

UK-China CZO Summary Sheet

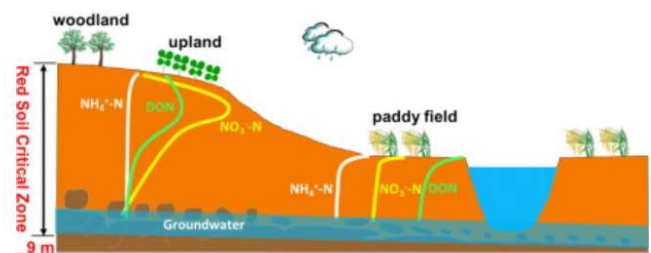
Deep Nitrogen Accumulation and Sources

In Red Soil Critical Zone nitrogen (N) is accumulated at 1-8 m soil depth and in Loess Plateau Critical Zone nitrogen (N) is stored more deeply (30-50 m depth).

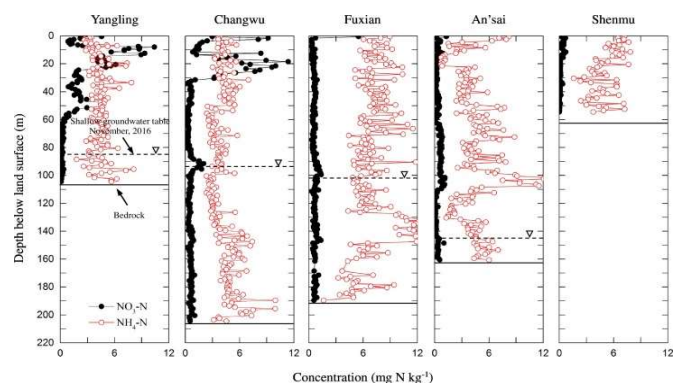
Rationale: Existing soil N studies have mainly focused on the top and near subsurface. The UK-China CZO project used field and laboratory studies to identify the amount and sources of N accumulation in deep soil profiles in Loess Plateau in Shaanxi and Red Soil in Jiangxi, China.

Method: Samples were collected across different land uses via borehole drilling at five sites in Loess Plateau (~50–200 m) and eight sites in Red Soil (1-30 m). Physico-chemical properties and isotope analyses allowed the vertical profile of N concentration change in deep soil to be measured.

Findings: Eighty percent of N was found to accumulate at 1-8m soil in red soil, while significant N is observed between 30–50 m depth in Loess. Land use and critical zone features (e.g. thickness of loess deposit, water regime) are key determinants of N accumulation patterns where agricultural inputs – e.g. fertiliser, manure and organic sources – are significant contributors.



Reactive nitrogen accumulates beneath 1 m depth. (Jia et al., 2018)



Vertical distribution of NO₃-N and NH₄-N from the ground surface to bedrock at the borehole sites in Loess Plateau. (Wu et al., 2019) (Jia et al., 2018)

Relevance for policy making and practice

1. Our data shows local agriculture has a large (negative) influence on soil quality at much greater soil depths than previously understood.
2. In the Loess plateau region, accumulated nitrate introduced by human activities is mainly distributed in the upper vadose zone (above 30 m), indicating there is currently a low risk of nitrate leaching into groundwater.

Further Reading:

Wu, HY et al. 2019. Accumulation of nitrate and dissolved organic nitrogen at depth in a red soil Critical Zone. *Geoderma*, 337, 1175-1185.
 Jia X. et al. 2018. Mineral N stock and nitrate accumulation in the 50 to 200 m profile on the Loess Plateau. *STOTEN*, 633: 999-1006.