MAINTENANCE AND ENHANCEMENT OF SOIL ORGANIC MATTER CONTENT

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Description
Maintaining and enhancing soil organic matter levels by the regular addition of organic manures and the retention of crop residues.

Rationale, mechanism of action
Low soil organic matter levels can give rise to soil structural problems and increased risk of all kinds of erosion. Maintaining or enhancing the content of soil organic matter helps to reduce the risk of surface run-off and erosion, and enables the efficient use of soil nutrients and added mineral fertiliser. At a later stage, this helps to maintain good soil structure, fertility and aggregate stability. Good structure enhances the infiltration, retention and movement of water through the soil. Improved soil microbiological activity can increase nutrient uptake from soil reserves. Soil aggregate stability improves the ability of the soil to resist the erosive forces of rainfall and surface run-off. Direct relationships between the concentration of total organic carbon and aggregate stability have been indicated in some studies [1,2].
Well-structured soils are more easily cultivated, resulting in more uniform crop establishment and growth. Risk areas of poor crop establishment and low yields with high levels of residual soil nitrate will probably become fewer. On the other hand, the method builds up the soil organic matter pool and may increase the nitrate leaching risk arising from extra mineralisation.

Applicability
This measure is especially important for silty and clayey soils with P problems, but for sandy soils a very high concentration of (fresh) organic matter can enhance N mineralisation and leaching.

Effectiveness, including certainty
Nitrogen: An increase in nitrate leaching of 1-10 kg N ha^{-1} has been estimated from regular additions of organic matter in southern Sweden [3].
Phosphorus: Any comparable reduction in sediment loss might only be achieved by building up organic matter over a period of years. There would also be an increased risk of incidental P losses from any added manures. On the basis of UK expert opinion, it was assumed that the net short-term effect of the mitigation method would be neutral [4].
Improved soil fertility by addition of extra organic matter (cut grass incorporated into the topsoil) and no tillage improved yields significantly compared with conventional ploughing on silty soil in NW Sweden [5].

Time frame
This measure should be evaluated after a long time, since improving the soil content of organic matter may take time.

Environmental side-effects
Too high a concentration of organic matter may become a goal-conflict since it supports N mineralisation and N leaching.

Relevance, potential for targeting
Soil organic matter concentration has already been used as a target in many countries.

Costs: Investment, labour
For certain soils, increasing soil organic matter can be highly cost-effective since crop yields can improve significantly [5].

References

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