A Framework for Evaluating Physical and Chemical Indicators of Soil Quality

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Public and private efforts to define and evaluate soil quality are increasing in the USA and throughout the world. The apparent force behind these efforts is public recognition that it is essential to balance the world's finite soil resources with an ever-increasing population, and that soil resources are as vulnerable to degradation as air or water. The rationale is that a quantitative index of soil quality may serve as an indicator of a soil's capacity for sustainable production of crops and animals in an economically sound, socially acceptable, and environmentally friendly manner. These activities are increasing public awareness that soil quality is affected by natural and human-induced processes (Karlen et al., 1992). However, in many areas, inferior soil management practices continue to decrease soil quality through erosion and to create severe off-site damages through sediment, nutrient, and pesticide transport and deposition.

Efforts to define and quantify soil quality are not new, but establishing a consensus with regard to a set of standard conditions to be used for evaluation remains difficult. Unlike water or air quality standards that have been established by legislation using potential human health impact as the primary criterion, soil quality depends on the soil's primary function, which is much more site- and soil-specific. Papendick and Parr (1992) stated that if properly characterized, soil quality should serve as an indicator of the soil's capacity to produce safe and nutritious food, to enhance human and animal health, and to overcome degradative processes. Larson and Pierce (1991) presented a functional definition of soil quality, stating that it is the capacity of a soil to function within ecosystem boundaries and to interact positively with the...