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DIPARTIMENTO DI SCIENZE DELLE  
PRODUZIONE AGROALIMENTARI  
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# Greenhouse gas and ammonia emissions from soil: the effect of organic matter and fertilization method

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## INTRODUCTION

- Emissions from Global agricultural sector accounts for:
  - 11% of  $\text{CO}_2$
  - 50% of  $\text{CH}_4$  (GWP = 28 - 36)
  - 68% of total  $\text{N}_2\text{O}$  (GWP = 265 - 298)
  - 94% of  $\text{NH}_3$
- Main sources are represented by **fertilization, intense livestock systems** and **fuels**
- Nowadays, low-impact agricultural management strategies are a hot topic
- **Digestate** is by-product of biogas production process and represents an alternative to mineral fertilizers due to the high N-easily available for crops ( $\text{NH}_4^+$ )
- **Compost** from organic fraction of municipal solid waste (**OFMSW**) is a solution for organic wastes re-used as fertilizer (85% of total N is represented by organic N)



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## MATERIALS AND METHODS

- **3** replicates
- **2** organic matter levels: **OM1** (1,3%) – **OM2** (4,3%)
- **4** treatments: **Control** (no fertilization)

**Digestate** (liquid fraction, pig slurries)

**Urea**

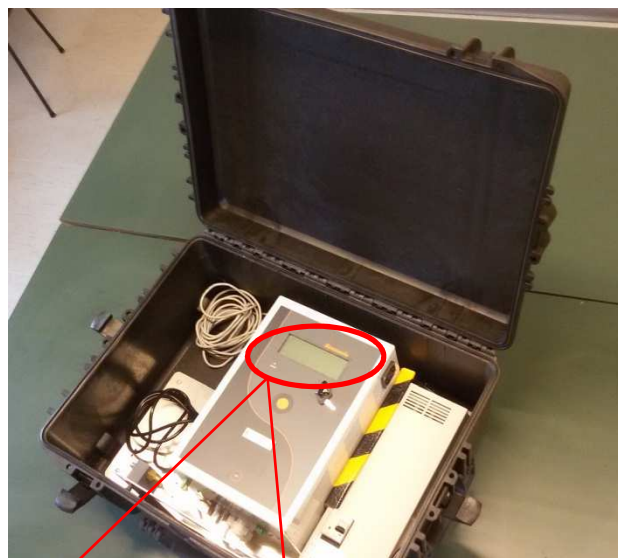
**Compost** (organic fraction of  
municipal solid waste)

- **18** pots (volume 8 L)
- Fertilization rate **150** Kg N ha<sup>-1</sup>
- **2** irrigations (10 mm each)



	Urea	Digestate	Compost
<b>N content Total %</b>	46	0.319	2.27
<b>N-NH<sub>4</sub><sup>+</sup> %</b>	-	0.284	0.15
<b>N-NO<sub>3</sub><sup>-</sup> %</b>	-	0.035	0.0013
<b>P content Total %</b>	-	1.84	0.34
<b>K content Total %</b>	-	6.94	0.97

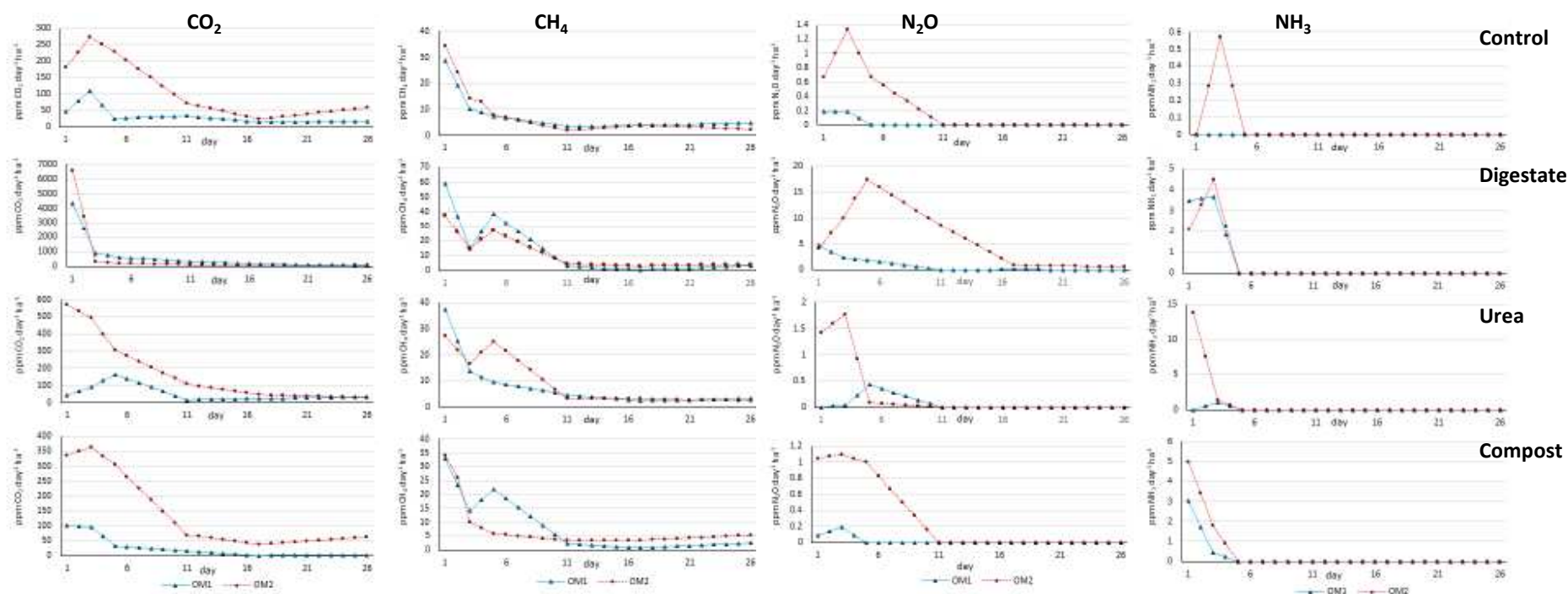
## MATERIALS AND METHODS



## RESULTS

	kg CO <sub>2</sub> -C ha <sup>-1</sup>		kg CH <sub>4</sub> -C ha <sup>-1</sup>		kg N <sub>2</sub> O-N ha <sup>-1</sup>		kg NH <sub>3</sub> -N ha <sup>-1</sup>	
	OM1	OM2	OM1	OM2	OM1	OM2	OM1	OM2
<b>No-fertilizer</b>	38,50 <sup>g</sup>	129,19 <sup>e</sup>	8.06 <sup>d</sup>	8.06 <sup>d</sup>	0.04 <sup>c</sup>	0.31 <sup>bc</sup>	0.00 <sup>e</sup>	0.06 <sup>de</sup>
<b>Digestate</b>	604,12 <sup>b</sup>	679,75 <sup>a</sup>	15.07 <sup>a</sup>	12.65 <sup>b</sup>	0.96 <sup>b</sup>	7.65 <sup>a</sup>	0.61 <sup>b</sup>	0.59 <sup>b</sup>
<b>Urea</b>	67,04 <sup>f</sup>	206,67 <sup>c</sup>	8.95 <sup>d</sup>	11.17 <sup>bc</sup>	0.09 <sup>c</sup>	0.29 <sup>bc</sup>	0.09 <sup>de</sup>	1.15 <sup>a</sup>
<b>Compost</b>	29,22 <sup>h</sup>	169,35 <sup>d</sup>	9.62 <sup>cd</sup>	8.38 <sup>d</sup>	0.03 <sup>c</sup>	0.38 <sup>bc</sup>	0.26 <sup>cde</sup>	0.54 <sup>bc</sup>

## RESULTS





## CONCLUSIONS

- In the bare soil experiment GHGs emissions can be overestimated (absence of crop)
- Organic Matter plays a key role on GHGs and  $\text{NH}_3$  emissions from soil enhancing bacteria activity
- Digestate and Compost produce higher  $\text{CH}_4$  emissions from OM1 than OM2
- Compost is able to mitigate environmental impacts of fertilizers (reduction of  $\text{CO}_2$  and  $\text{NH}_3$  emissions than Urea)
- Further experiments on field scale are required for a more in depth understanding of emissions dynamics



## AND MORE...


- Bachelor thesis was wrote with the support of Professor Branko Cupina and Dr. Svetlana Vujic of PFNS on ***“The role of intercropping on Nitrogen availability in agriculture”***



## AND MORE...

- a scientific publication is in progress between DISPAA and PFNS on the topic of Nitrogen emission losses and Nitrogen Use Efficiency from different cover crops





Thanks for your attention