FARMING PRACTICE
FALLOWING

IMPACT: CARBON SEQUESTRATION

Reference 2

Kaempf, I; Hoelzel, N; Stoerrle, M; Broll, G; Kiehl, K 2016 Potential of temperate agricultural soils for carbon sequestration: A meta-analysis of land-use effects SCIENCE OF THE TOTAL ENVIRONMENT, 566, 428-435. 10.1016/j.scitotenv.2016.05.067

Background and objective

Restoring depleted soil organic carbon (SOC) stocks of arable land to remove carbon from the atmosphere and offset fossil fuel emissions is a promising strategy for the mitigation of climate change. To investigate if soil organic carbon sequestration in the top-soil of ex-arable grasslands and under conservational tillage regime is significantly affected by edaphic and climatic conditions. Speciffic questions addressed: (i) how do SOC stocks change after longstanding arable land is converted to managed or unmanaged grasslands (ex-arable land) or if ancient grassland is converted into arable land, (ii) how do SOC stocks of ancient grassland and ex-arable land differ, (iii) how do SOC stocks develop after conversion to conservational tillage, and iv) what are the effects of time since abandonment, climate and initial SOC stock on the variability of soil carbon change in ex-arable land and arable land with conservational tillage management. Here, only results on the effect of short time since abandonment (0-4 years) are reported, as equivalent to the effect of fallowing.

Search strategy and selection criteria

Compilation of data from publications in English, Russian and German language via key words, including: SOC, sequestration, carbon stocks, humus, land-use change, abandonment, organic matter recovery, ex-arable land, old field succession, no-till and agro-ecosystems. Key word searching also allowed to widen the database to the "grey" literature. 1) Restricted to terrestrial mineral soils of the temperate zone such as Retisols, Luvisols, Cambisols, Phaeozems, Chernozems and Kastanozems; 2) Every study used in the dataset had to provide at least two carbon values for different land-use types measured in one or several soil depths.

Data and analysis

Because most studies did not provide error estimates, an un-weighted meta-analysis was conducted. Mean effect sizes were calculated with bootstrapped 95% confidence intervals based on 1000 bootstrap replications using the package 'boot' in R3.0.2 software. Publication bias was explored by graphical inspection of funnel plots. Moreover, a Spearman rank correlation test revealed no significant correlation between response ratio and sample size (rho =−0.05, p = 0.42).

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
65	Mineral soils from the temperate zone	Ex-arable land recently abandoned (0-4 years)	Arable land	Metric: Soil organic carbon sequestration; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	56.25

Results

- Soil carbon change (t/ha) in ex-arable lands recently abandoned (0-4 years) compared to arable lands was 2.8± 2.3, but such an increase was not significant according to the effect size 95% CI.
- NULL
- NULL
- NULL
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

SOC sequestration in recently (0-4 years) abandoned arable lands was not significantly higher than in arable lands.