

Comments on “*First signs that national cropland organic carbon loss is reversing in British topsoils*” by Bentley et al.

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In an analysis of the most recent data from the UKCEH Countryside Survey, Bentley et al. (2025) find a modest increase in soil organic carbon (SOC) stocks of topsoil in croplands across Great Britain from 2007 to 2020, and they suggest this is the first evidence of a reversal of soil carbon loss at national scale anywhere, linked to improvements in land management. This is a significant claim, and the paper is likely to be highly cited. However, some important caveats are apparent from a close reading of the paper, and the results need to be treated with caution. The authors do say this but in drawing conclusions they appear to overlook this caution and the necessary caveats.

Firstly, this is a relatively small dataset given the diversity of soils and management in cropland across Great Britain. The ‘stable cropland’ data analysed is for 86 of the 1 km × 1 km Countryside Survey squares with on average 2.6 plots per square and a single soil core per plot, i.e. 226 samples in total. While the single core per plot may not introduce a systematic bias for a national-scale estimate, it does greatly add to the noise in the data. Hence the large error bars on the estimated changes in Figure 2 relative to the changes.

Second, the definition of cropland is broad, including both arable and horticultural crops, and there is no information on changes in crop rotations between the samplings. But differences in SOC stocks within and between traditional rotations will be significant. In the National Soil Inventory (NSI) of England and Wales, sites that were recorded as arable at both NSI samplings had mean SOC stocks 30% smaller but rates of change 50% greater than those recorded as arable at one sampling and ley grass at the other (Kirk and Bellamy 2010). While this question of definition regarding “cropland” might not introduce a systematic bias between the CS samplings, it will further add to the variance, making it more difficult to reliably detect a change in SOC between the 2007 and 2020 samplings. It also increases the likelihood that the distribution of cropland managements is not representative of the national distribution.

Third, after decades of SOC depletion following past changes in land management, rates of loss will inevitably decrease over time as a new steady-state level is approached; Johnson et al. (2009) and Powlson et al. (2022) give examples from long-term experiments. Further, as minimal SOC levels determined by SOC protection processes are approached, it is statistically more likely to see an increase in SOC concentration over time than a decrease. Prout et al. (2022) analysed SOC/clay ratios in the NSI data – clay content being a major determinant of SOC protection – and found that almost half of arable soils had SOC/clay ratios indicating a “degraded” state (< 1/13) and 60% of these soils showed increases in SOC concentration between the two NSI surveys. The results reported by Bentley et al. are consistent with such trends. Also, in view of the large confidence intervals shown in Figure 2 of Bentley et al., the data could equally be interpreted as showing no change in SOC between 2007 and 2020.

Fourth, in view of the last point, measured increases in SOC stocks (or a cessation of the previous decreases) can be explained without invoking the adoption of new sustainable land management practices. Bentley et al. propose that adoption of reduced tillage practices over the survey period could account for increased SOC in the 0–15 cm soil depth they sampled. This would be equivalent to a redistribution of SOC through the soil profile, not a net removal of CO₂ from the atmosphere and therefore not a contribution to Net Zero. In any case, estimates of the proportion of UK farmers regularly practicing zero tillage vary from only 7% (Alskaf et al. 2020) to 25% (Jaworski et al. 2024), but minimum tillage, which is more widely practiced, will only have negligible effects on SOC stocks compared with conventional tillage (Powlson et al. 2012).

The above points illustrate the challenges in carrying out reliable and fit-for-purpose soil monitoring at national scales, given that changes in SOC and other soil properties are slow and subject to spatial variability and the interplay of numerous land management factors. However, such monitoring is essential for evidence-based soil policy and innovation in land management. We applaud the UK Government for its continuing support for the Countryside Survey and other soil monitoring initiatives. We are pleased that Bentley et al. have drawn attention to the new results emerging from the Countryside Survey but call for greater caution in interpretation. Ascribing the apparent small SOC increases seen in the CS predominantly to adoption of improved practices is, at best, optimistic and at worst misleading for policymakers.

Author contributions

A.D. had the idea. G.K. wrote the first draft. All contributed to subsequent and final drafts.

Conflicts of interest

The authors declare no conflicts of interest.

Data availability statement

No unpublished data was used.

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