Agriculture and Agri-Food Canada

# Soil origin and land use history determine C cycling in transplanted soils after 21 years


Soils and Crops- March 2017

Panchali Katulanda

Dr. Fran Walley and Dr. Bobbi Helgason

University of Saskatchewan

# Introduction


Soil microbial communities
- Functions
- Composition

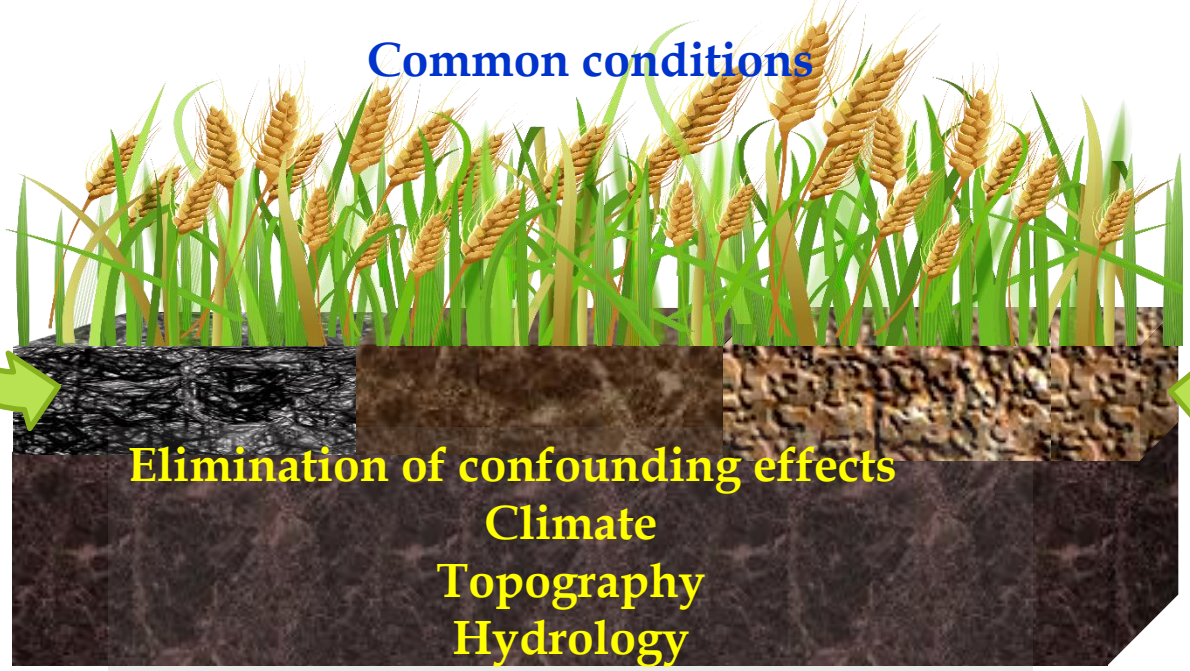
Nutrient cycling
Eg. C and N

# Soil Transplantation



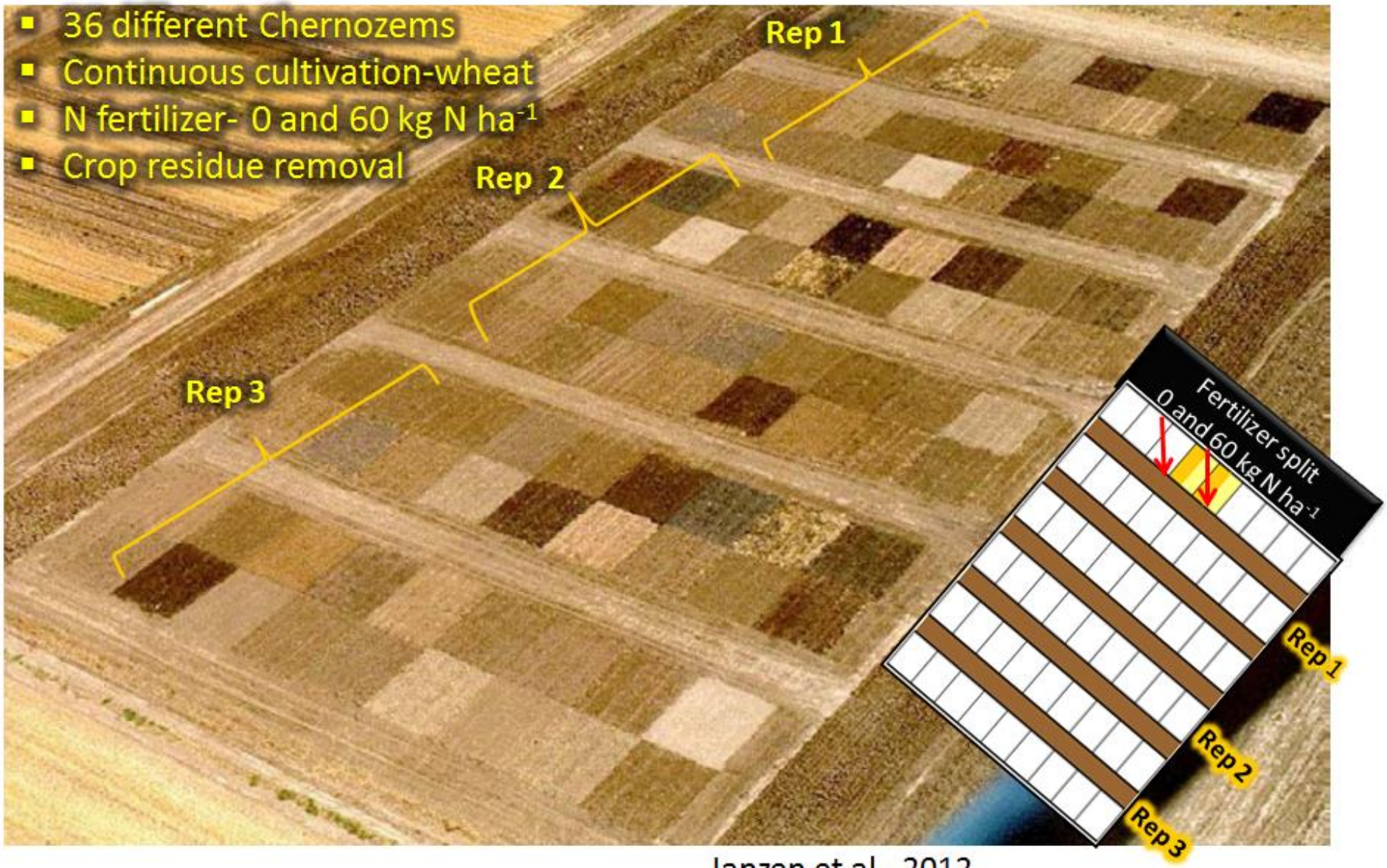

**36 diverse Chernozems**

**Common conditions**



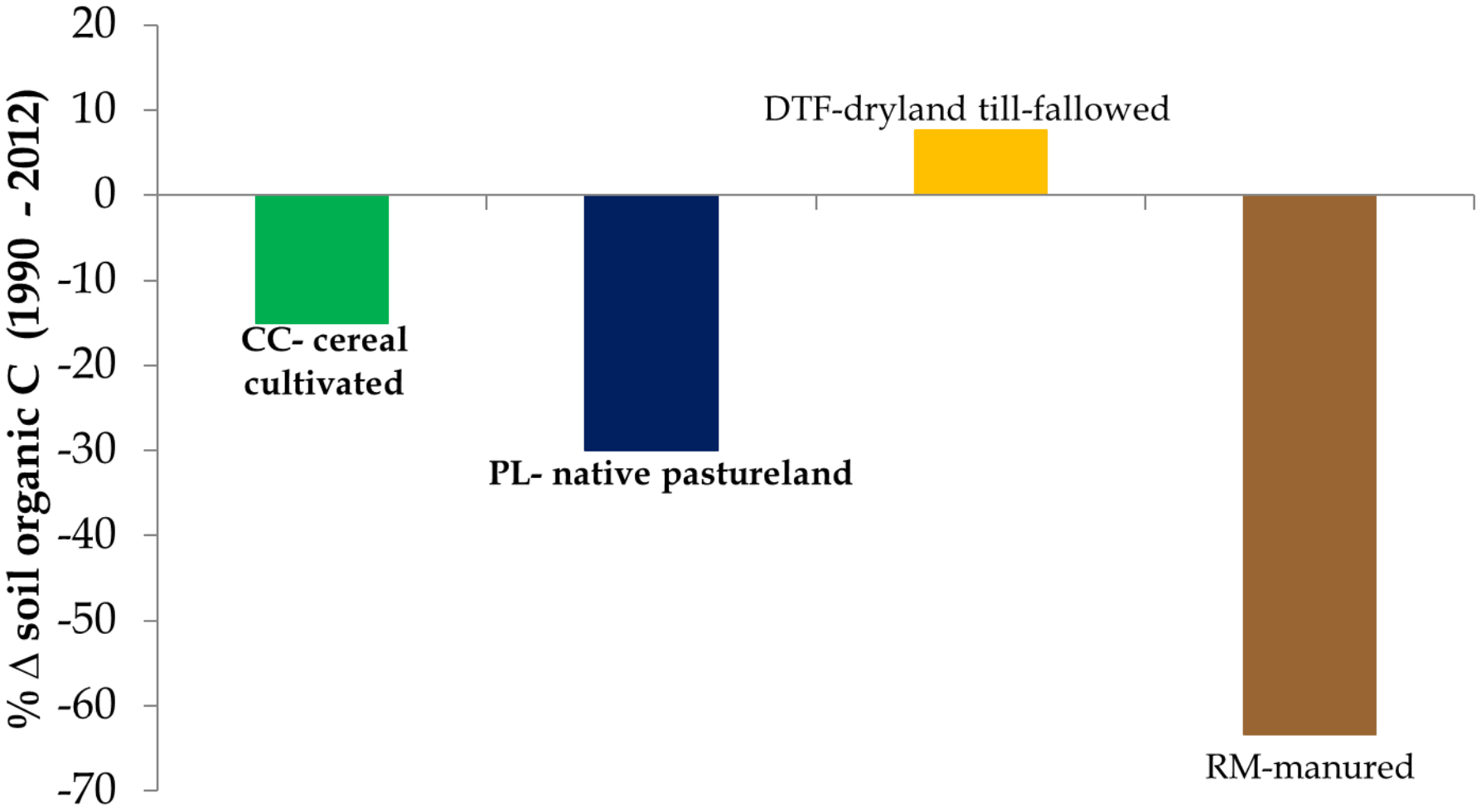

http://www.daviddarling.info/encyclopedia/S/AE_soil.html

# Long-term Transplanted Soils




Janzen et al., 2012

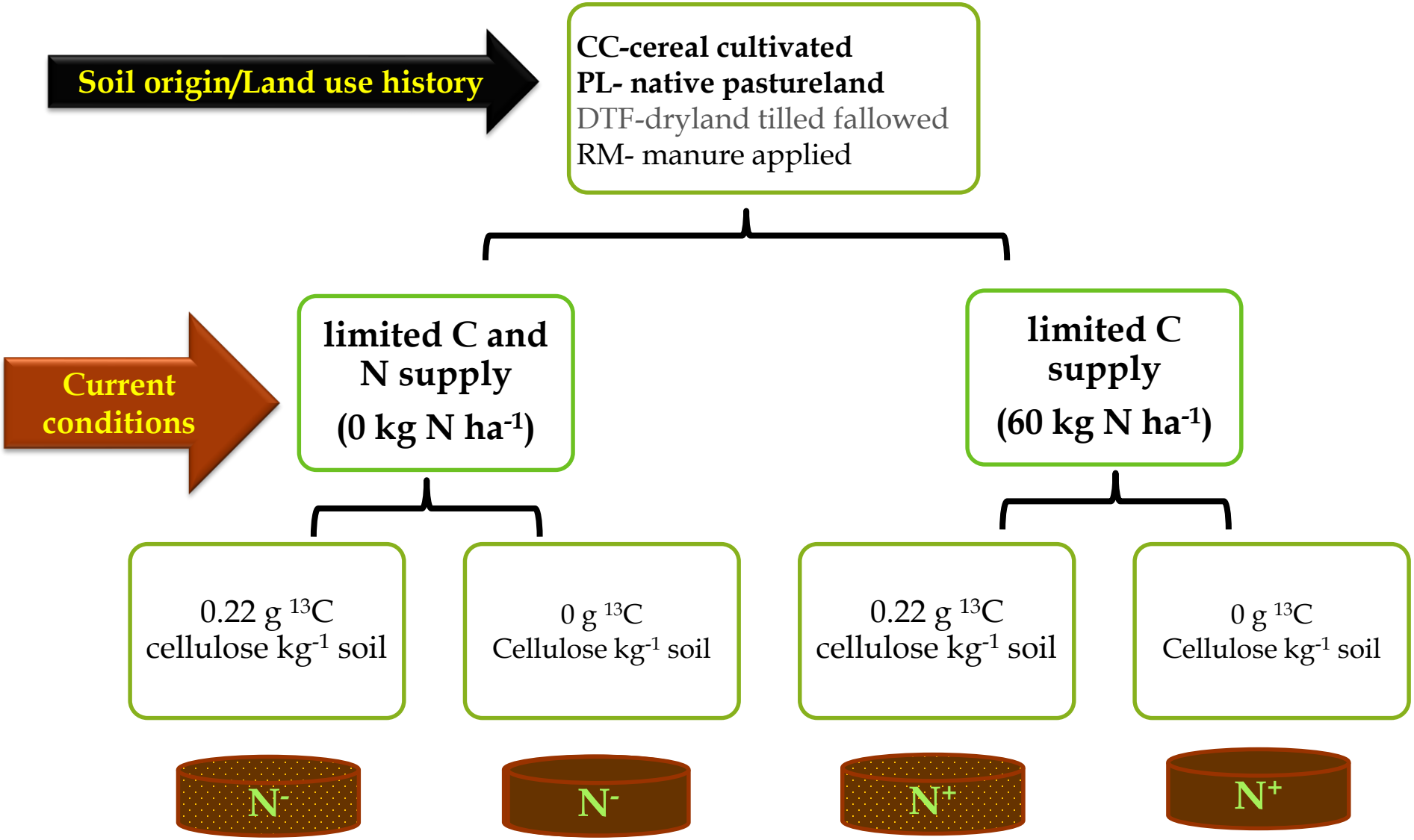
# Effect of Residue Removal on Soil Total Organic C After 21 Years



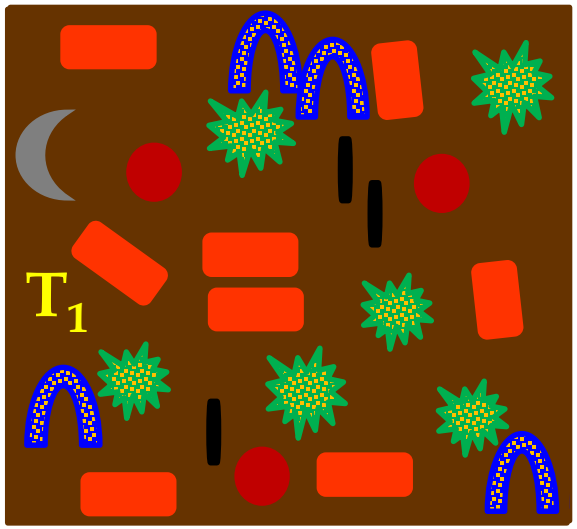
# Objectives

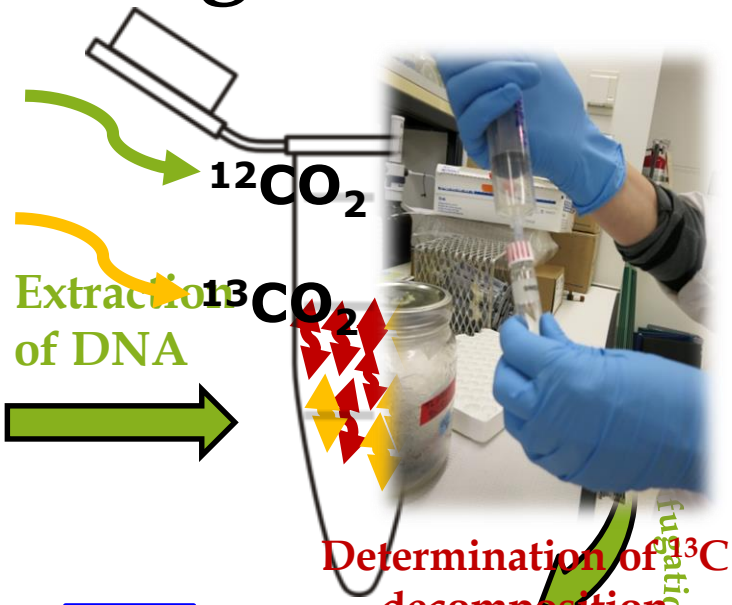
- To characterize microbial use of $^{13}C$ cellulose in different transplanted soils
- To observe the influence of long term N fertilizer application on $^{13}C$ labeled cellulose decomposition in different soils.

# Incubation conditions



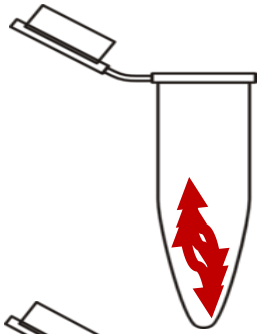
# Stable Isotope Probing

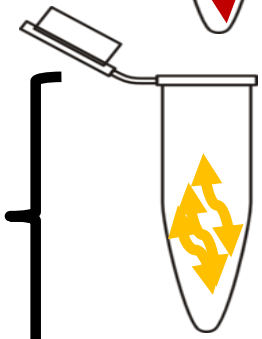






Determination of $^{13}$C decomposition

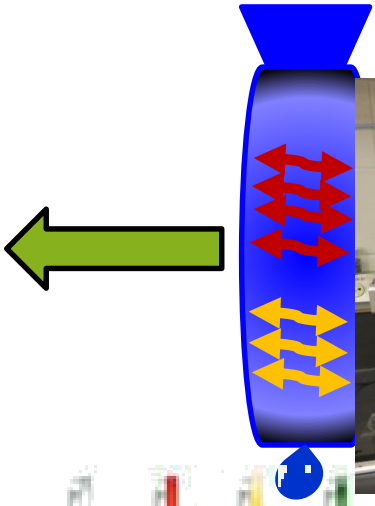


Light fraction
$^{12}$C DNA

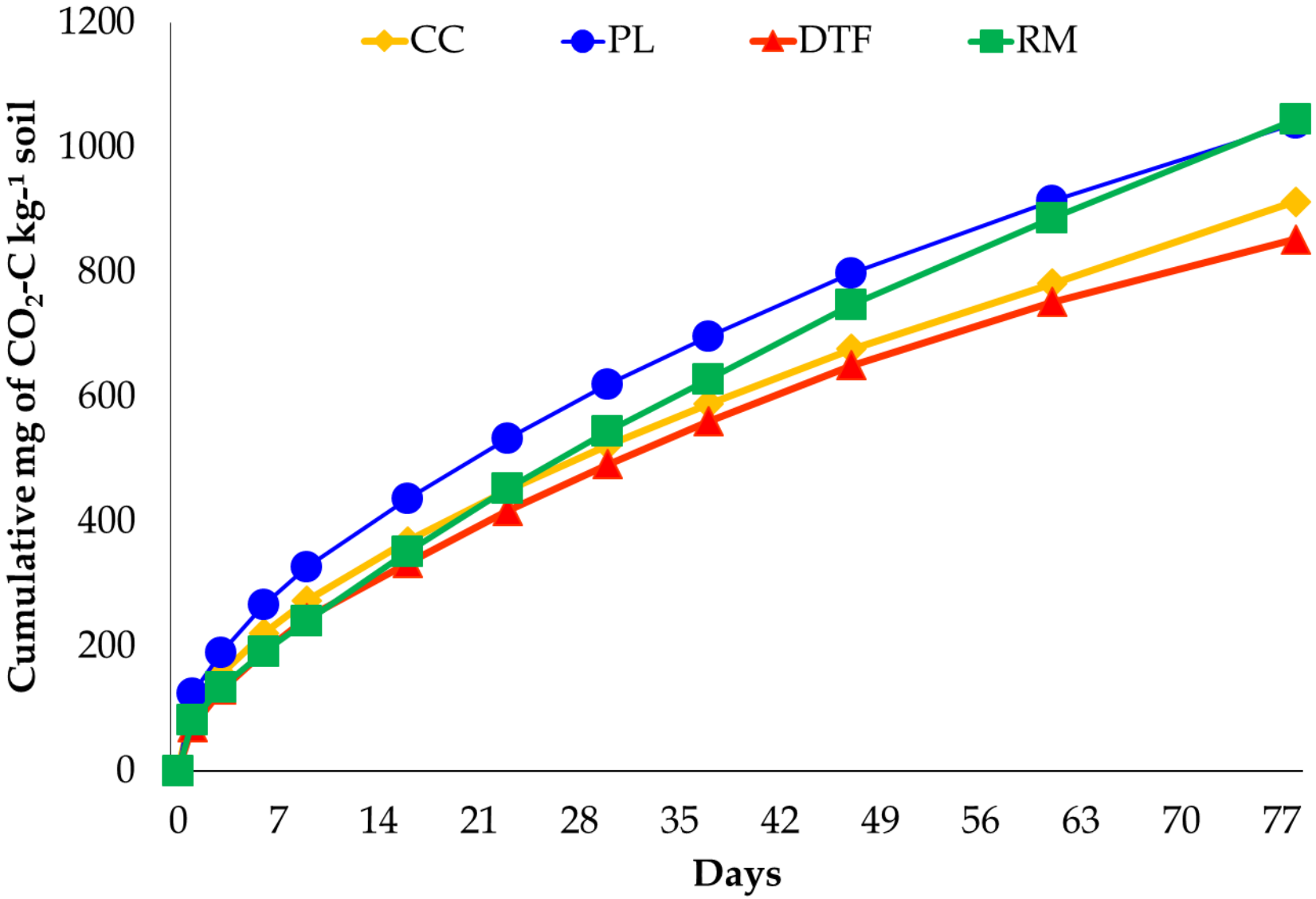


Heavy fraction
$^{13}$C DNA

Illumina sequencing



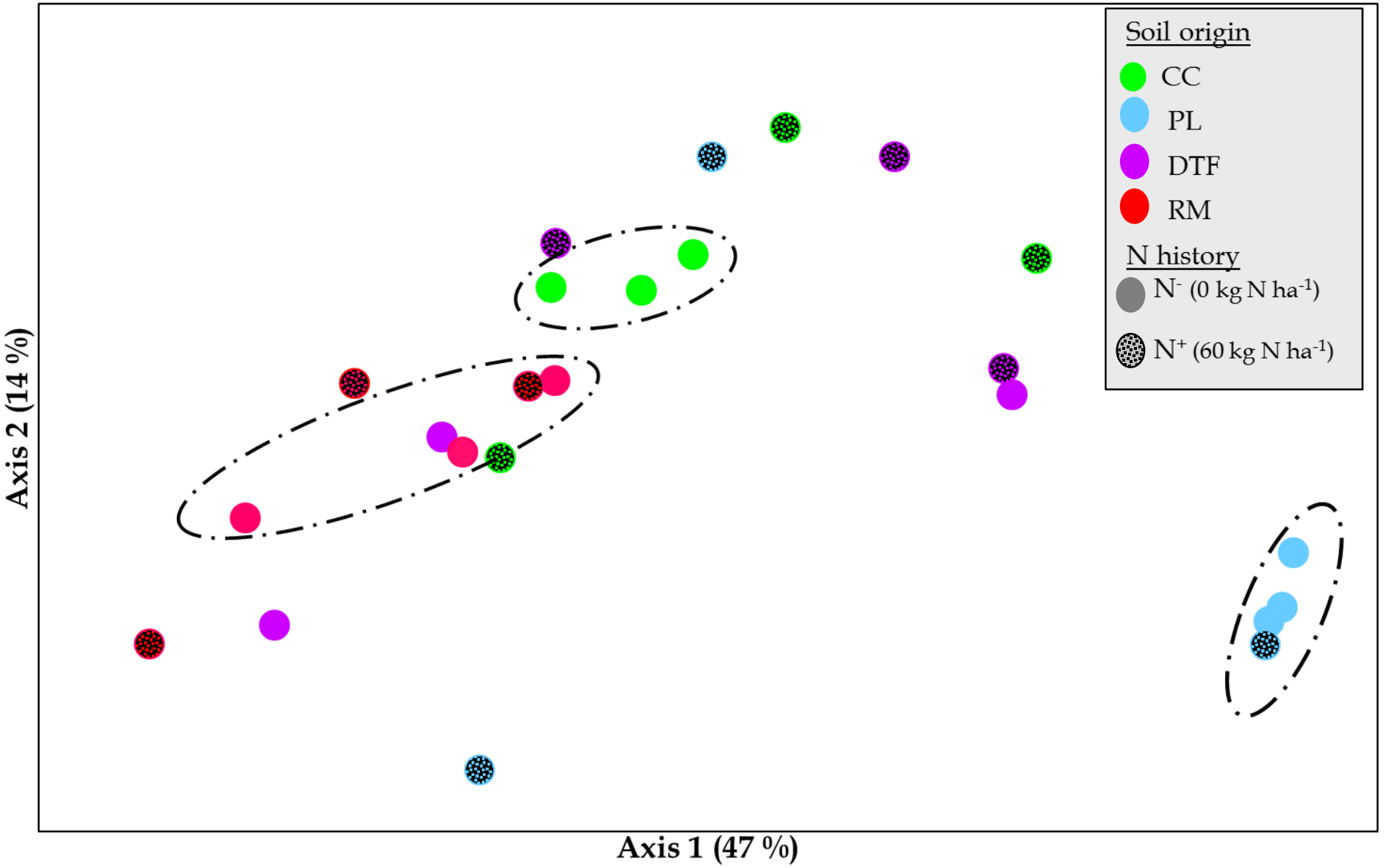
# Cumulative C-$CO_2$ emission



# Effect of N fertilization history on cumulative respiration

| Soil origin | $^{13}$Cellulose unamended | | | $^{13}$Cellulose amended | | |
|---|---|---|---|---|---|---|
| | N history | | N effect | N history | | N effect |
| | $N^-$ | $N^+$ | | $N^-$ | $N^+$ | |
| **CC** | 775 | 898 | 16 % | 966 | 1014 | 5 % |
| **PL** | 863 | 1102 | 28 % | 984 | 1205 | 23 % |
| **DTF** | 750 | 902 | 20 % | 762 | 999 | 31 % |
| **RM** | 979 | 1106 | 13 % | 970 | 1129 | 16 % |

# Decomposer microbial community structure



# Conclusion

- Soil origin and land use history have a long lasting impact on soil microbial community composition and C cycling.
- The effects of current agriculture land use management practices on soil decomposer communities and their functions remained affected by soil origin and past land use history.

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