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experimental facility: Ex-ante assessment of variations
in C, N, P, Cu and Zn soil stocks**

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Influence of organic broiler droppings on the soil of 2 contrasting outdoor-runs: Assessment of nutrients soil stocks variations

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Introduction

Organic broilers must have access to an outdoor-run:

- sustainability ? ⇒ AlterAviBio program
- broilers droppings on outdoor-runs ⇒ impact on soils ?

Material and Methods

Outdoor-runs characteristics

2 outdoor-runs of 2500 m²:
seeded grassland (G) vs. oak canopy (T)



INRA domain
"Le Magneraud"



- 5 batches x 750 organic broilers (Mar. 2009 to Nov. 2010)
- first outdoor access at 28 days of age

Soil sampling and analysis

- 2 horizons: 0 – 5 cm and 5 – 15 cm
- soil bulk density (g cm⁻³): cylinder method
- soil contents (g kg⁻¹), ISO and AFNOR norms: organic C, total N, Olsen P₂O₅, Zn and Cu



$$\text{nutrient stock} = \text{horizon thickness} \times \text{bulk density} \times \text{soil content}$$

Excretion assessment

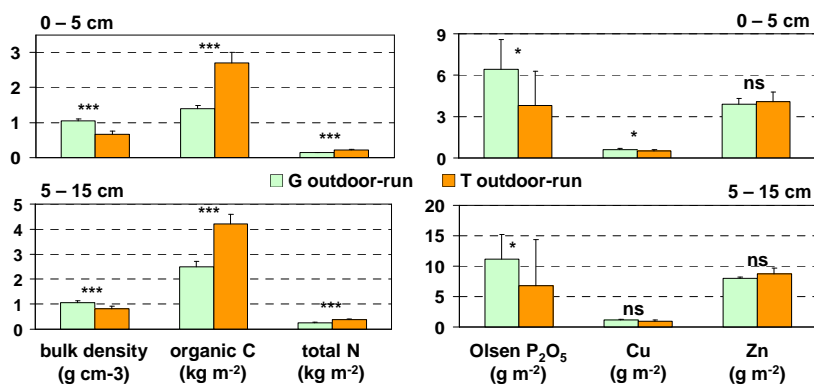
- Outdoor-run excretion for 5 batches of 750 broilers: CORPEN [1] ⇒ N, P₂O₅, Cu and Zn
C/N ratio in fresh droppings [2] [3] ⇒ organic C
 - 2 hypotheses of droppings distribution:
uniform distribution (hyp. 100%) VS.
excretion on the first half of the outdoor-run (hyp. 50%)
- ⇒ comparison to detection thresholds

Objectives

- ⇒ measurements of initial stocks of C, N, P, Cu and Zn in the soils of two contrasting outdoor-runs types :
grassland (G) vs. oak canopy (T)
- ⇒ prediction of final nutrients stocks and comparison to estimated detection thresholds

Results

Soil characteristics



Figures 1a & 1b: Nutrients stocks for G and T outdoor-runs for 0 – 5 and 5 – 15 cm horizons

Broilers excretion

Table 2: Outdoor nutrients broilers excretion according to two droppings distribution hypotheses (prediction for 5 batches x 750 broilers)

	organic C (kg m ⁻²)	total N (kg m ⁻²)	Olsen P ₂ O ₅ (kg m ⁻²)	Cu (g m ⁻²)	Zn (g m ⁻²)
hyp. 50%	0.450	0.020	0.027	0.056	0.297
hyp. 100%	0.900	0.039	0.054	0.111	0.594

Soils stocks variations VS. detection thresholds

G outdoor-run	T outdoor-run
organic C, total N, Olsen P ₂ O ₅ DETECTABLE	
total Cu, total Zn NOT DETECTABLE	

Conclusions

After 5 batches of 750 broilers:

- ⇒ variations in soil stocks will be detectable ONLY for C, N and P
- ⇒ final spatial variability of stocks will depend on droppings distribution (broilers behavior)
- ⇒ final stocks will be measured and compared to results of this study

References

- [1] CORPEN, 2006. Estimations des rejets d'azote, phosphore, potassium, calcium, cuivre, zinc par les élevages avicoles. p. 55.
- [2] Amanullah, M., 2007. Nutrient Release Pattern during Composting Poultry Manure. Research Journal of Agriculture and Biological Sciences, 3(4): 306-308.
- [3] Rynk et al., 1992. On-Farm Composting Handbook. Natural Resource, Agriculture, and Engineering Service. Ithaca, New York, USA.

