EFFECT OF ORGANIC AND MINERAL FERTILIZERS ON GREENHOUSE GASES EMISSIONS FROM AN IRRIGATED MAIZE CROP IN MADRID (SPAIN)

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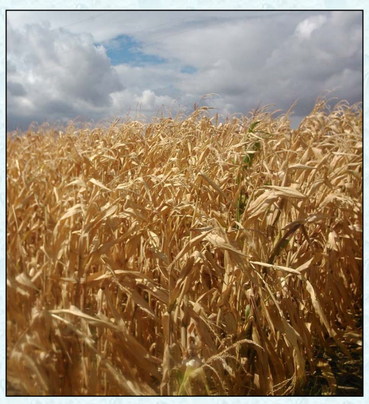
INTRODUCTION AND OBJECTIVES

- Application of **organic fertilizers (OF)** in semiarid Mediterranean soils is a **sustainable alternative** to improve low organic matter content and fertility levels, while reducing environmental impacts arising from a wrong management of these residues, and also abating farm costs associated with the use of synthetic fertilizers.
- Contrastingly, there is **no consensus** in the literature on the effect of the N source (organic vs synthetic) on **greenhouse gas** (GHG) emissions **from cultivated** soils (Chadwick et al., 2011, Thangarajan et al, 2013).
- In Mediterranean agro-ecosystems, OF have shown **potential to reduce N_2O losses**, but this abatement was only significant in the case of **solid amendments** (Aguilera et al., 2013).
- The **aim** of this study was to evaluate to evaluate the effect of partially **replacing top-dressing urea** (U) **by organic amendments** (pig urine, U-PU, and compost from the solid phase of pig slurry, U-PC) at seeding, on GHG emissions from soil in a maize (*Zea mays* L.) crop.

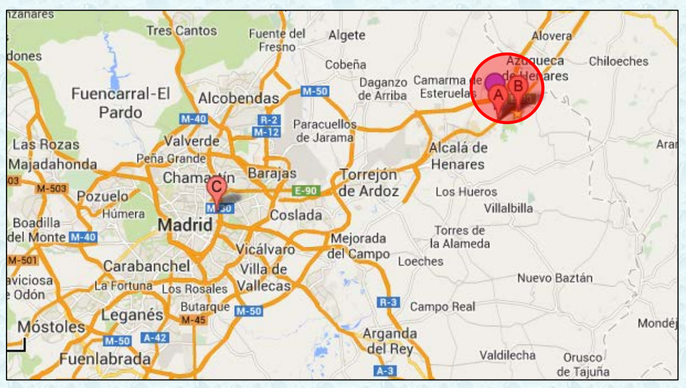
MATERIALS AND METHODS

Soil properties: *Calcic Haploxerept*						
% Sand	% Silt	% Clay	SOC (g kg^{-1})	Bulk density (g cm^{-3})	pH_w	$CaCO_3$, (g kg^{-1})
55	17	28	8.1 ± 0.3	1.4 ± 0.1	7.6	13.2 ± 0.4

- The study was carried out at **"El Encín"** field station (Madrid, Spain) on a clay loam soil (*Calcic Haploxerept*) under irrigated conditions.
- The experimental design was a three-replicated completely randomized.
- Maize was sown 7th May 2014, in a plant population density of 7.50 plants m^{-2}. All plots (except control, C) were fertilized with **180 kg N $ha^{-1}year^{-1}$**.
- GHG were sampled periodically by Static Closed Chamber method (Abalos et al., 2013) and quantified by Gas Chromatography.



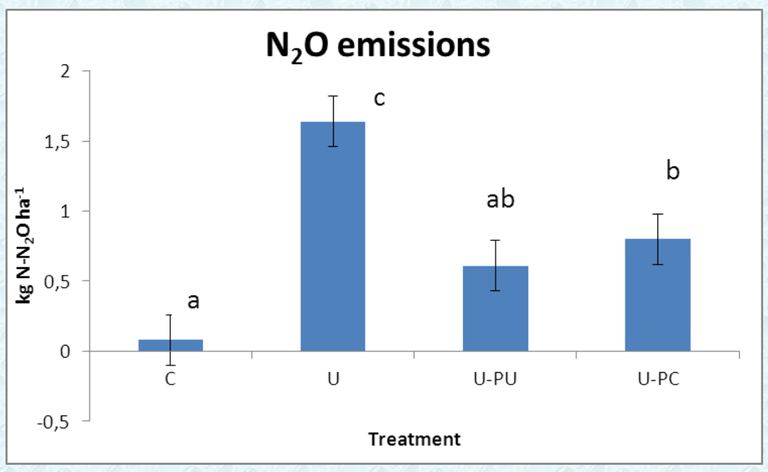
Treatment	kg N ha^{-1}		
	Urea	Pig Urine	Pig compost
C	–	–	–
U	180	–	–
U-PU	60	120	–
U-PC	60	–	120

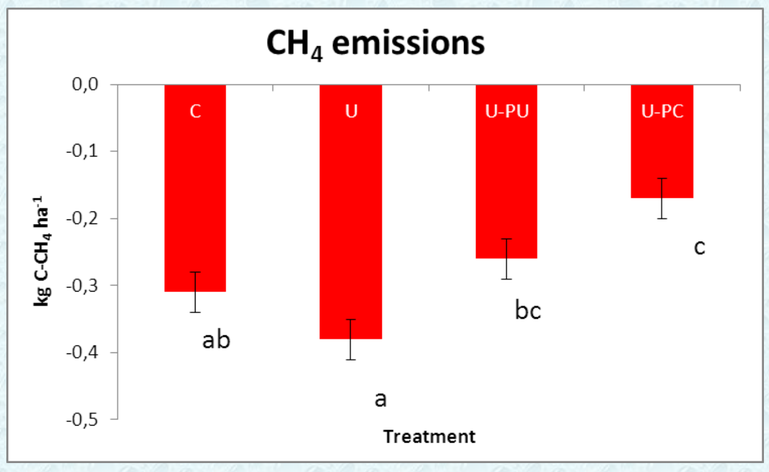


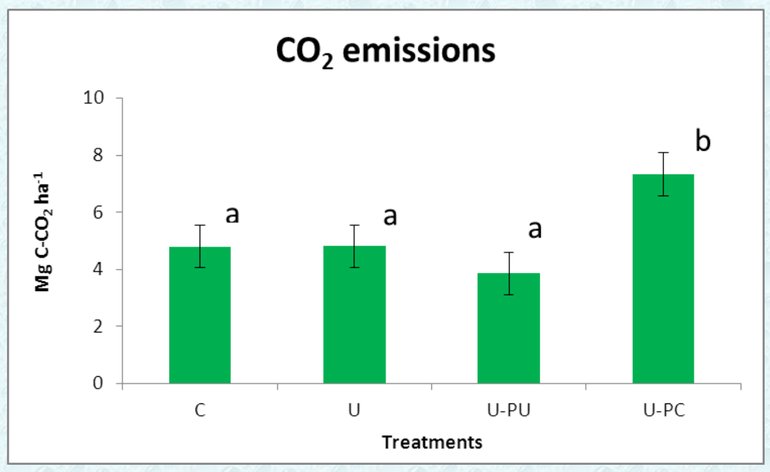
RESULTS

Cumulative emissions 18/09/2014

- *Bars with the same letter are not significantly different according to HSD Tukey test at a 0.05 probability level.*
- *Vertical bars indicate standard errors of the mean*







Global Warming Potential (CO_2 equivalents)

- 100-year time horizon (Linquist et al., 2012).
- A radiative forcing potential relative to CO_2 of 298 was used for N_2O and 25 for CH_4

Treatment	kg CO_2 eq ha^{-1}	Multiple comparisons (Tukey 95%)
C	17.7	X
U-PU	174.5	XX
U-PC	235.2	X
U	479.9	X
S.E.	53.9	

CONCLUSIONS

- Both solid or liquid **OF** showed a **significant abatement of N_2O** cumulative emissions in this irrigated Mediterranean cropping area ($P < 0.05$) comparing to U.
- Urea-Pig Compost (**U-PC**) treatment showed the **lowest CH_4 sink** and highest cumulative soil respiration rates ($P < 0.05$).
- Considering **GHG-GWP**, the use of **OF** can be considered as an **advisable practice** to mitigate GHG emissions under Mediterranean climatic conditions.

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