



## Theme 1

### Status and trends of global soil nutrient budget



# Nitrogen diagnosis in maize-forage grasses intercropping receiving nitrogen as side-dressing for production sustainability

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## INTRODUCTION

The maize- grasses intercropping has been used in Brazil for the recovery of degraded soil and has been identified as part of the new Brazilian agricultural revolution. This practice, when used in autumn-winter season, possibility soil coverage and animal feed in the dry season. Grasses and maize need nitrogen adequate supply to ensure adequate production, but in this system only maize is fertilized. Thus, the purpose of this study was to evaluate N in the diagnostic leaves of the maize and grasses intercropped receiving N rates as side-dressing in the dry season (autumn-winter crop) for sustainability of this system.

## METHODOLOGY

- Site experimental: Red-Yellow Argisol - Ultisol located in southeastern Brazil (22°42'S, 47°18'W, and 570-m altitude).
- Experimental design: Randomized blocks with four replications in a split-plot scheme.
- Main plots: Maize in a monoculture system (Fig.1a); Maize intercropped with Congo grass (*Urochloa ruziziensis* cv. Comum) (Fig.1b); and Maize intercropped with Aruana Guinea grass (*Megathyrsus maximus* cv. Aruana) (Fig.1c).
- Subplots: 0; 50; 100 and 150 kg ha<sup>-1</sup> of N applied manually as side-dressing along maize and grasses rows grown when maize plants had 5–6 fully expanded leaves.
- Evaluation: N in the leaves diagnostic of the maize and grass at the maize flowering at 2021 autumn-winter crop.

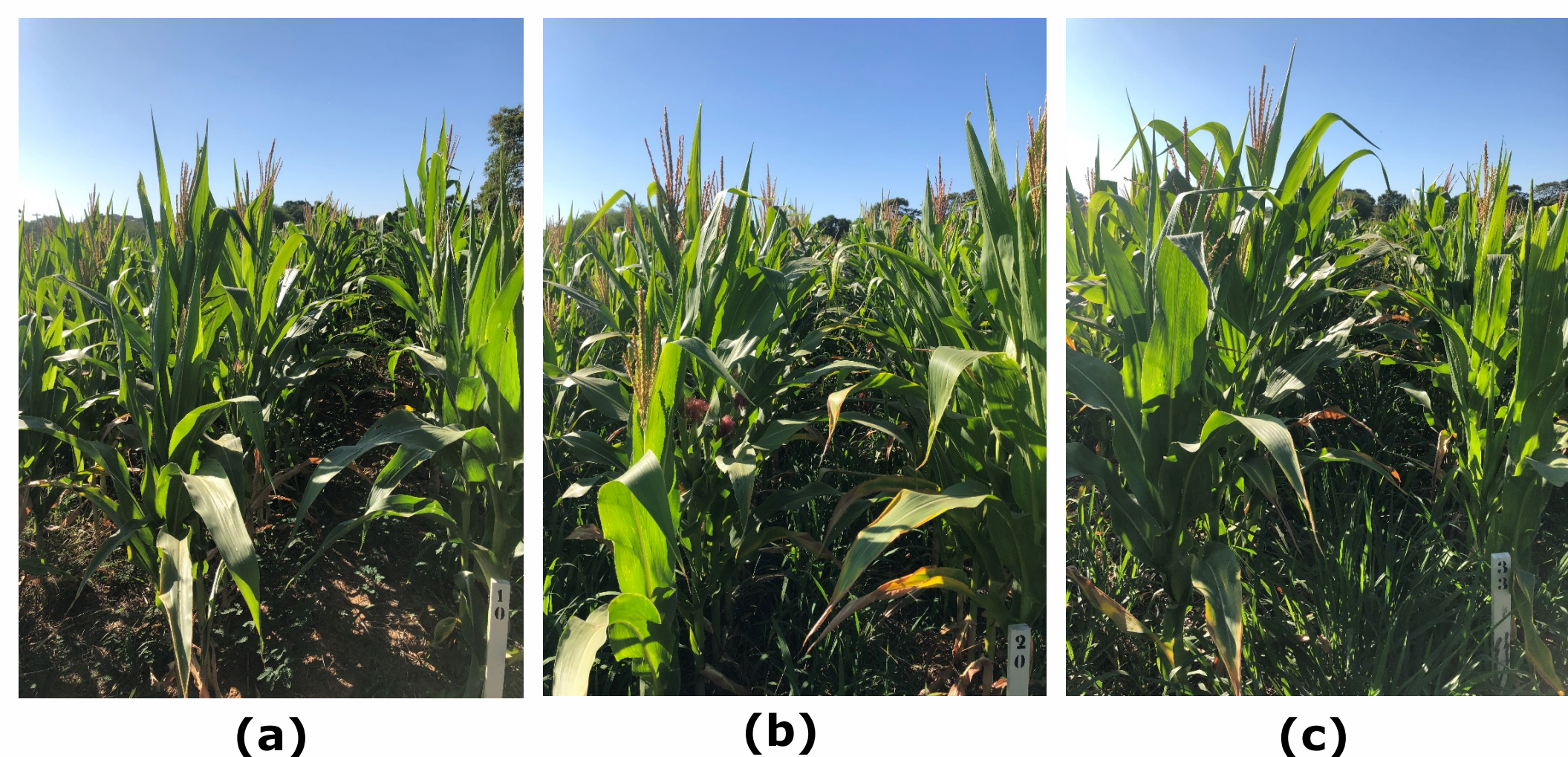


Fig.1: Maize in a monoculture system (a); Maize intercropped with Congo grass (b); and Maize intercropped with Aruana Guinea grass (c).

## RESULTS AND DISCUSSION

- N concentration in the diagnostic leaves of the maize and of the grasses showed significance for the interaction between maize-Congo grass intercropping and nitrogen rates applied as side-dressing (Table 1).

Table 1. Nitrogen diagnosis in maize - grasses intercropping receiving nitrogen as side-dressing in the autumn-winter of 2021 crop.

Consórcios	N rates (kg ha <sup>-1</sup> )					F test for regression	
	0	50	100	150	Means	Linear	Quadratic
<b>Nitrogen in the diagnostic leaves of the maize</b>							
Maize in monoculture system	17.10 a	17.46 a	16.92 a	18.18 a	17.42 a	ns	ns
Maize-Aruana grass intercropping	15.48 a	17.82 a	18.00 a	18.72 a	17.50 a	ns	ns
Maize-Congo grass intercropping	15.30 a	16.38 a	16.74 a	19.26 a	16.92 a	0.0090	0.0279
Means	15.96	17.22	17.22	18.72		ns	ns
CV%	9.84						
<b>Nitrogen in diagnostic leaves of the grasses</b>							
Maize-Aruana grass intercropping	24.30 a	25.74 a	30.24 a	31.14 a	25.72 a	ns	ns
Maize-Congo grass intercropping	24.12 a	25.20 a	26.28 a	27.00 a	25.79 a	0.0015	ns
Means	24.21	25.47	28.26	29.07		ns	ns
CV%	10.64						

Means followed by different capital letters in the columns differ from one another by the F-test (P < .05). ns: not significant (P > 0.05).

- N rate of 10.36 kg ha<sup>-1</sup> showed the lowest concentration of N in the diagnostic leaves of the maize (15.49 g kg<sup>-1</sup>) (Fig. 2). N concentrations in diagnostic leaves of maize intercropped with Congo grass are below the level considered adequate (27.5 to 32.5 g kg<sup>-1</sup>) by Malavolta et al. (1997), even at rates higher than the one responsible for the lowest concentration.

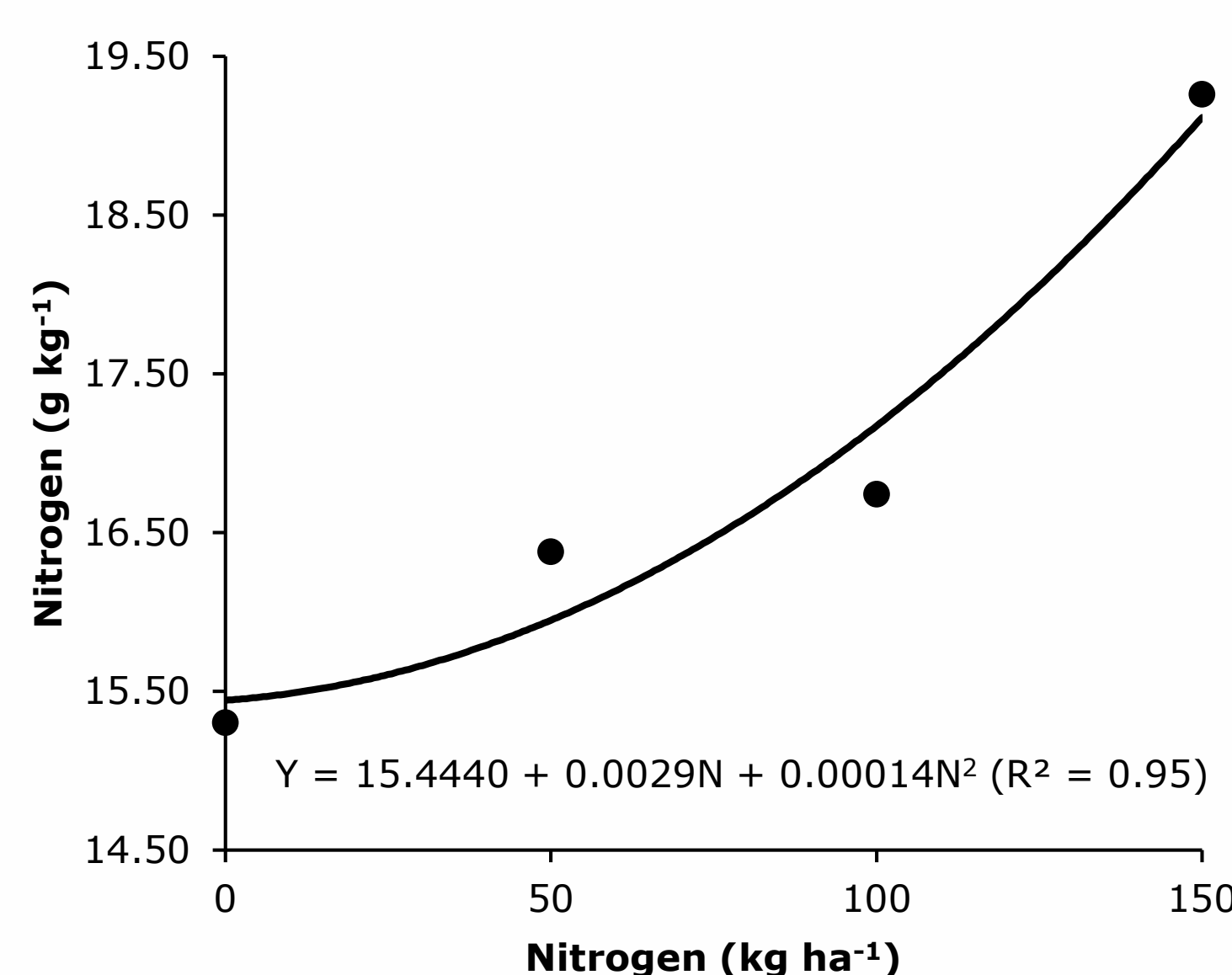


Fig. 2: N concentration in the diagnostic leaves of the maize.

- The increase in the N rates applied as side-dressing promoted a linear increase in the N concentration in the diagnostic leaves of the Congo grass (Fig. 3). Thus, Congo grass when intercropped with maize can induce N deficiency if it is not adequately replenished according to plant needs, negatively affecting the overall balance of nitrogen in the cropping system (Rocha et al., 2020).

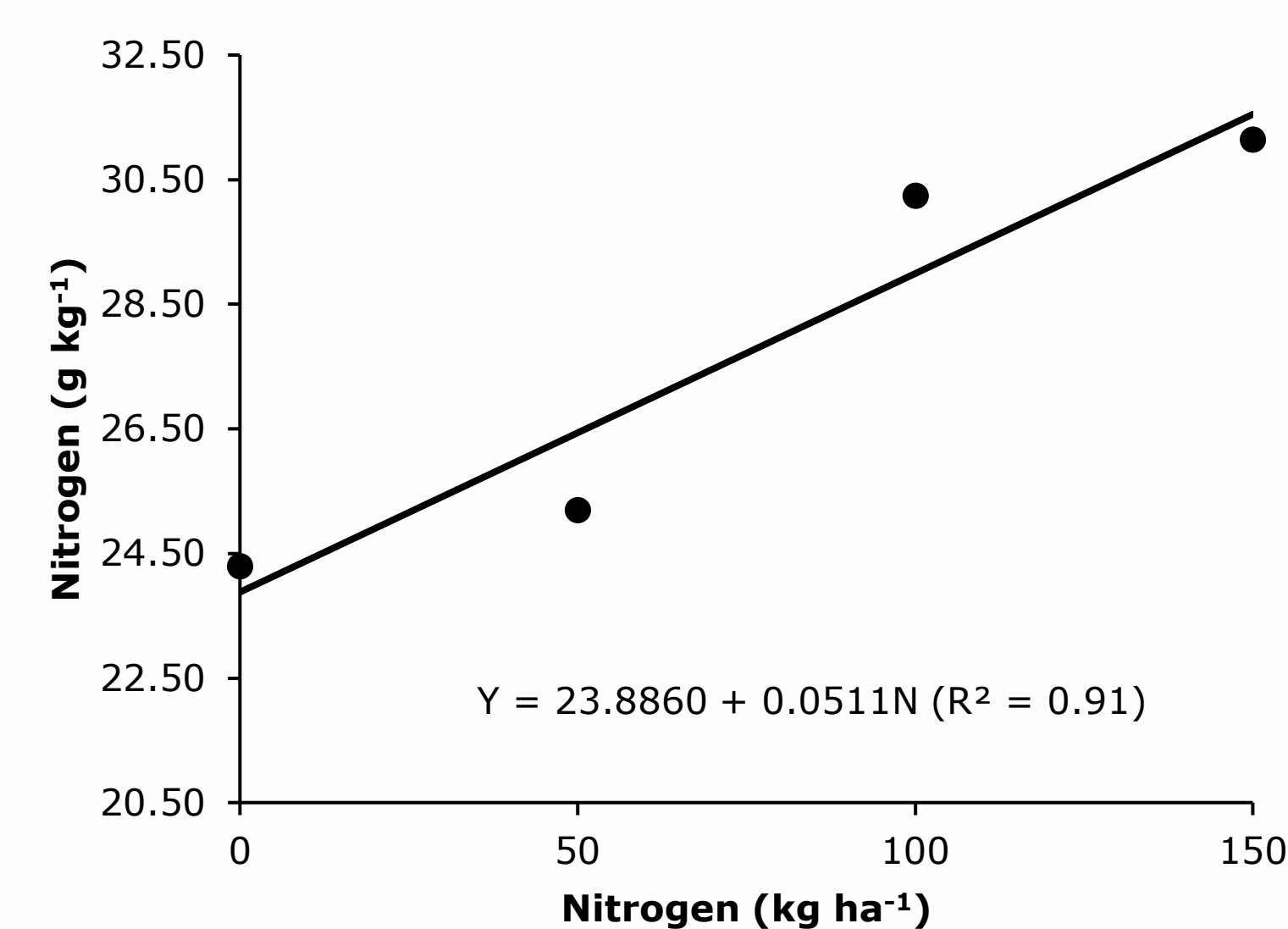


Fig. 3: N concentration in the diagnostic leaves of the Congo grass.

## CONCLUSIONS

- The results highlighted that when maize is intercropped with Congo grass in the autumn-winter, it is necessary to administer nitrogen fertilization to complement the amount of nitrogen supplied by the soil in order to avoid competition between the intercropped plants.
- N diagnosis in maize-Congo grass intercropping can help in the sustainable maize production in autumn-winter season.

## ACKNOWLEDGEMENTS

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## REFERENCES

- Malavolta, E., Vitti, G. C., Oliveira, S. A. de., 1997. *Avaliação do estado nutricional das plantas: princípios e aplicações*. Piracicaba: POTAFOS, Brazil.
- Rocha, K. F., Souza, M. De, Almeida, D. S., Chadwick, D. R., Jones, D. L., Sacha, J. M., Rosolem, C. A. (2020). Cover crops affect the partial nitrogen balance in a maize-forage cropping system. *Geoderma*, 360, p. 1-7. DOI: 10.1016/j.geoderma.2019.114000.

