SHALLOW CULTIVATION IN EARLY AUTUMN INSTEAD OF PLOUGHING FOR WINTER CROPS

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Description
The procedure involves sowing after soil preparation by shallow cultivation (usually to 5-7 cm using discs but without soil inversion) before seedbed preparation.

Rationale, mechanism of action
Tillage operations enhance N mineralisation and may adversely affect soil physical properties, including soil aggregation, that are responsible for good infiltration and percolation of water. Conversely, reduced tillage of soils provides less erodible soil, greater crop residue cover, less susceptibility to surface sealing and a more even surface for tractor traffic due to the more consolidated and uniform soil structure. Reducing tillage may result in less compaction in the long term, without development of a plough pan and in more biological activity (including the number of worms) and better soil structure, due to an increase in organic matter towards the surface.

Relevance, applicability & potential for targeting
Shallow cultivation (5-7 cm) with a powerful machine for seedbed preparation is possible for soils with up to 30% clay. In warmer climates, reduced tillage can help reduce the rate of organic matter decomposition. Other benefits include increased water storage and a reduction in water losses by evaporation. Shallow cultivation provides better soil cover by straw and hence, a potentially reduced risk of sediment and P losses compared to autumn ploughing [1]. However, the potential for reduced sediment and P losses is lower than for direct drilling with no-till in autumn.
On soils with poor structure (sandy or loamy soils), reduced tillage is less effective since the soil needs to be loosened by regular deep tillage.

Effectiveness, including certainty
Nitrogen: In the south of Sweden, reduced tillage has been estimated to result in a small reduction in nitrate leaching losses [2].
Phosphorus: Chopping and spreading straw under minimum tillage, instead of baling and removing, consistently resulted in significant reductions (typically 30-60%) in total-P losses from a clay soil in the UK [3].

Time frame
Shallow tillage for winter cereals can result in a short term reduction in erosion risk. The effects of shallow tillage on soil structure and improved infiltration can, however, only be expected in the medium to long term.

Environmental side-effects
Weeds tend to increase and the greater amount of straw and stubble on the soil surface poses a risk of infection surviving from one year to another. Therefore with reduced tillage a good crop rotation is very important. Furthermore, severe topsoil compaction may ensue when reduced tillage is applied on structurally unstable soils [4]. A number of studies have also highlighted an increase in a more biologically active dissolved fraction of P under conservative than under conventional tillage due to the preferential accumulation of available P at the surface of non-inverted soils [5,6,7].

Administrative handling and control
Reduced tillage is highly relevant for many clayey and silty soils where erosion is a problem. The measure is easy to promote, but the potential for targeting is difficult in practice as the technique must be adapted to local soil and climate conditions and requires a high degree of management skill.

Costs: Investment, labour
All kinds of minimal tillage techniques generally reduce the costs associated with fuel and labour. However, reduced tillage may result in increased herbicide application, which can potentially eliminate any previous cost savings.

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