

# EVALUATING THE EFFECT OF BIOCHAR ON NUTRIENT LEACHING AND RICE GROWTH IN DISTURBED AND UNDISTURBED SOIL-COLUMNS

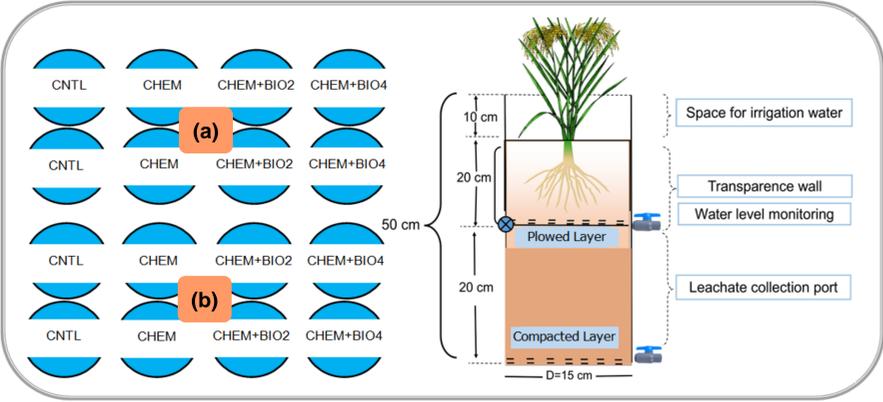
Chenda Lai<sup>1,2</sup>, Nachhy Ly<sup>3</sup>, Veasna Touch<sup>4</sup>, Sarith Hin<sup>4</sup>, Pascal Podwojewski<sup>5</sup>, Pinnara Ket<sup>1,3</sup>, Pascal Jouquet<sup>5</sup>, Aurore Degré<sup>2</sup>, Vannak Ann<sup>1,3</sup>

<sup>1</sup> WAE Research Unit, Institute of Technology of Cambodia, Phnom Penh, Cambodia  
<sup>2</sup> Gembloux Agro-Bio Tech, University of Liège, Gembloux, Belgium  
<sup>3</sup> Faculty of Hydrology and Water Resource Engineering, Institute of Technology of Cambodia, Phnom Penh, Cambodia  
<sup>4</sup> Soil and Water Science Division, Cambodian Agricultural Research and Development Institute, Phnom Penh, Cambodia  
<sup>5</sup> Sorbonne Université, UPEC, CNRS, IRD, INRAE, Institut d'écologie et des sciences de l'environnement, IEES, FEST, Paris, France  
 \*Corresponding author: [chenda.lai@gsc.itc.edu.kh](mailto:chenda.lai@gsc.itc.edu.kh)

## INTRODUCTION

Soil fertilization stands on the top of rice crop production issue. **Nutrient leaching** in paddy field, leading to lower plant uptake and **low yield**, poses a challenge for Cambodian farmers and is becoming a key concern for the environment. The carbonized organic waste called **biochar** is known as potentially valuable input to enhance soil properties in many regions is introduced. This study is to evaluate the effect of biochar on the leaching of N and P, and rice growth under disturbed and undisturbed conditions of the plowed layers using soil column-based experiment.

## MATERIALS AND METHODS



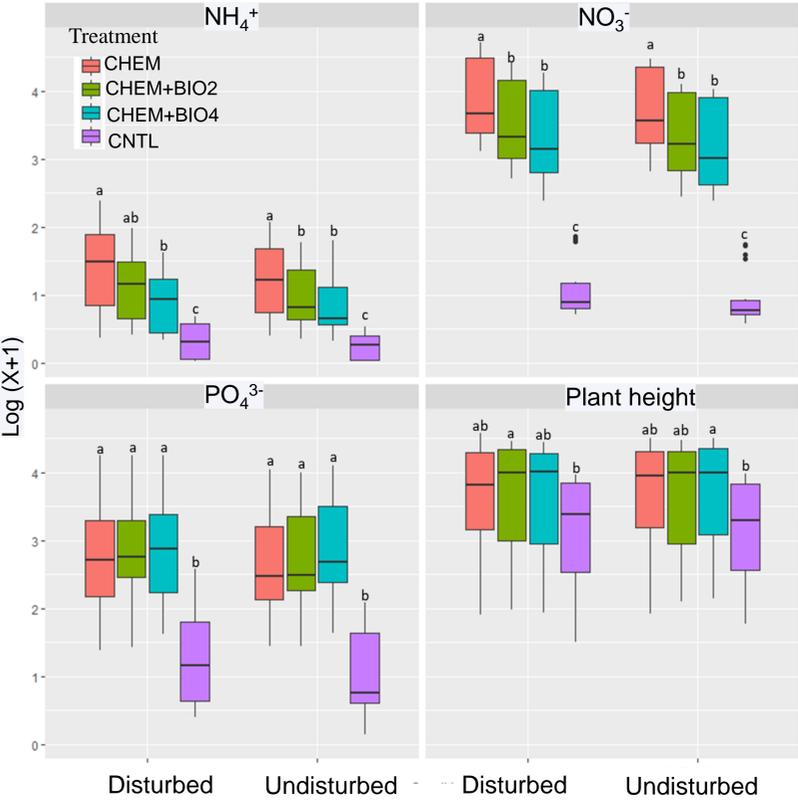
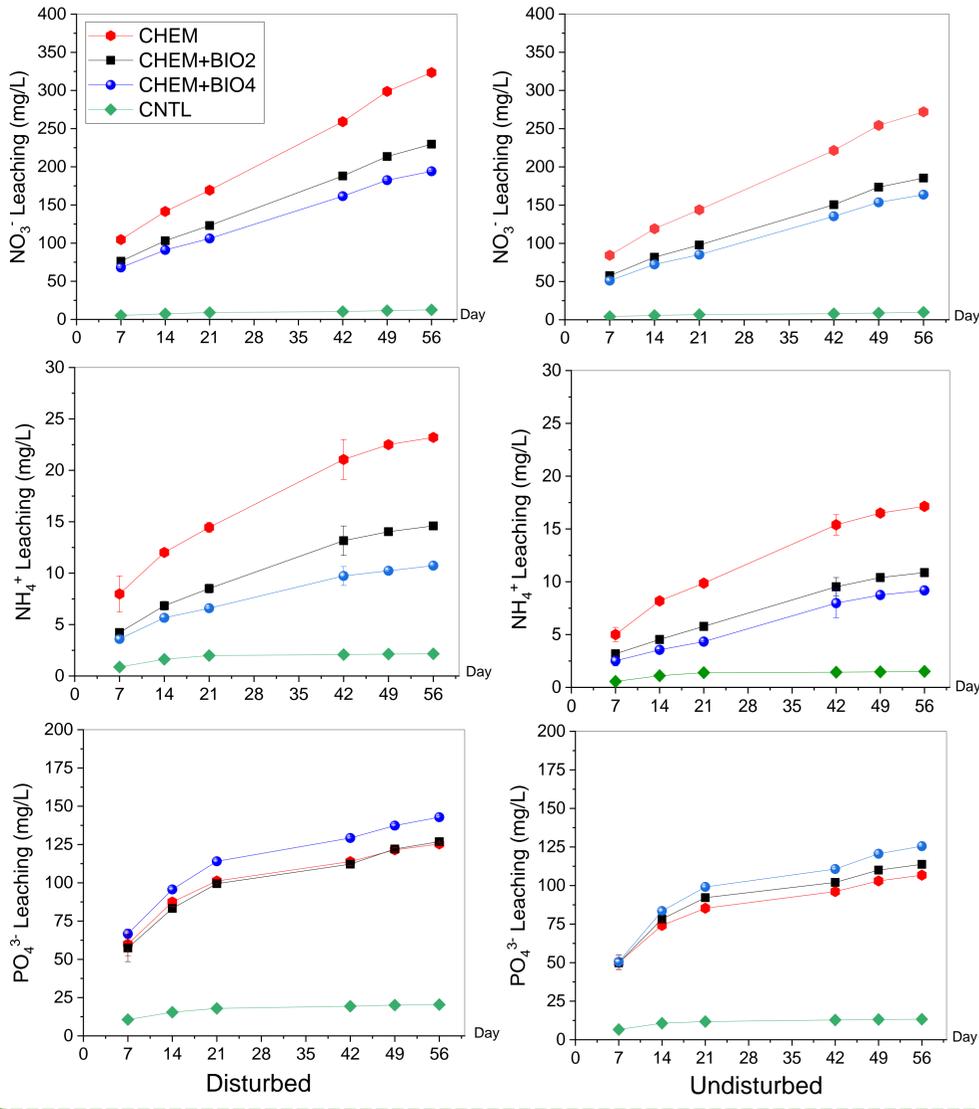
**CNTL**, Control; **CHEM**, Chemical Fertilizer in rate of 60:30:30 of NPK; **CHEM+BIO2**, Chemical Fertilizer in rate of 60:30:30 + Biochar 2t/ha; **CHEM+BIO4**, Chemical Fertilizer in rate of 60:30:30 + Biochar 4t/ha.



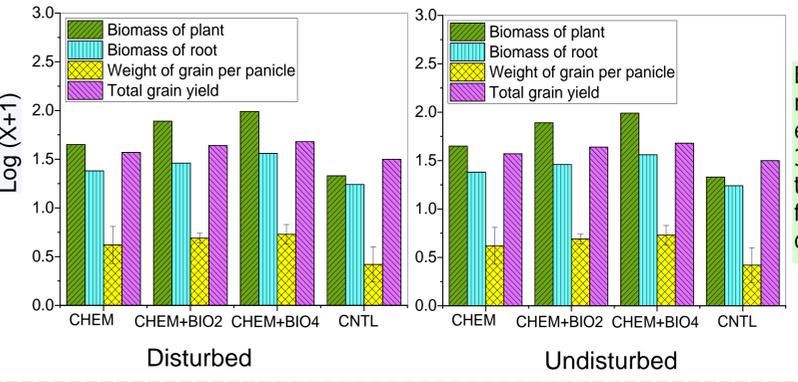
- ❖ Leachate ( $\text{NO}_3^-$ ,  $\text{NH}_4^+$ ,  $\text{PO}_4^{3-}$ ) was collected at 7-days interval.
- ❖ Rice growth (biomass of plant, biomass of root, weight of grain per panicle, total grain yield) was collected at the mature stage.

## RESULTS AND DISCUSSION

Accumulation of nutrient leaching ( $\text{NO}_3^-$ ,  $\text{NH}_4^+$ ,  $\text{PO}_4^{3-}$ ) from disturbed in undisturbed soil-column



The leachates are not significantly different between the soil-column conditions.  
 The leaching of  $\text{NH}_4\text{-N}$  and  $\text{NO}_3\text{-N}$  in the column with 4t/ha of biochar was lower than the column with chemical fertilizer while  $\text{PO}_4^{3-}$  leaching was the same measured from both rates.



Biochar amendment at the rate of 4t/ha (CHEM+BIO4) enhanced rice yield by 32.17% in comparison with the column using chemical fertilizer, and by 52.77% in comparison with the control.

## CONCLUSION

- ❖ No significant differences between “disturbed” and “undisturbed” columns, except the biomass of root.
- ❖ Lower leaching of N ( $\text{NH}_4\text{-N}$  and  $\text{NO}_3\text{-N}$ ) in presence of biochar but no effect on  $\text{PO}_4^{3-}$ .
- ❖ Rice yield and biomass were increased in presence of biochar.