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Soil physical quality as affected by management practices

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Different management practices can result in a number of agricultural and environmental problems resulting from degradation of soil structure. A measure of physical quality, S, is used which is defined as the slope of water retention curve at its inflection point. The value of slope, S, indicates the extent to which the soil porosity is concentrated into a narrow range of pore sizes. Larger values of S indicate the presence of a better-defined micro-structure and consequently better soil physical quality. Processes of soil physical degradation, such as compaction, can destroy soil micro-structure, and one of the best indicators showing these changes is the distribution of pore sizes as quantified by S.

We quantified soil physical quality, S, in order to study the effects of different management practices. Increasing values of soil bulk density, such as produced by compaction, are found to give smaller values of S. This trend is consistent with S values determined for different levels of mechanization in the field (for example, values of S decreased in the order zero mechanization $>$ light mechanization $>$ heavy mechanization).

Similarly, lower values of organic matter content are found to result in lower values of S. The greatest effect was produced by the use of different crop rotations. Rotations including grass and clover had the greatest effect in increasing S. Fertilization, both with manure and mineral fertilizers had a smaller effect on S.

Experience in the field shows that S can predict the critical thresholds for bulk density and organic matter content. It is proposed that S can be used as an indicator for charac-

terization of soil physical quality that enables the effects of different soil management practices on soil physical quality to be quantified and compared. This approach using S can help us to select appropriate management practices to protect our soils and the environment.