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ICARDA/INRA Morocco



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Soil Organic Carbon and Enzymatic Activity under Conservation Agriculture in Moroccan Dry land

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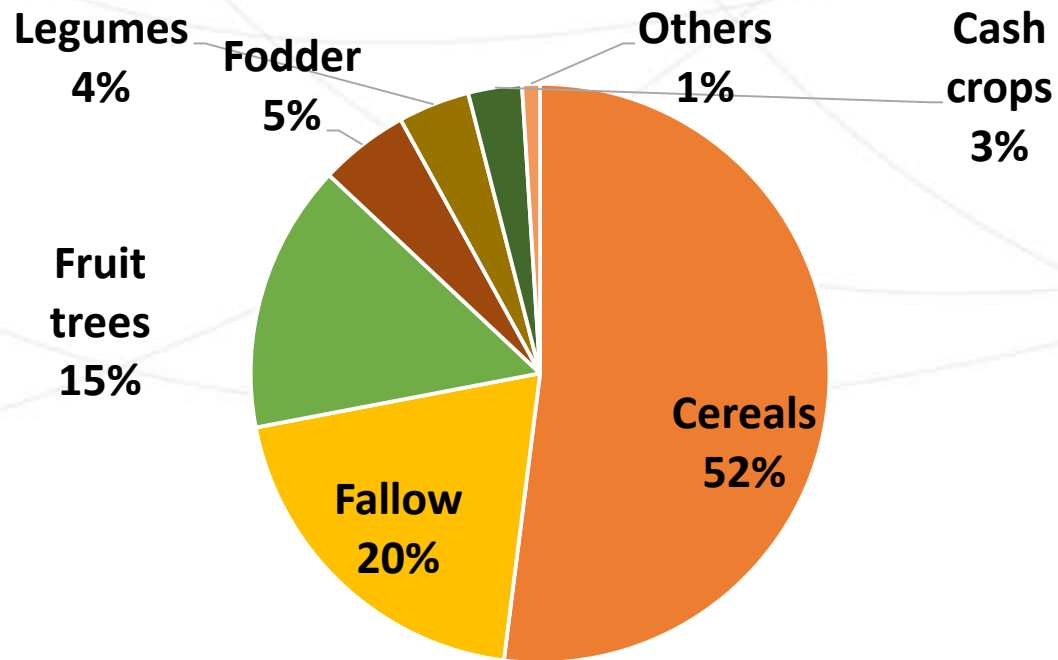
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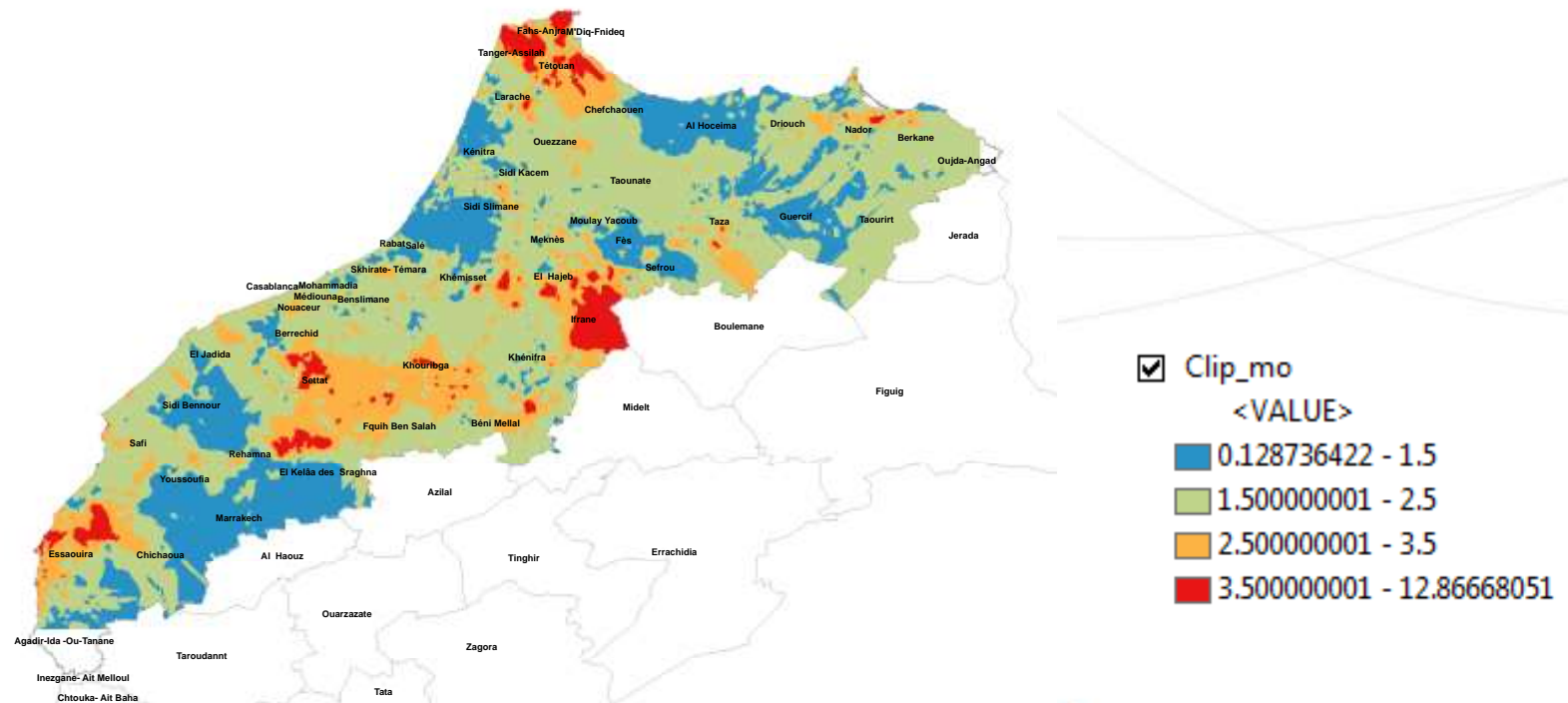


Land use in Morocco



Source: MAPMEFDR

Soil organic matter



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Will soil remain productive?

- Soil organic carbon pool of most soils has been depleted by soil erosion and widespread use of subsistence and intensive farming systems.
- Soil Organic Carbon ranges between 0.5 and 1 percent and rarely exceeds 2.0 percent.



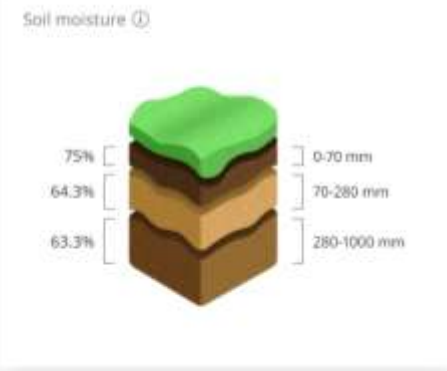
**Does Conservation Agri.
enhance the SOC quantity
and quality to shift the
negative effect of soil
degradation and climatic
change?**



Long term NT trial vs CT

- The experiment was established since autumn 2004.
- the trial consists of two tillage systems: no-tillage system (NT) and conventional tillage system (CT), performed on two adjacent plots of 200 m long and 100 m wide each.
- The CT plots were ploughed, according to farmers' practice in the region,
- The soil was not disturbed in the plots under NT which were maintained covered with flat and stubble residues at 30% levels at least.
- Wheat- food legume rotation was adopted and the crop management was similar in CT and NT treatments.

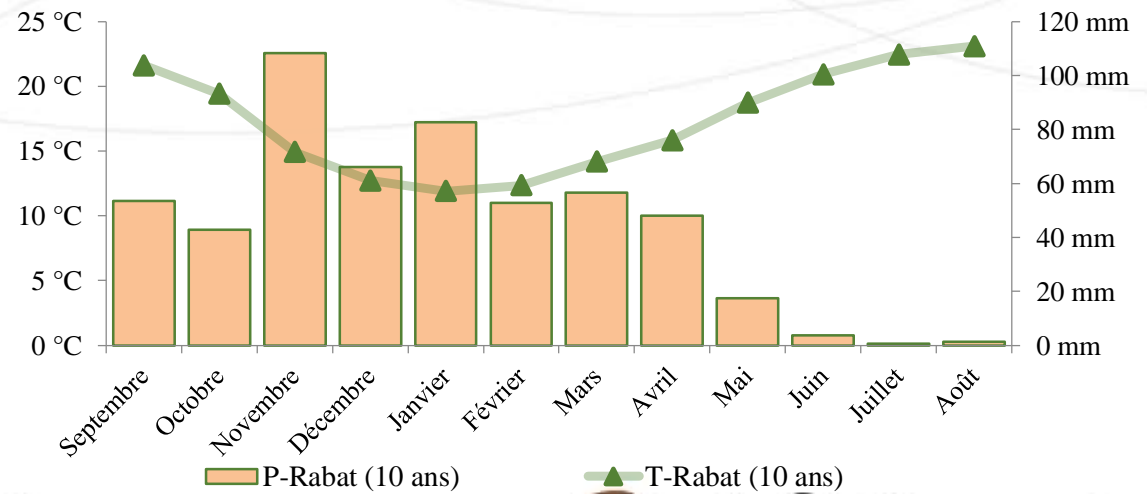




Haplic Vertisol

Rainfall & Temperature (10 Y average)

Mediterranean Climate



20/04/2021



Methods



Soil organic Carbon (SOC)

Walkley et Black

Soil organic Carbon Stock

$\text{Bulk Density} \times \text{SOC} \times \text{Depth}$



Humic acides

Method IHSS



Soil enzymatic properties

Three soil enzymatic activities involved in soil Carbon, Nitrogen and Phosphor were analyzed using leucine-amminopeptidase, alkaline phosphatase and arylsulfatase (Tabatabai, 1982)..

Double strand DNA (ds DNA) was extracted



Results



SOC stock

Depth (cm)	NT	CT
0–5	5.39a	4.14b
5–10	5.83a	4.62b
10–20	11.32a	10.77b
20–30	9.34a	9.26a
Total (0–30 cm)	31.89a	28.79b

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Humic Substances

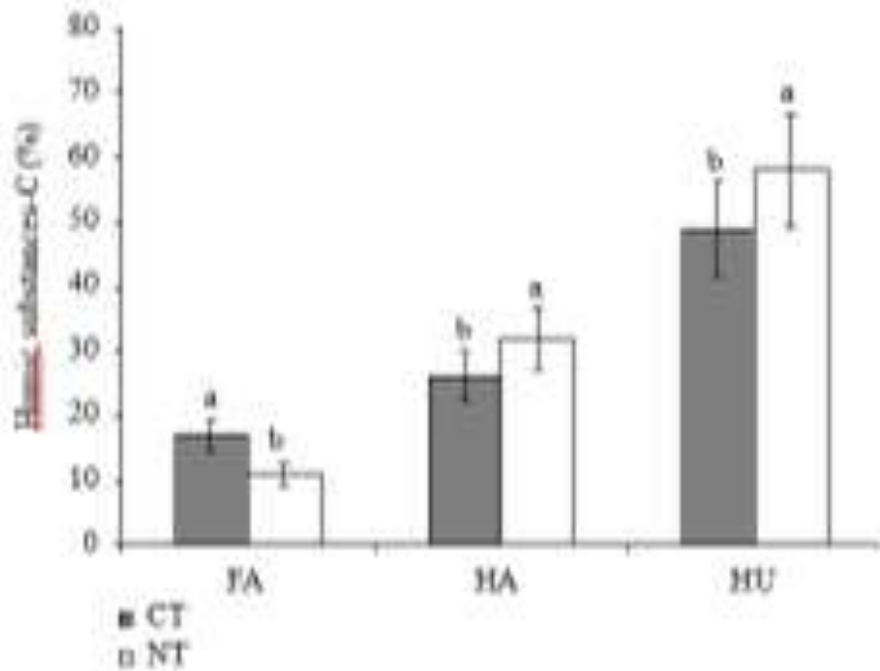
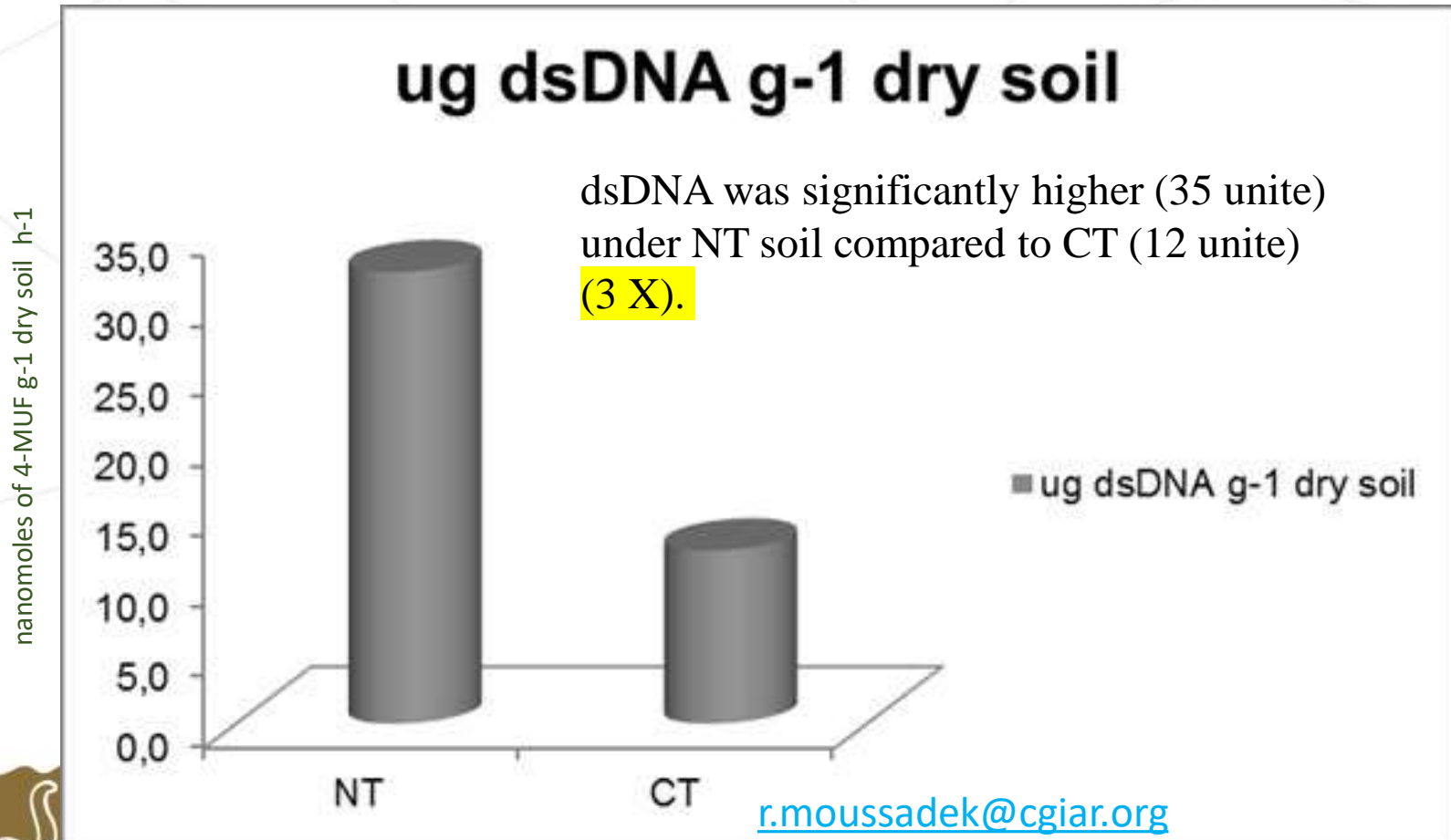


Fig.1: Humic (HA), fulvic (FA) acids and humine (HU) under the no tillage (NT)

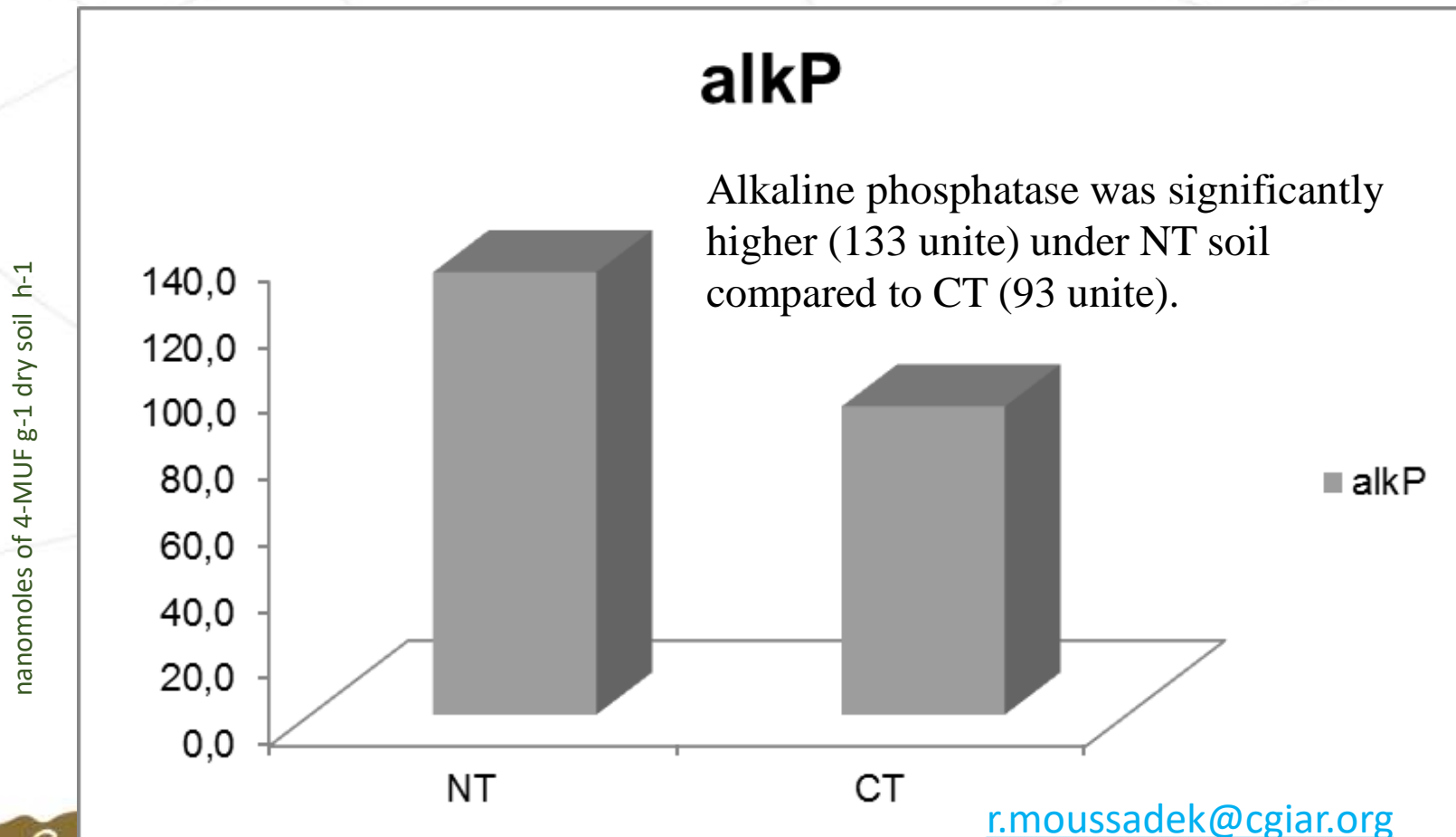
SOC under NT was composed of significantly higher amounts of humic acids (HA) and humin (HU) and lower amounts of fulvic acids (FA) compared to CT in Vertisol.

Additional HA serve to bond particles together and reduce soil erosion. In fact, in the studied Vertisol, positive effects of NT on aggregate stability and soil water content have been reported in a previous study by Moussadek et al. (2011,2014).

Double strand DNA



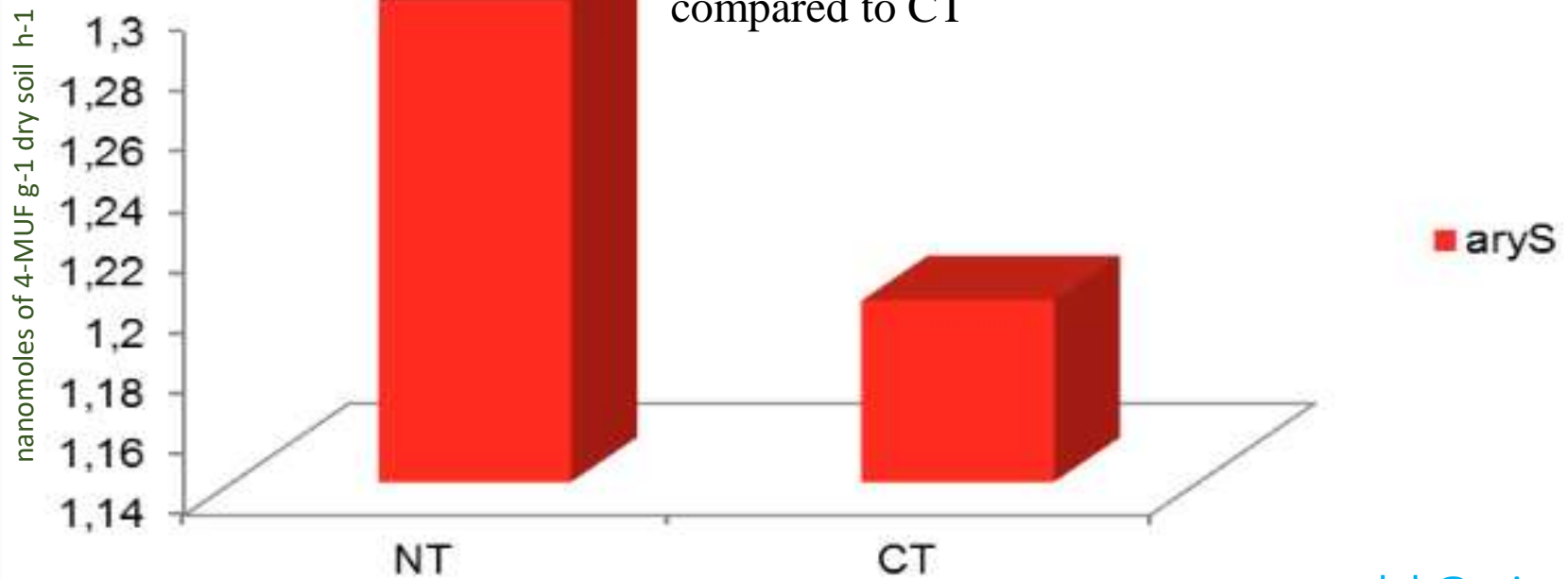
Alkaline phosphatase



Arylsulfatase

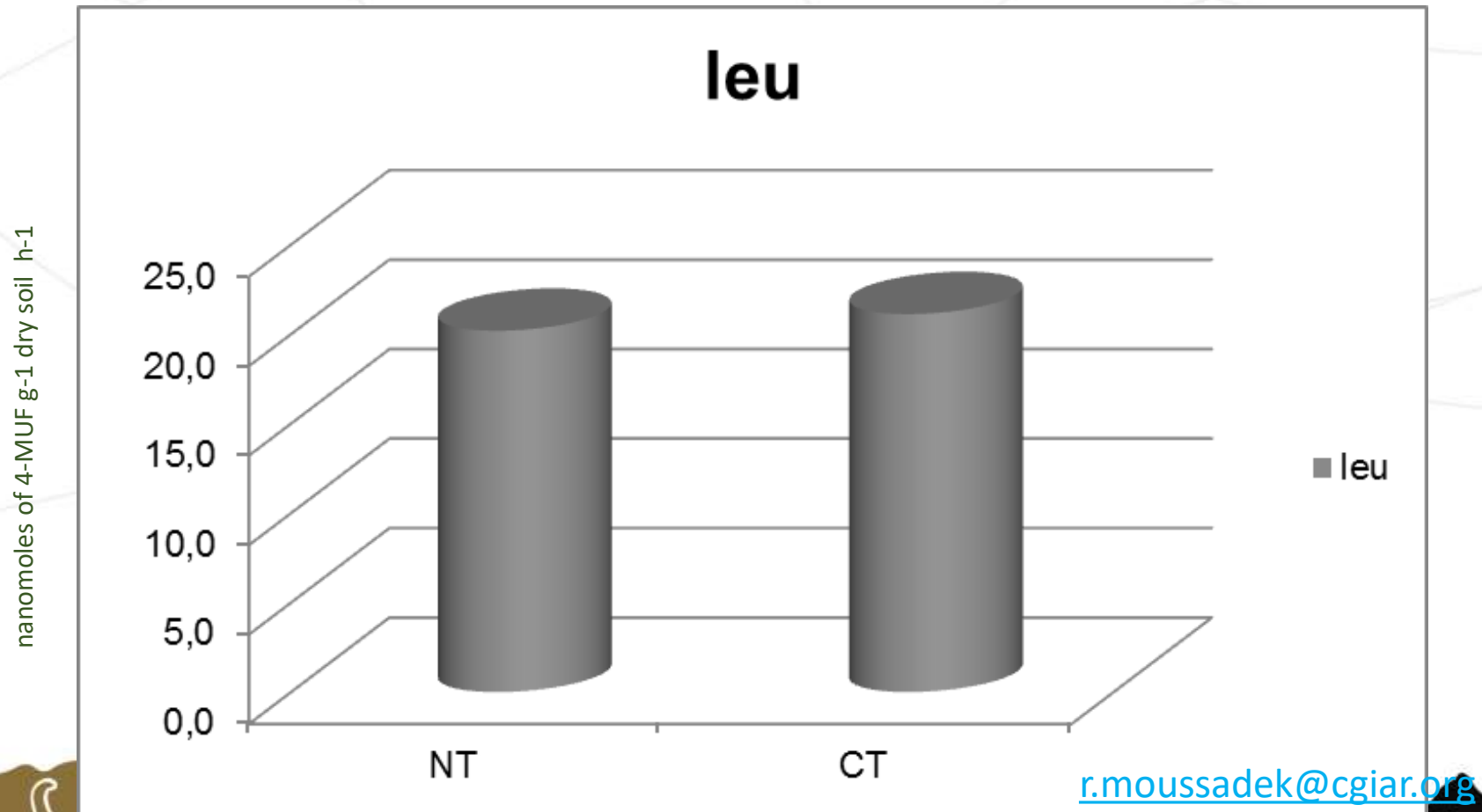
aryS

AryS was significantly higher under NT soil compared to CT



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Leucin-Amminopeptidase



Conclusion

- This study attests of the effectiveness of the conservation agriculture as Sustainable Soil Management for enhancing soil organic carbon quantity and quality.
- This study showed also a positive effect of adopting NT on soil biological enzymatic activities in Semi-arid Mediterranean zone
- More research is needed to monitor the effect of crop management on soil biological properties in semi-arid zones



Acknowledgements

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**Thank you for
your attention**

