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# How can we increase nutrient storage and retention in sands?

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Low nutrient retention and storage is a feature of coarse textured soils including most sands. Increasing nutrient retention in sands requires an increase in the specific surface area of soil through the addition of charged particles with a high surface area (e.g. organic matter and clay). In a series of studies the likely changes in cation exchange capacity (CEC) resulting from the addition of organic materials and clay were investigated on the south coast of WA.

Field surveys investigated differences in organic matter with long term annual and perennial grasses on deep and shallow sandplain soils. Results from this showed little difference in organic carbon contents within the 0 – 30 cm layer. Modelled changes in organic matter suggest the maximum change in CEC is no more than 2 - 3 CEC after 40 years of permanent pasture. Given the long time lag associated with permanent pastures, other forms of organic matter including biochar and compost applied at 5 t/ha were investigated. While the changes in organic matter and CEC were minimal, both biochar and compost resulted in significant yield increases in the year they were applied presumably due to nutrient additions (P, Zn, K, S) associated with these organic products.

In a long term claying trial which included treatments of 0, 50, 100, 200 and 300 t/ha of kaolinite rich subsoil, clay addition result in significant increases in CEC. The addition of 300 t/ha of 30 % clay resulted in an increase in CEC of 1.7 me/100g. Significant increases in nutrients (K and S) were also found. The benefits from claying were immediate and significant yield increases have persisted.

The results from this work show that increasing CEC can be achieved through organic and clay additions. However, the changes are relatively small and require either extensive periods of time or expense to adopt. Further work is required to determine whether the resultant changes in CEC result in biologically and economically significant increases in retained nutrients.