ha, the decrease was 56%. When the straw mass on soil surface exceeded 4 t/ha, it acted as an insulating material. In spring, soil temperature was considerably lower, and melting of frozen soil took a longer time than when the straw mass was 2 t/ha or less.

When no weed or disease control was performed, the highest yields were gained with the lowest straw residue mass on soil surface. Ploughing moulds the residues from surface into the soil, and so does stubble tilling with a low amount of straw. The yield of direct seeding was at the same level as in ploughing with 2 t/ha of straw residue. Yield decreased when the straw residue cover became thicker both in stubble tilling and in direct seeding. When weed and disease control were performed, the yields increased in every experimental setting. The increases were significant, from 1120 kg to 1660 kg/ha.