No-till in northern, western and south western Europe: A review of problems and opportunities for crop production and the environment

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Abstract

Recent literature on no-till is reviewed with particular emphasis on research results and commercial uptake in northern, western and southwestern Europe. Increased interest in no-till, as well as minimum or reduced tillage, is the result of changes in the economic circumstances of crop production, the opportunity to increase the area of more profitable autumn-sown crops and increased concern about environmental damage associated with soil inversion by ploughing. Highly contrasting soil and climate types within and between these regions exert a strong influence on the success of no-till. While no-till may often result in crop yields which equal or exceed those obtained after ploughing, modest reductions in yield may be tolerated if production costs are appreciably lower than with ploughing. The relative costs of fuel and herbicides have changed appreciably in recent years making no-till more attractive commercially. While effective weed control is an essential aspect of no-till, current herbicide technology may not yet fully achieve this.

No-till soils will usually have lower temperature and higher moisture content at the time of drilling, delaying drilling of spring-sown crops in northern regions. Their bulk density and bearing capacity are greater than for ploughed soils but the pronounced vertical orientation of macroporosity will allow encourage penetration of roots and water, especially in view of the increased population of deep-burrowing earthworms. Particular care must be taken to minimise soil damage at harvest and to ensure the even distribution of crop residues prior to drilling.

Reduced erosion and runoff under no-till are widely observed and are of particular importance in southwestern Europe. No-till reduces losses of phosphorus in runoff and the loss of nitrate through leaching. Emissions of greenhouse gases CO_2 and N_2O from no-till soils are highly variable and depend on complex interactions of soil properties. Emission of CO_2 from fuel during machinery usage is always appreciably reduced with no-till. Increased soil organic carbon in surface layers of no-till soils may not be associated with increased carbon sequestration throughout the profile. All relevant factors must

be included in the evaluation of the relative overall climate forcing effects of no-till and ploughing. Adoption of no-till could be encouraged by government financial assistance in recognition of environmental benefits, although future restrictions on the use of herbicides may be a deterrent. Opportunities for further research on no-till are outlined.

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