



Figure S1 Picture of the ETH mesocosm platform of the Sustainable Agroecosystems Group during the experiment. The picture shows two soil columns with the sampling ports at different depths, the wheat plants and the chambers used for $^{13}\text{CO}_2$ labeling.

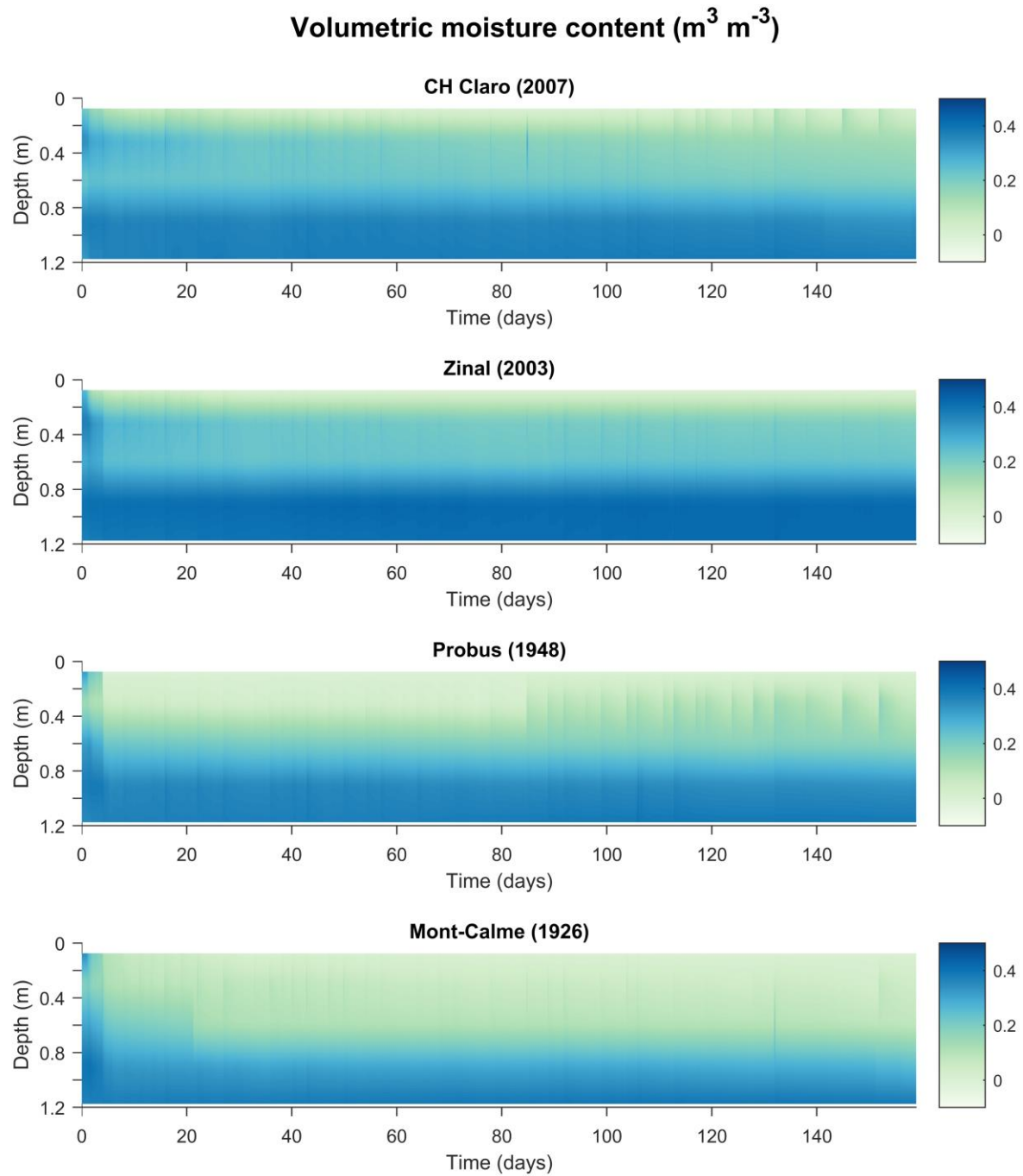


Figure S2 Depth profiles of the volumetric moisture content ($\text{m}^3 \text{m}^{-3}$) averaged for the different varieties ($n = 3$) for the duration of the experiments, measured at time intervals of 30 minutes at depths of 0.075, 0.30, 0.60, 0.90 and 1.20 m.

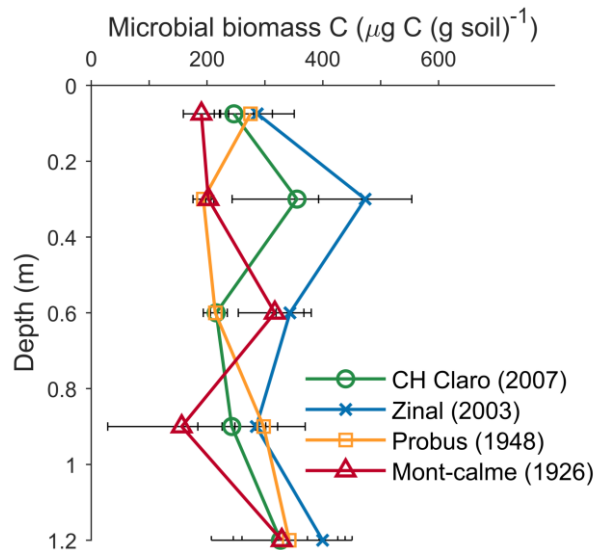


Figure S3 Depth profiles of the average microbial biomass carbon (μC per gram soil) per wheat variety at the end of the experiment. Error bars represent the standard error ($n = 3$).

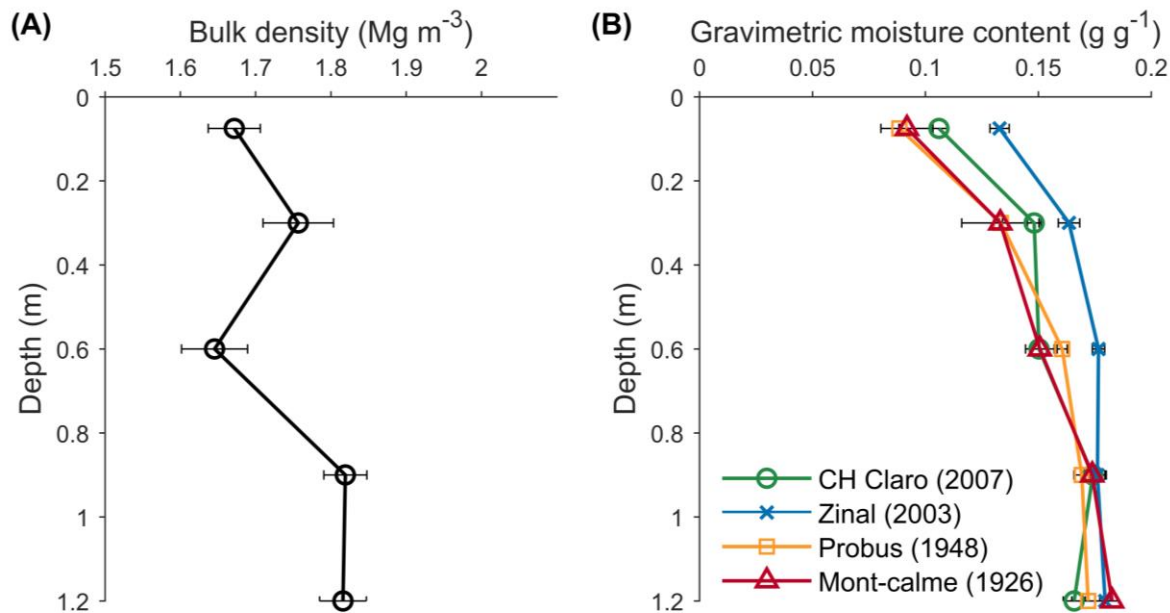


Figure S4 Depth profiles of bulk density, averaged for all 12 soil columns (Mg m^{-3}) (A) and gravimetric moisture content (g g^{-1}) (B) as measured at the end of the experiment. Data are averaged per variety ($n = 3$). Error bars represent the standard error

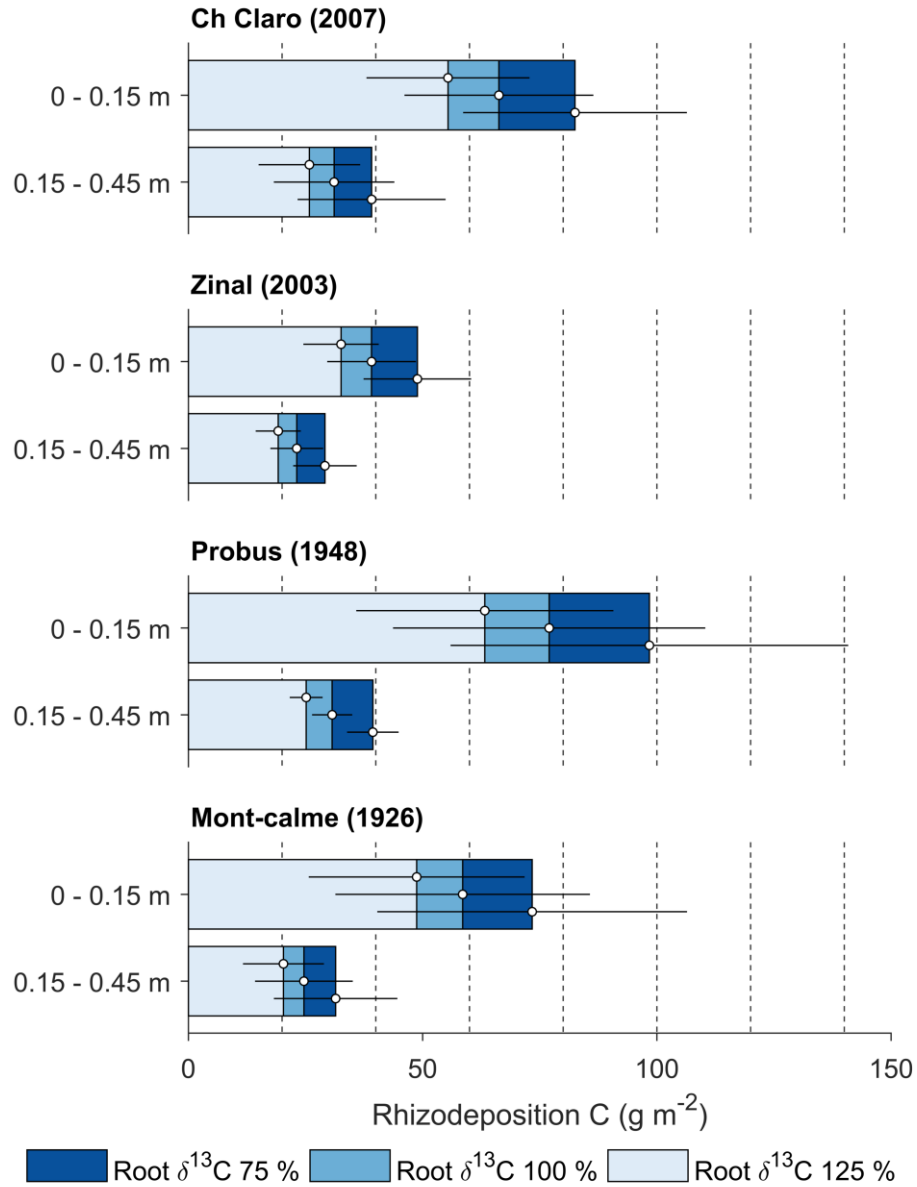


Figure S5 Depth profiles of rhizodeposition carbon, calculated with values of root $\delta^{13}\text{C}$ of 75 %, 100 % and 125 % of the values measured at the end of the experiment. Error bars represent the standard error ($n = 3$).

Table S1 Total ears, stem and leave biomass ($\text{g m}^{-2} \pm \text{standard error (n = 3)}$) of the different wheat cultivars at the end of the experiment. Variables that share a letter in the same column are not significantly different.

	Total ears biomass (g m^{-2})	Total stems biomass (g m^{-2})	Total leave biomass (g m^{-2})
CH Claro (2007)	92 ± 33^b	542 ± 94^b	430 ± 83^b
Zinal (2003)	333 ± 68^a	242 ± 40^a	135 ± 10^a
Probus (1948)	21 ± 12^b	578 ± 133^b	556 ± 77^b
Mont-Calme 268 (1926)	13 ± 8^b	520 ± 94^{ab}	587 ± 73^b