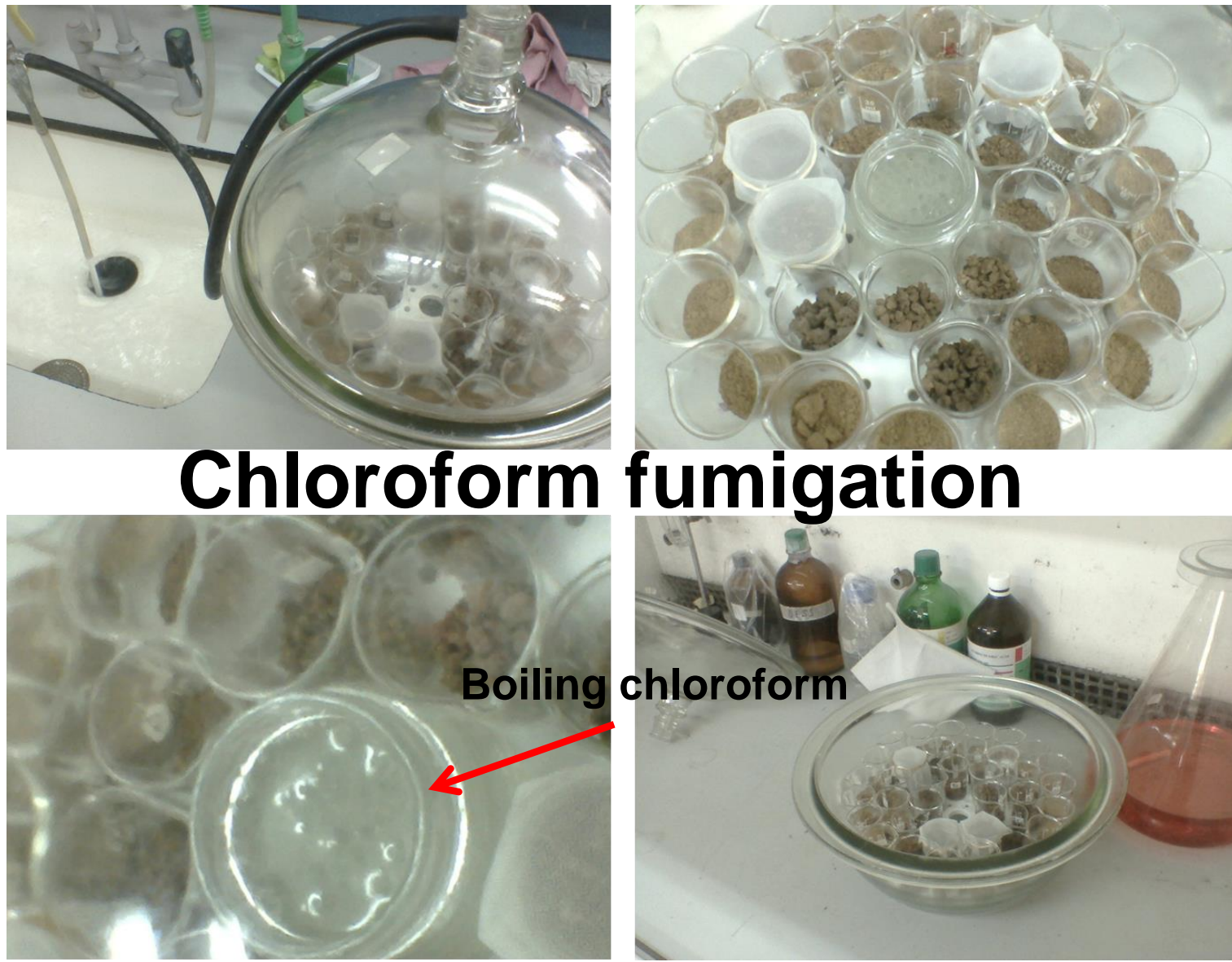




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Definition of the problem
 Using the CFE method may lead to overestimation of the amount of microbiological carbon due to artifacts such as:
 > chloroform residues dissolve in soil water.
 > Adsorption by soil organic matter or other surfaces.

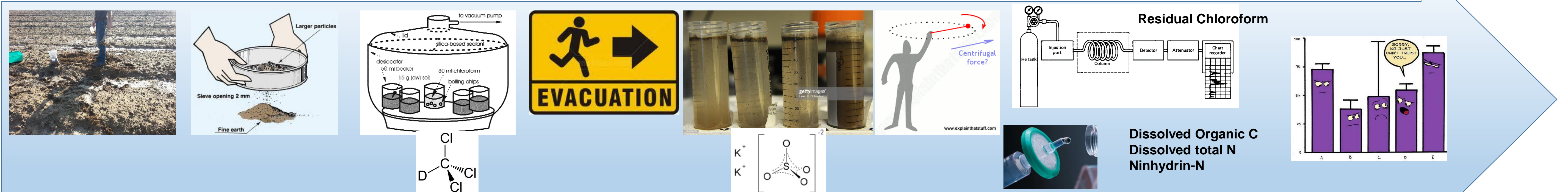
Introduction

Microbial biomass (MB) in the soil is considered sensitive and useful indicator of the effects of human activity and environmental conditions on soil fertility. The widely used method for determining MB is the fumigation of chloroform-extraction (CFE), in which carbon and / or nitrogen content is measured in the water extraction of soil sample that has been fumigated with chloroform vapor (a process that destroys the cell wall and enables extraction of its contents), while deducting values obtained for a non-fumigated audit sample that reflects non cellulose extracts.

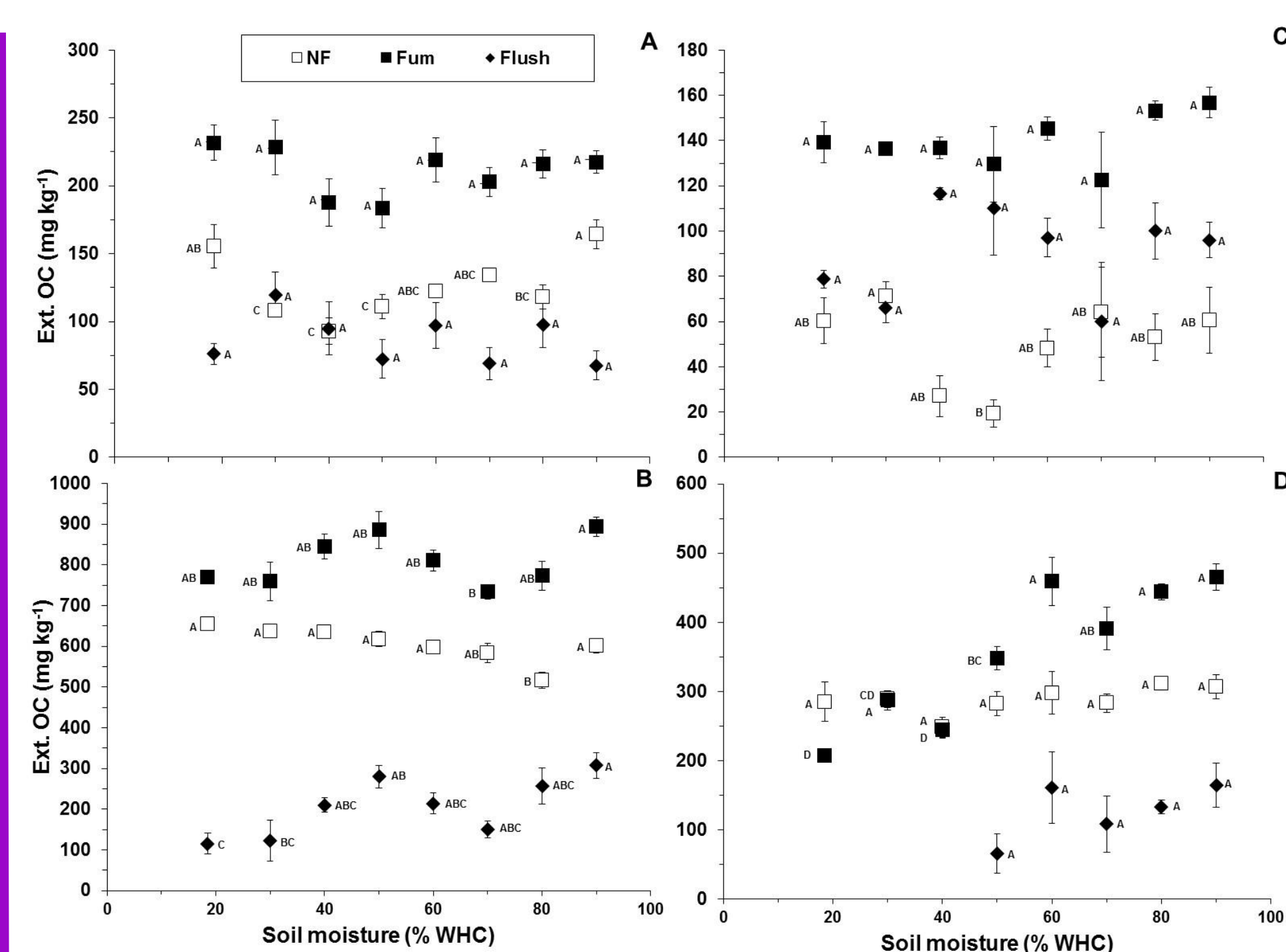
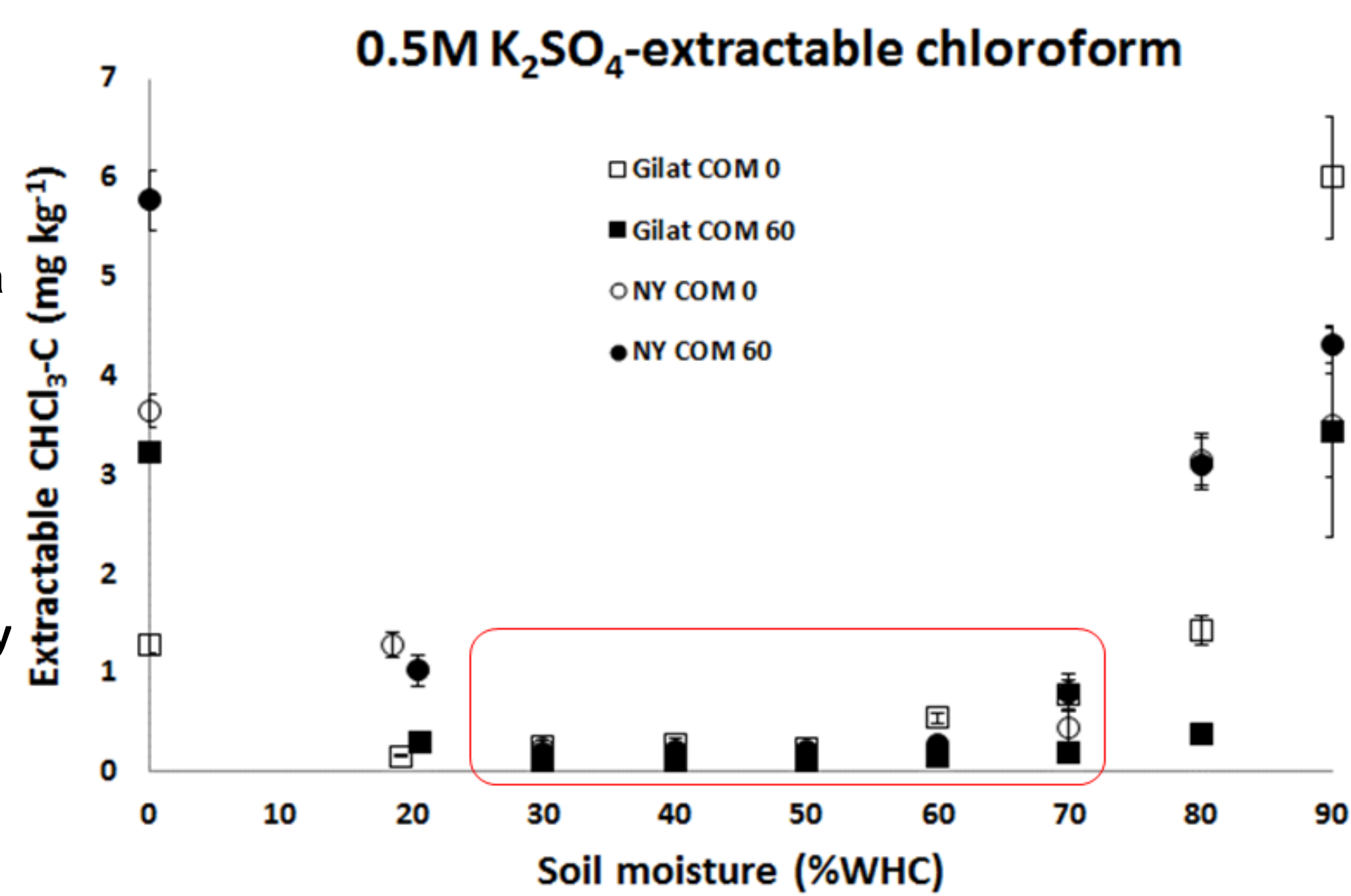
Objectives

1. Examination of the effect of soil moisture level on the chloroform residue and its relationship to the adsorption mechanism and the dissolution of the chloroform residue.
2. Verification of the accuracy of the CFE method for MB under the influence of soil moisture and examination of the effect of clay and soil organic matter (SOM) on this effect.
3. Quantification of Fumigation-extractable C (FEC) levels in in soils with different clay and SOM at different depths.
4. Quantification of chloroform fraction of FEC levels in in soils with different clay and SOM at different depths.

For objectives 1 & 2, we used soil samples from a long-term study on the effects of compost dose on soil fertility and for objectives 3 & 4 we used soil samples from soil profiles of non-cultivated soils from 3 sites from southern Israel (sandy soils) and 3 sites from northern Israel (clay soils). Microbial carbon and nitrogen as well as residual chloroform were determined using CFE.

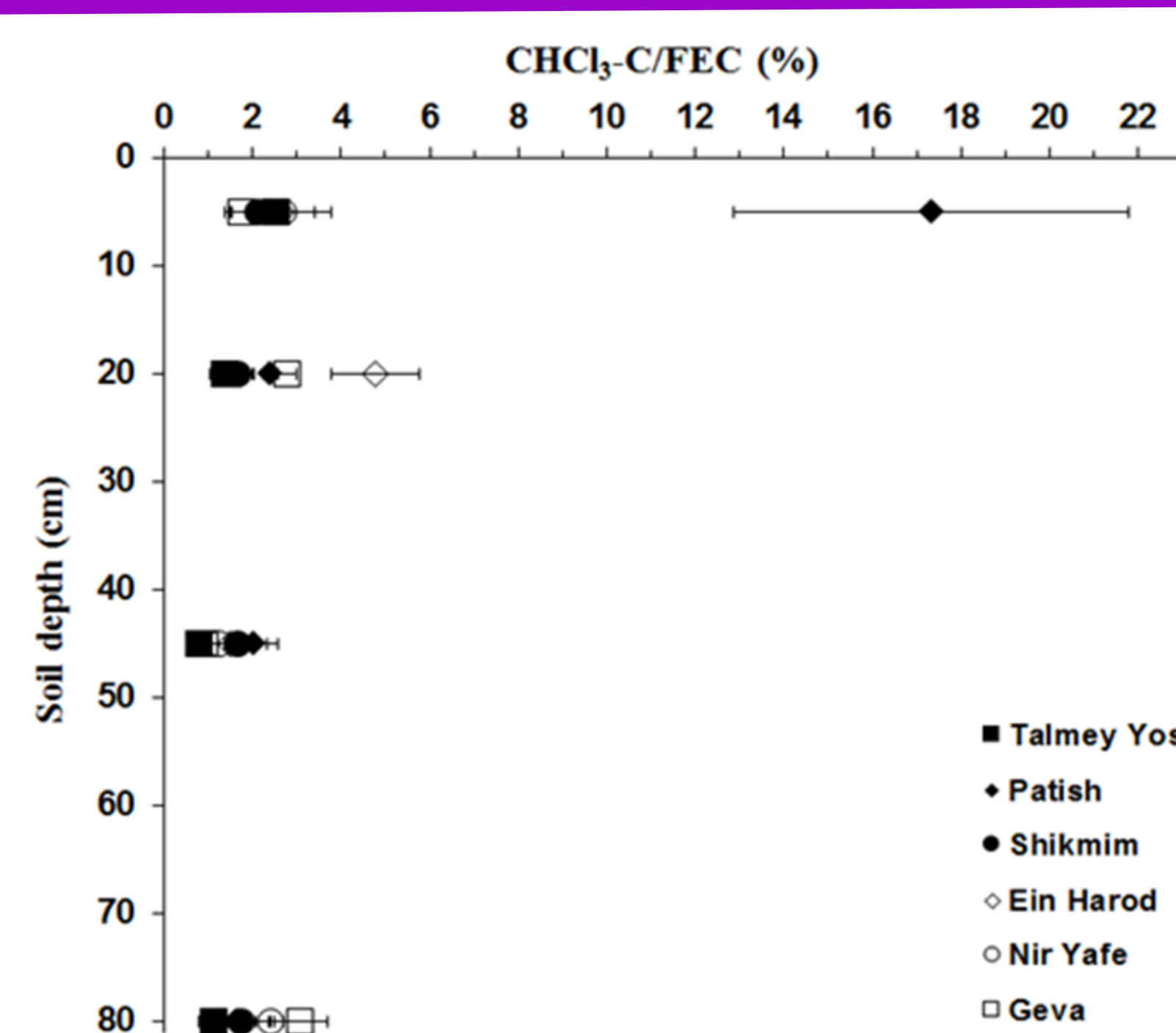
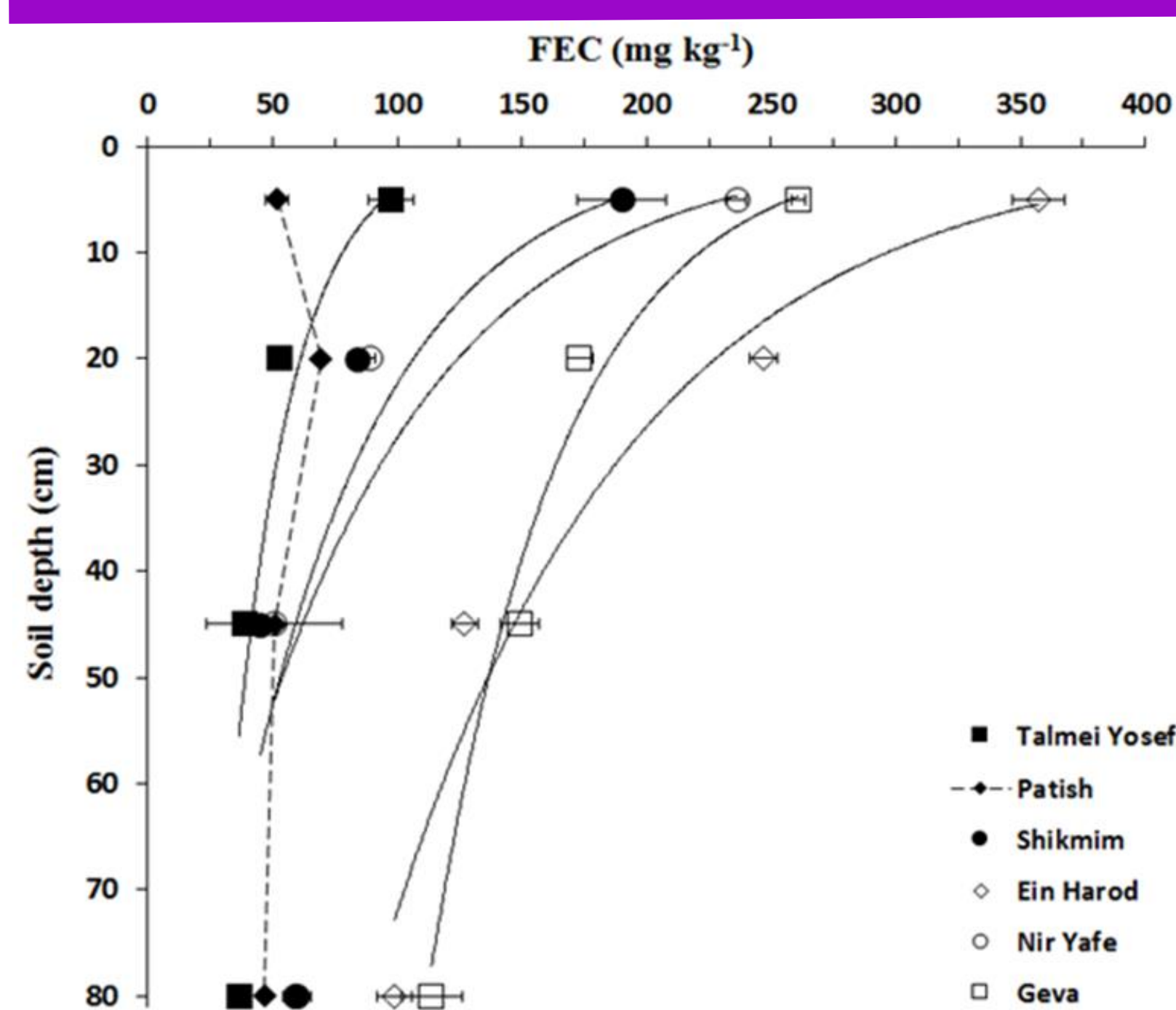


0.5M K₂SO₄-extractable residual chloroform levels as a function of soil moisture level maintained during fumigation (represented by the percentage of soil water holding capacity WHC).



0.5M K₂SO₄-extractable organic carbon concentrations with respect to non-fumigated and fumigated soil extracts and flush, as a function of soil moisture maintained during fumigation (percentage of soil water holding capacity). (A) NY COM 0; (B) NY COM 60; (C) GIL COM 0; and (D) GIL COM 60.

Fumigation-extractable C (FEC) content (per soil dry weight) as a function of soil depth. The values of R² for exponential fit (except Patish) were 0.92, 0.86, 0.98, 0.86 and 0.98 for the Talmei Yosef, Shikmin, Ein Harod, Nir Yafe and Geva soils, respectively.



Chloroform (CHCl₃)-C percentage in the fumigation-extractable C (FEC) as a function of soil depth.

CONCLUSIONS

- Soil moisture in the CFE should be maintained at moisture content levels of ~ 30-50% of Water Holding Capacity (WHC).
- High level of soil water content can be used without soil drying.
- Microbial carbon determined by the CFE decreases exponentially with soil depth and there was no increase of the overestimation with depth.
- Chloroform may contribute ~ 2.0% to over-estimate biomass (carbon) regardless of soil type or depth.
- The results strengthened the credibility of the CFE process for evaluation of MB in agricultural soils.