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A REVIEW OF STRATEGIES FOR BUILDING SOIL RESILIENCE TO DEGRADATION

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ABSTRACT

Soils are a key element of terrestrial ecosystems on which humans and animals depend for their nourishment. However, continuous degradative processes such as soil erosion, loss of soil organic matter, nutrient loss and imbalance, salinization, sealing of surface, biodiversity loss, pollution, acidification, compaction and waterlogging can decline soil capital. Declines in soil capital by degradative processes are often slow, but these slow changes can be disrupted by a relatively sudden change into a contrasting state or regime. Loss of resilience, aggravated by different events, is the cause of such change into alternate stable state. Soil resilience is the ability of the soil to absorb disturbances without fundamentally changing its function and structure. The objective of this review paper was to conceptualize soil resilience, to identify attributes of resilient soils and to assess strategies for building soil resilience. Soil resilience can be determined by many variables. However, it is driven by only a few variables which are often slow changing or controlling variables such as texture, pH, aggregate stability and soil structure, buffering capacity, microbial biomass C, and the presence of key microbial groups. If the soil system changes beyond a threshold of these controlling variables it behaves in a different way, often with unwelcome and unexpected shocks. The strategies identified to build soil resilience are: (i) to reduce soil erosion; (ii) to create a positive soil C budget; (iii) to increase soil biodiversity; (iv) to enhance rhizosphere processes; (v) to improve nutrient availability. However, there is no single strategy to build soil resilience and hence all the above strategies should be integrated for successful soil resilience building.