



Theme 1

Status and trends of global soil nutrient budget



Bio-based fertilizers: some case studies

ROSSI Gabriella¹, BENI Claudio², SOCCIARELLI Silvia¹

¹ Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria - Centro di ricerca Agricoltura e Ambiente (CREA-AA) - Rome (Italy);

² Consiglio per la Ricerca in agricoltura e l'analisi dell'Economia Agraria- Centro di ricerca Ingegneria e Trasformazioni agroalimentari (CREA-IT) - Monterotondo (Rome, Italy).

INTRODUCTION

Optimizing the use of bio-based fertilizer can contribute to the replacement of chemical fertilizers. Bio-based fertilizers contain mainly nitrogen and phosphorus, which can be recovered to improve soil fertility and crop nutrition. Furthermore, agronomic systems which adopt fertilization practices with bio-based fertilizers administer organic matter to the soil, increasing soil organic carbon levels, mitigating soil organic carbon loss with positive effects on soil quality. The agricultural use of compost as well as of digestate is rising, allowing the re-use and the transformation of the bio-residues with positive effects on soil fertility and crop productivity.

This study aimed to evaluate the effects of fertilization with zootechnical digestates on *Lolium spp.* (**Site A**) and the effect of the compost from distillation residues on the productivity and the nutritional characteristics in *Cucurbita pepo* L. (**Site B**).

METHODOLOGY

Site A

Ryegrass was fertilized with three types of zootechnical digestates. Plants were grown in pots and five harvests were made. During cultivation, six rains were simulated. Plant productivity and nitrogen uptake were determined. At each rain, the concentration of nitrogen in the leached was analysed.

Site B

Zucchini, grown in open fields, were fertilized with chemical fertilizer (F) or compost (C). The productivity, the nutrient contents and some quality indexes were determined.

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RESULTS

Main results

Site A

The crop nitrogen nutrition and nitrogen leaching were influenced by the mineral nitrogen content and C/N ratio in digestates. The pig slurry as such digestate (PD) had similar effects to chemical nitrogen fertilizer. The pig slurry-solid fraction digestate (PDSF) had similar effects to a soil improver, supporting sufficient productivity and with limited nitrogen losses in the eluates. The bovine manure digestate (BD) was similar to fertilizer which gradually releases nitrogen into the soil (Tables 1 and 2).

Site B

The highest productivity and dry weight were higher in treatment with compost. Few significant differences were determined in nutrients contents in zucchini squash differently fertilized. The effect of compost fertilization was evidenced on some quality parameters (Figure 1).

CONCLUSIONS

These studies have highlighted the agronomic validity of the use of recyclable by-products of agro-industrial and livestock waste, in order to reduce the use of synthetic fertilizers in line with the main objectives of the European "Farm to Fork" strategy and the Circular Economy.

The recovery and recycling in agriculture of bio-based fertilizers represents an opportunity to combine sustainable practices and circular economy. It also represents a strategy to create a positive C budget (C input > C output) contributing to soil carbon sequestration.

REFERENCES

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Site A

TABLE 1. Main chemical parameters of zootechnical digestates (d.m.) - Site A.

Parameters	DP	PDSF	BD
N tot. %	8.2	2.2	5.6
Organic N %	2.2	1.2	2.4
Organic C %	24.7	41.8	37.5
C/N ratio	3	19	7

TABLE 2: cumulative values of parameters analysed on ryegrass and eluates - Site A

	PD	PDSF	BD
N concentration in ryegrass (% d. w.)	29.74	27.86	29.93
Plant biomass production (g pot ⁻¹ d.w.)	16.86	21.2	20.41
N-uptake (g pot ⁻¹ d.w.)	1.0	1.18	1.23
Total N leached (mg pot ⁻¹)	799	418	947

Site B

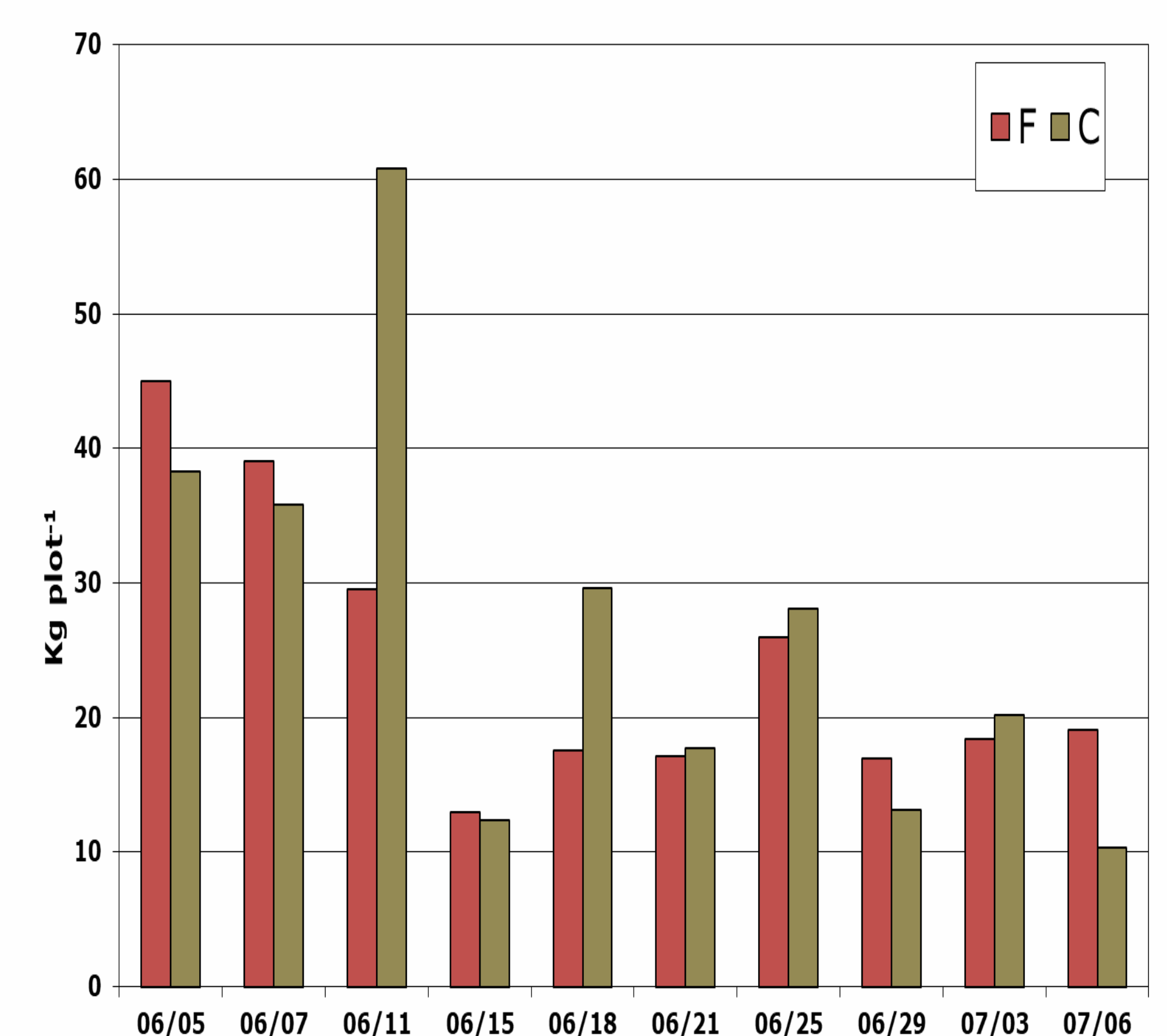


FIGURE 1: Crop yield - Site B

