



## Use of the $^{15}\text{N}$ gas flux method to calculate the emission factor for $\text{N}_2\text{O}$ in a Brazilian soil cultivated with sugarcane

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### INTRODUCTION

In Brazil, it is usual to apply vinasse (liquid residue from ethanol production) as organic fertilizer for the sugarcane crop. This practice can increase  $\text{N}_2\text{O}$  emissions, because the vinasse is rich in carbon and nitrogen, elements essentials for denitrification process. This study aimed to determine the emission factor of a sugarcane ratoon, with or without vinasse application, using the  $^{15}\text{N}$  gas flux method.

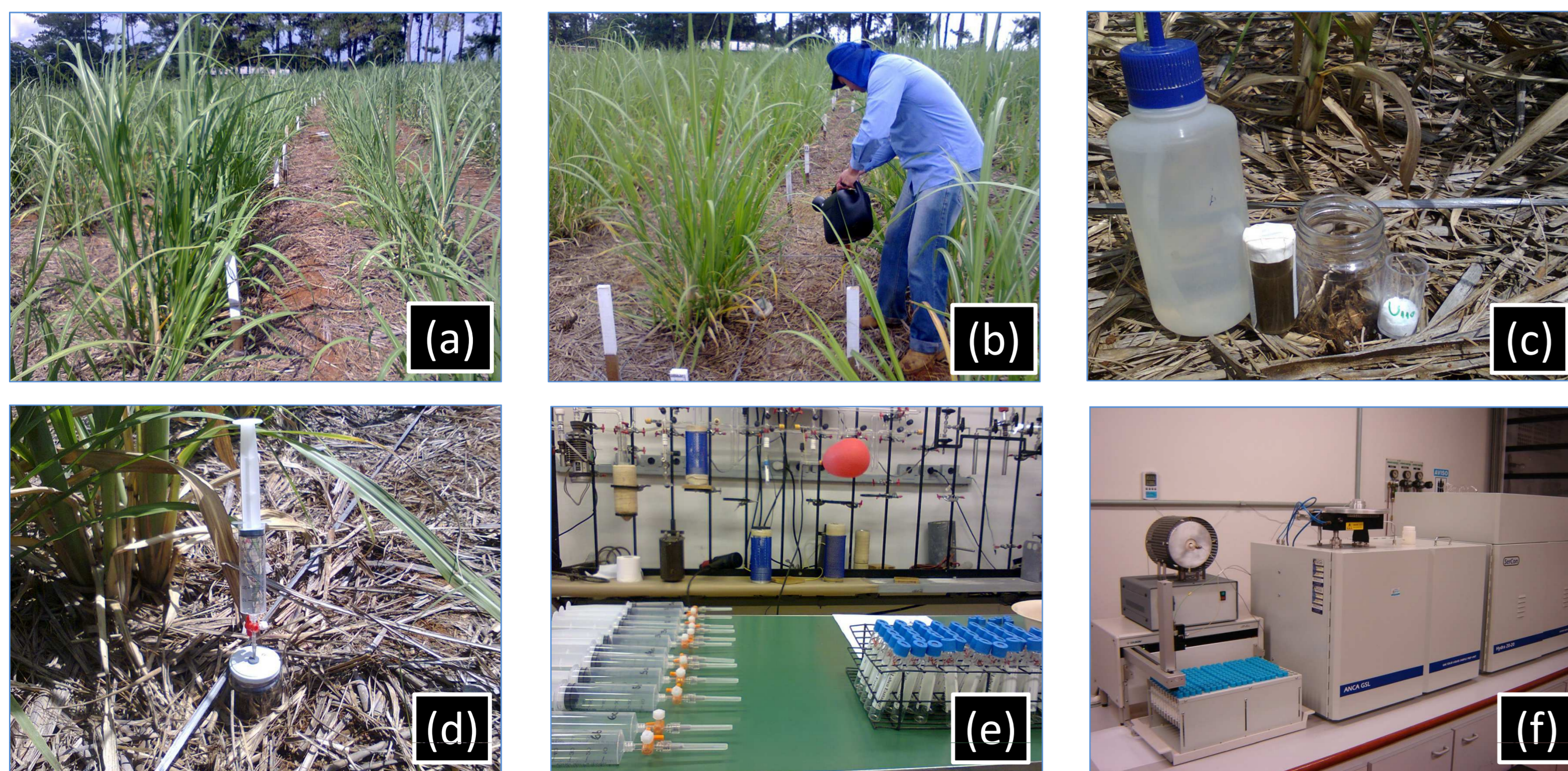
### MATERIAL AND METHODS



- Piracicaba, São Paulo State (22°41'S 47°38'O)
- Randomized blocks with 4 replicates
- Treatments arranged in 2x2 factorial

#### Treatments

- 2 rates of N (55 and 110  $\text{kg ha}^{-1}$  as  $^{15}\text{NH}_4^{15}\text{NO}_3$  at 31.9 atom %  $^{15}\text{N}$ )
- with or without vinasse application ( $100 \text{ m}^3 \text{ ha}^{-1}$ )



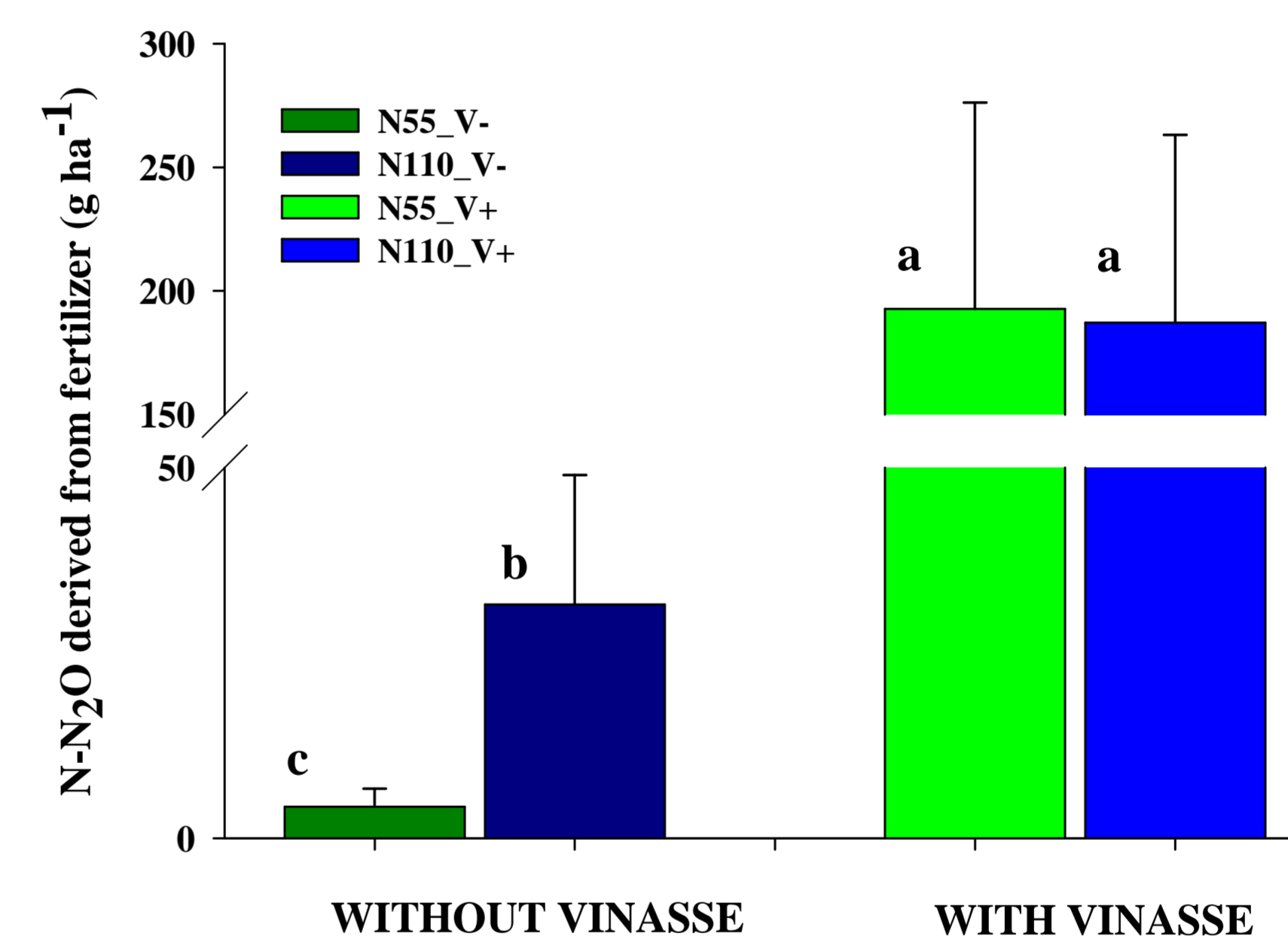
**Fig. 1.** Material and procedures: a) plots delimitation (Sugarcane rows with 1.5 m long and 1.5 m inter rows); b) vinasse application; c) treatments application in the collectors (0.06 m diameter; 0.07 m height;  $0.2 \text{ dm}^3$ ); d) sampling (60 mL); e) concentration on a high vacuum line; f) Isotope-ratio mass spectrometry (IRMS) (Hydra 20-20 SerCon)

### RESULTS

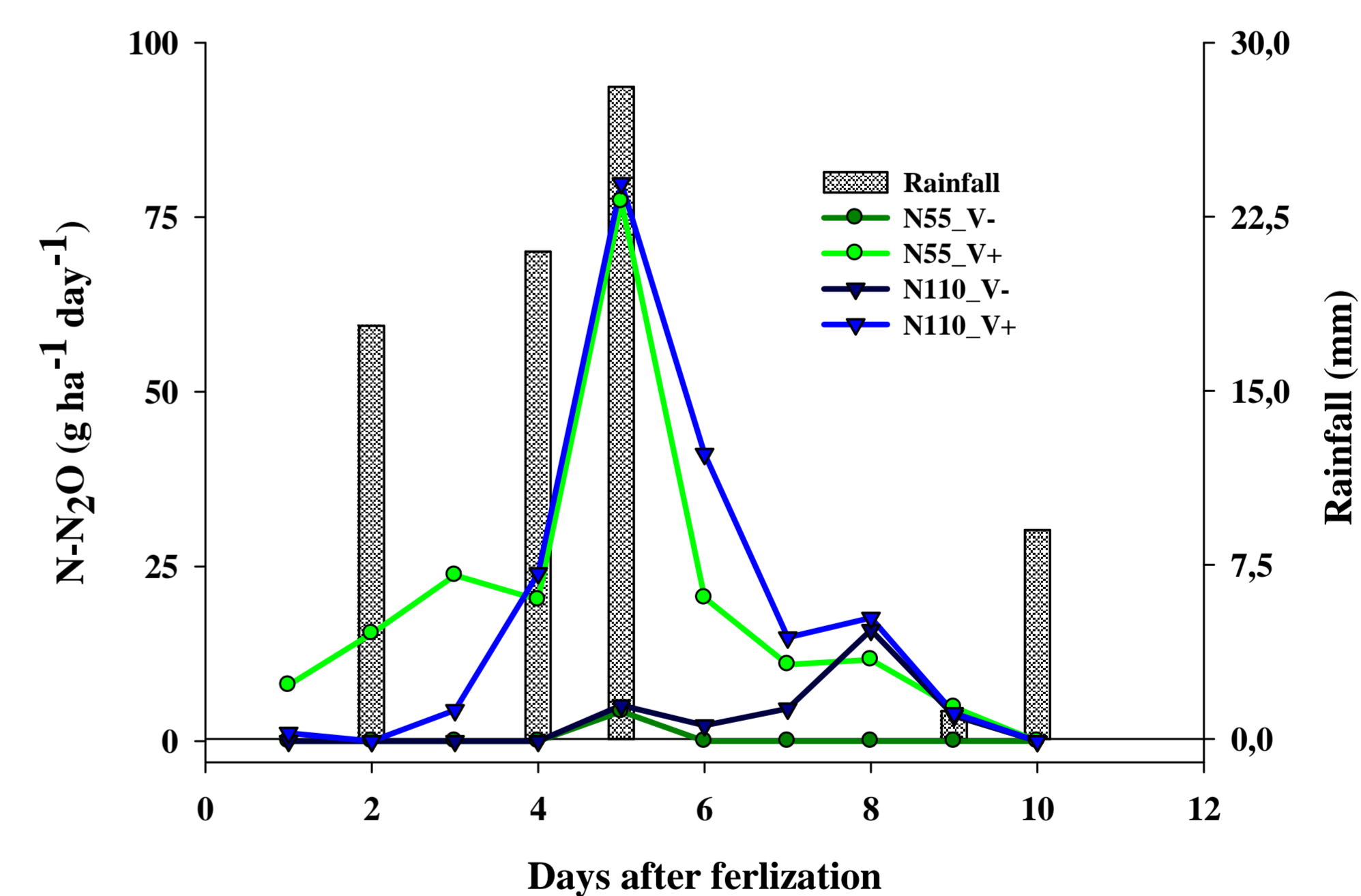
**Table 1.** N fertilizer emission factor

Treatments		Emission Factor <sup>(1)</sup>
N rate ( $\text{kg ha}^{-1}$ )	Vinasse	
55	Without	$0.01 \pm 0.004$
55	With	$0.35 \pm 0.152$
110	Without	$0.03 \pm 0.016$
110	With	$0.17 \pm 0.069$

<sup>1</sup> Samples collected in the fertilization line. Data represent means and standard deviation.



**Fig. 2.** Cumulative emission of  $\text{N-N}_2\text{O}$  derived from  $^{15}\text{NH}_4^{15}\text{NO}_3$  (tukey  $p < 0,05$ ).



**Fig. 3.** Daily mean fluxes of  $\text{N-N}_2\text{O}$  derived from  $^{15}\text{NH}_4^{15}\text{NO}_3$  and rainfall. ( $n = 4$ ).

### CONCLUSION

The use of  $^{15}\text{N}$  gas flux method indicated a low emission factor for soil cultivated with sugarcane. The vinasse increased the losses of N-fertilizer as  $\text{N}_2\text{O}$ .

ACKNOWLEDGEMENTS:

