Greenhouse Gas Fluxes Across Palm Oil-Riparian Interface

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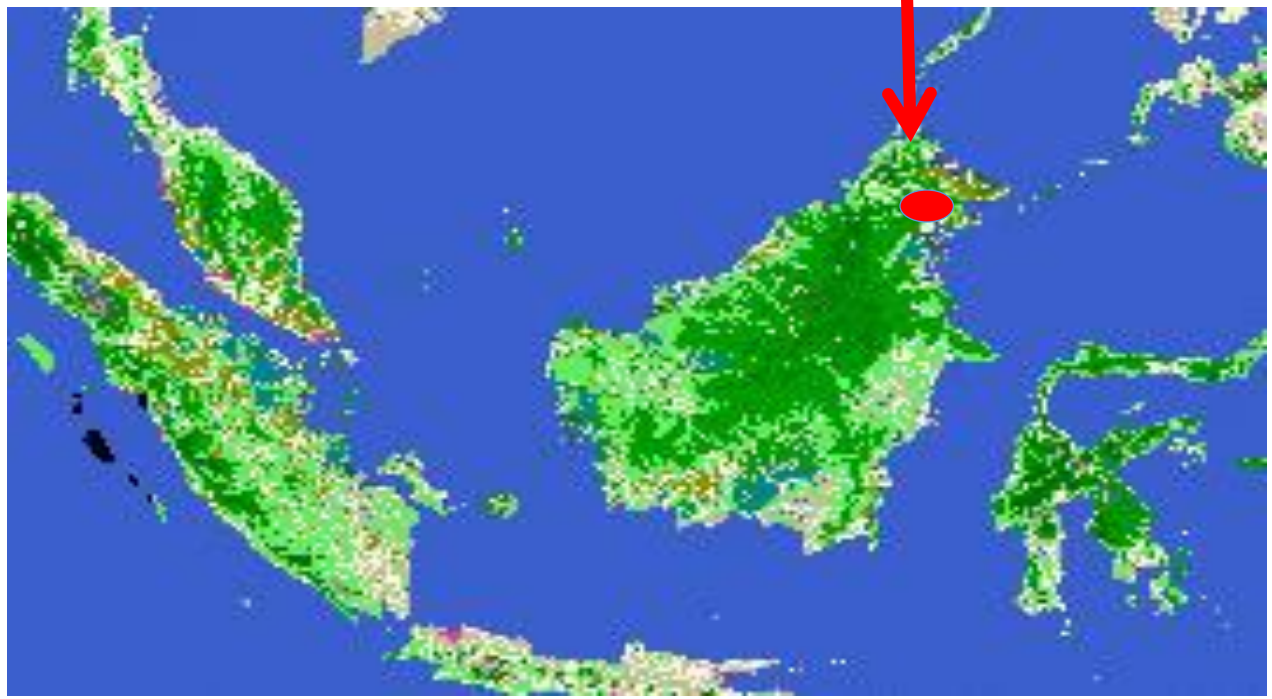
Stability of Altered Forest Ecosystems

SAFE Site in Sabah (Borneo)
- launched in 2011

- **SAFE Site is one of the largest ecological studies site in the world – encompassing 8000 ha**

- **One of the study focus is to investigate the impact of agricultural development on the ecosystem's ability to absorb carbon dioxide, an important greenhouse gas.**



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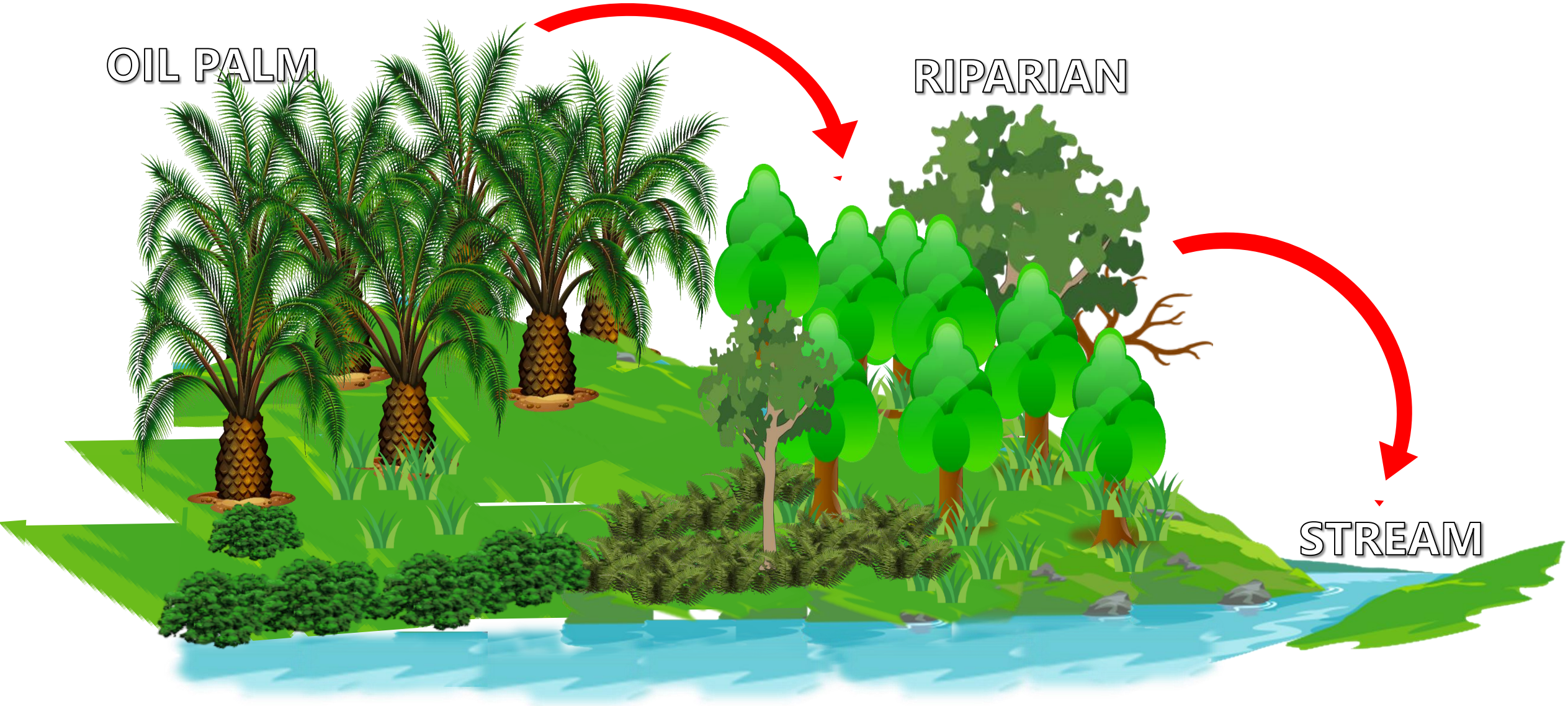
- To quantify soil carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) fluxes from soil in riparian habitats across land use gradients oil palm plantations to buffer strips and the river

- To investigate the efficiency of riparian buffer strips to retain nitrogen



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Measurements

The impact of oil palm plantations on soil nutrient translocation to riparian buffer strips and rivers (Greenhouse Gas Fluxes Across Palm Oil-Riparian Interface)

Measurements (Nov 2016 – Nov 2017) (1 year cycle)

3 sites

- OP1 – steep sloping forest-river
- OP2 – flat riparian, ferns
- OP3 – Long riparian (~68m), steep sloping forest-river

- Atmosphere- GHG emission (CH_4, N_2O, CO_2)
- Soil – NH4 and NO3 concentrations, pH, soil moisture, temperature, bulk density
- River – GHG emission, NH4 and NO3 concentraTions, *in situ* parameters

SAMPLINGS

Gas sampling

Glass Vials

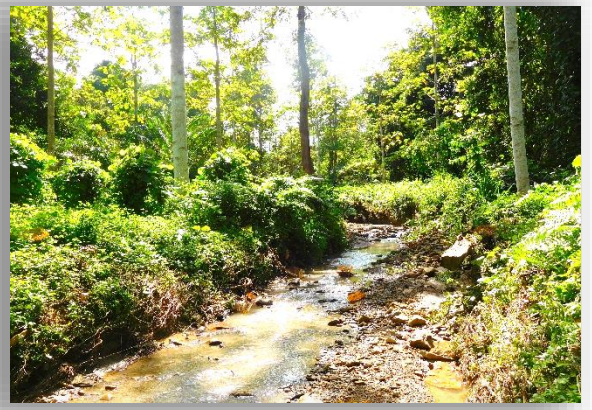
River sampling

Soil extraction

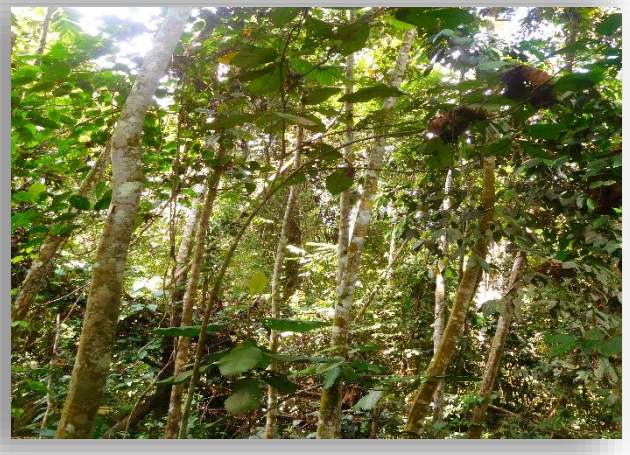
Soil sampling

Site 1

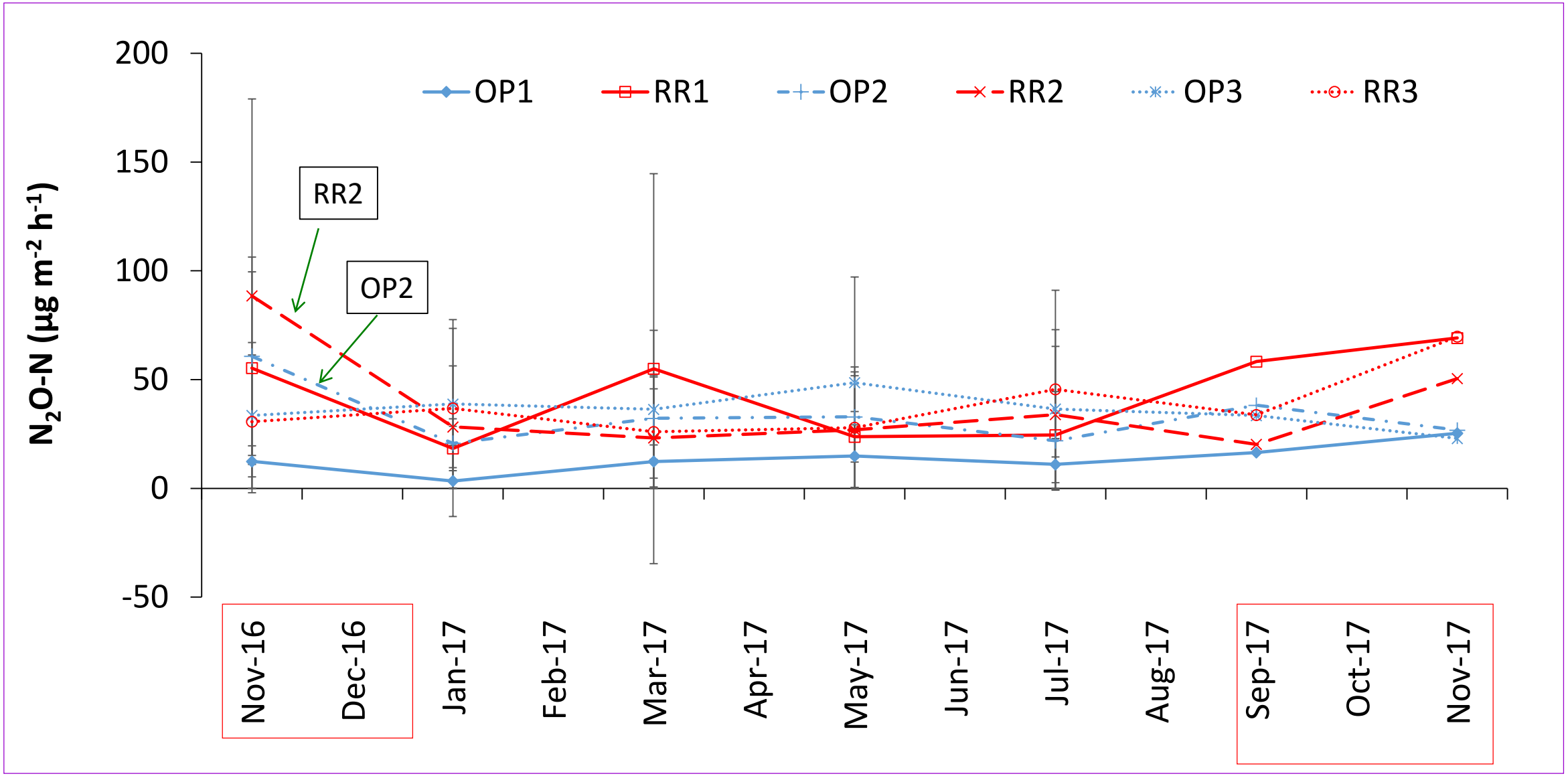
Site 2



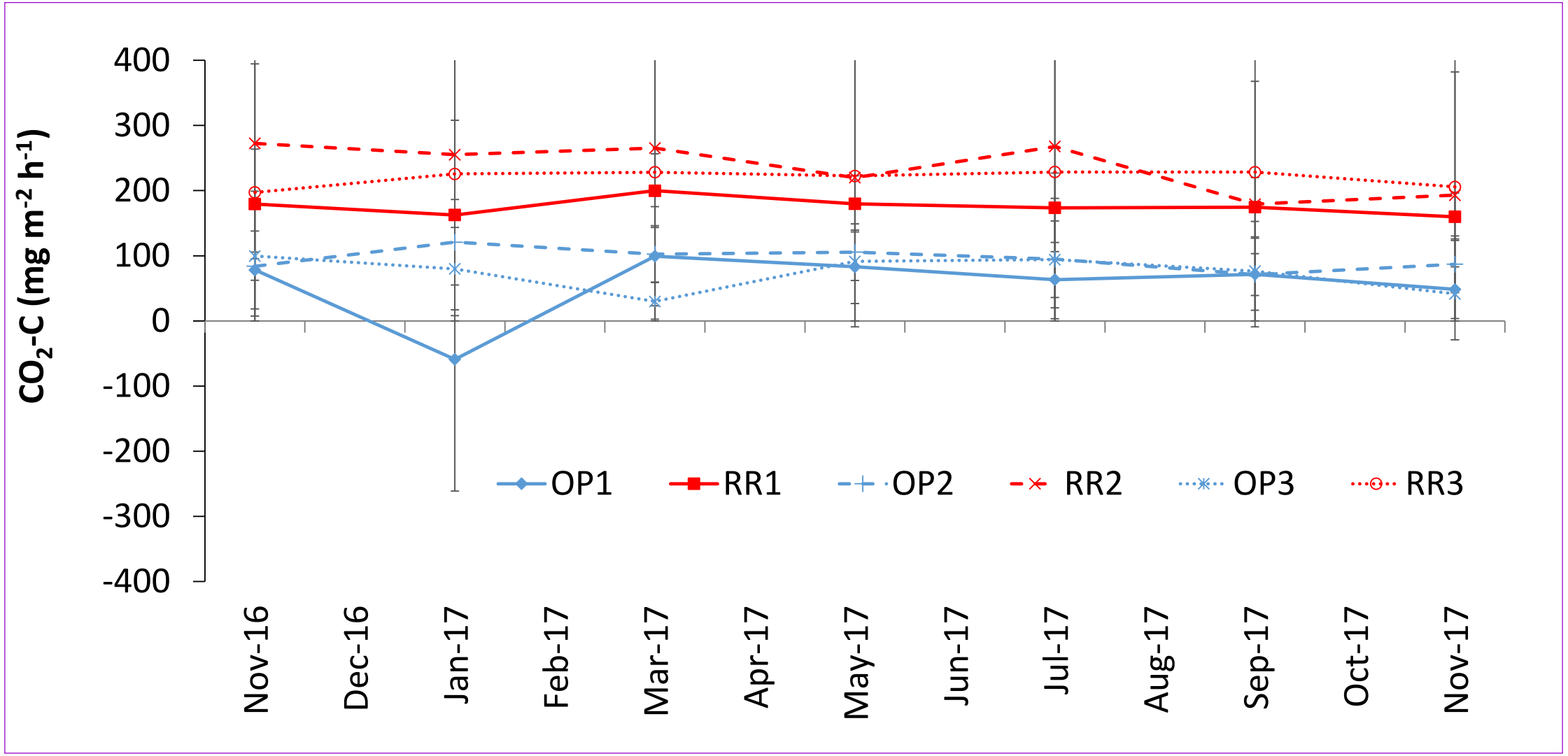
Site 3



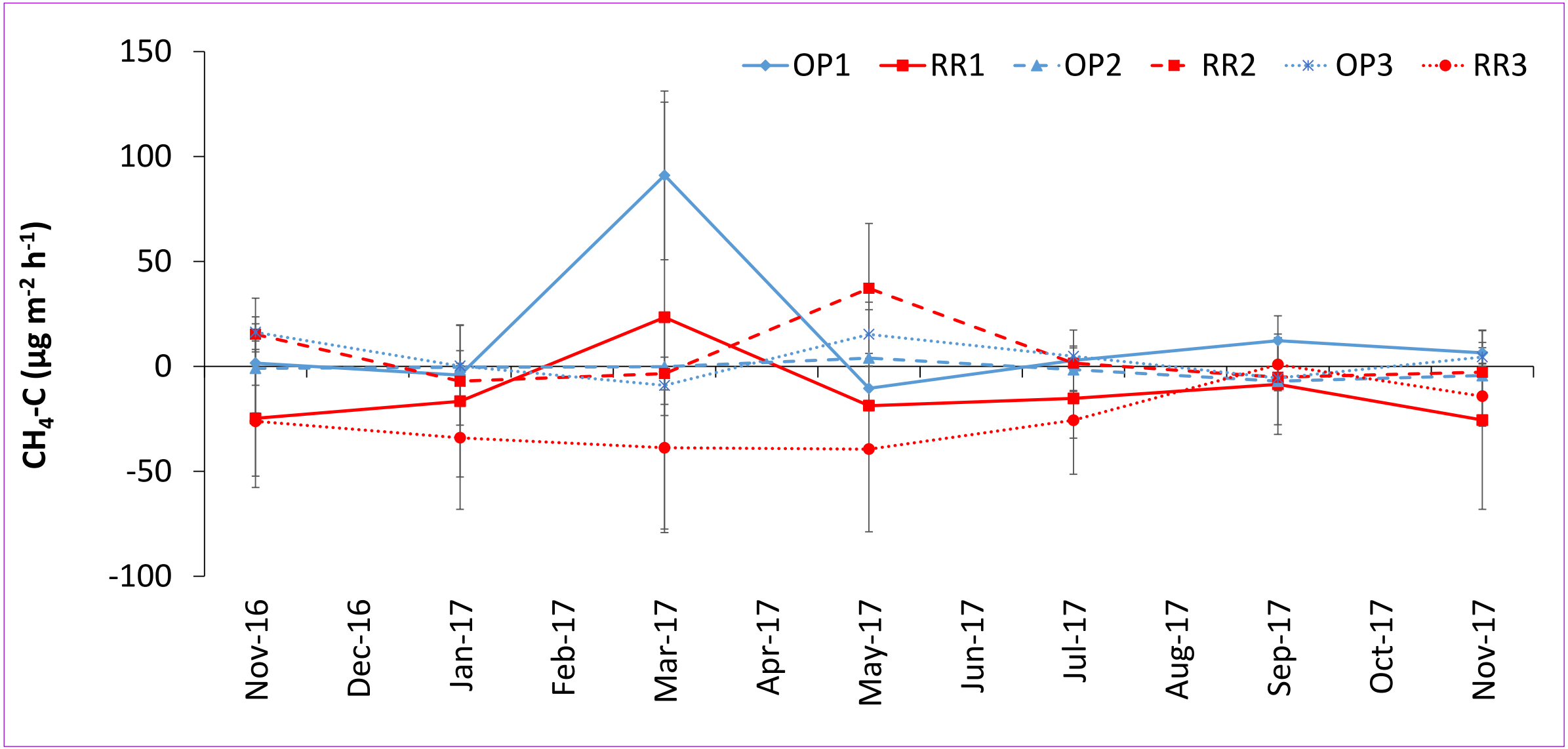
Temporal and Spatial Variability of GHGs (N_2O)



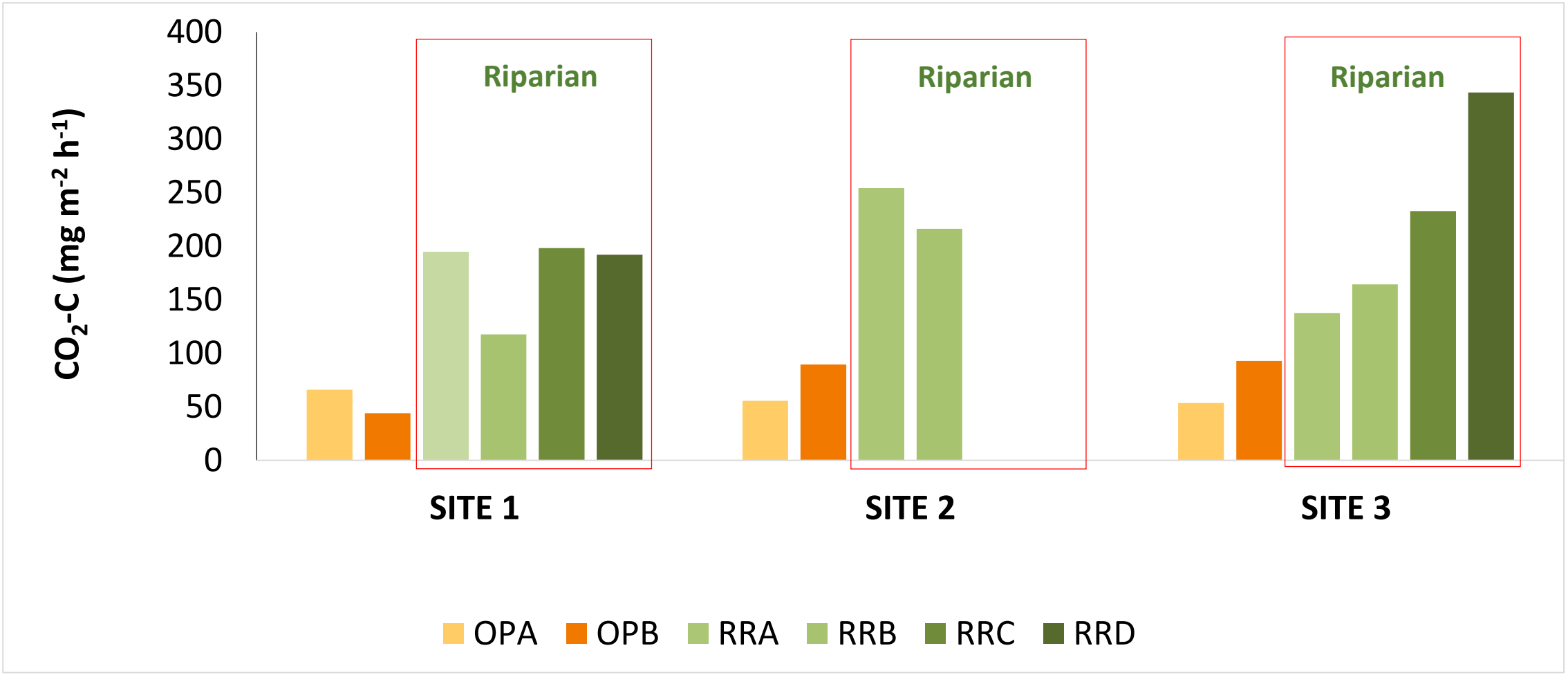
Temporal and Spatial Variability of GHGs (CO_2)



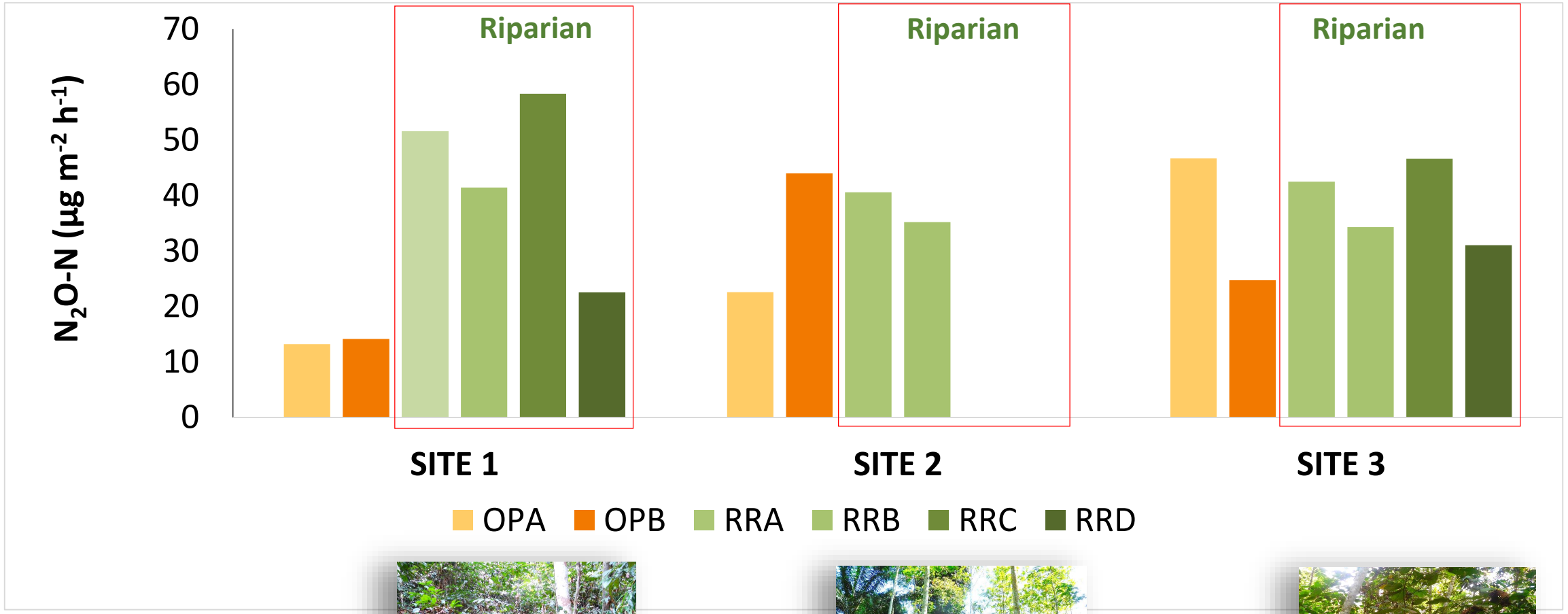
Temporal and Spatial Variability of GHGs (CH_4)

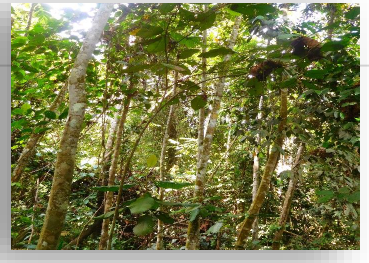


The impact of oil palm plantations on soil nutrient translocation to riparian buffer strips and rivers (CO_2)



The impact of oil palm plantations on soil nutrient translocation to riparian buffer strips and rivers (N_2O)





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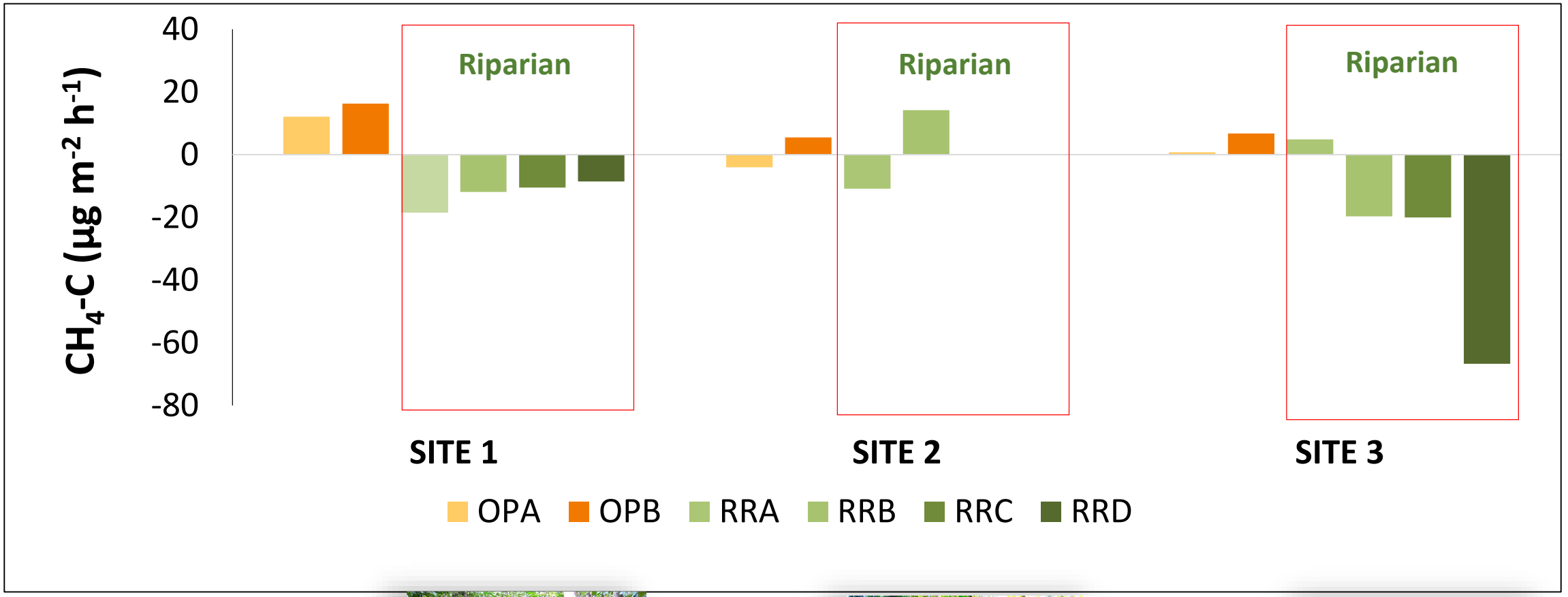
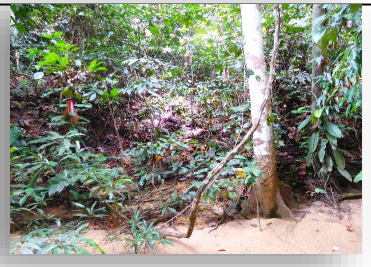
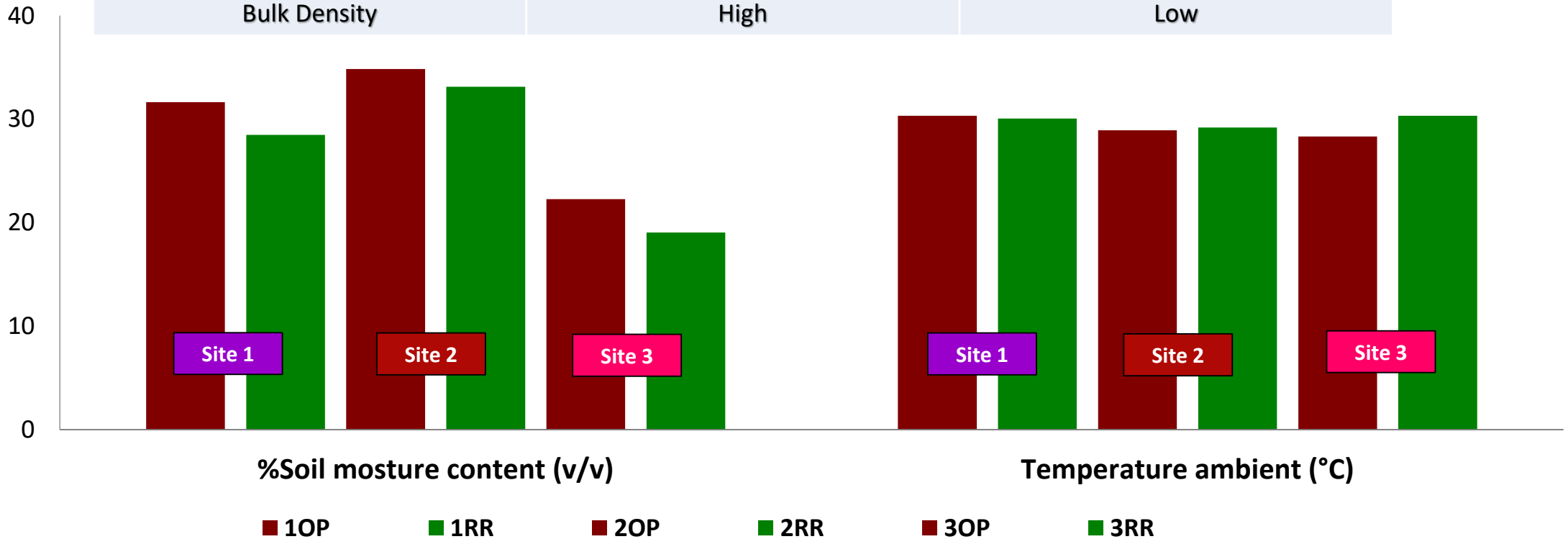


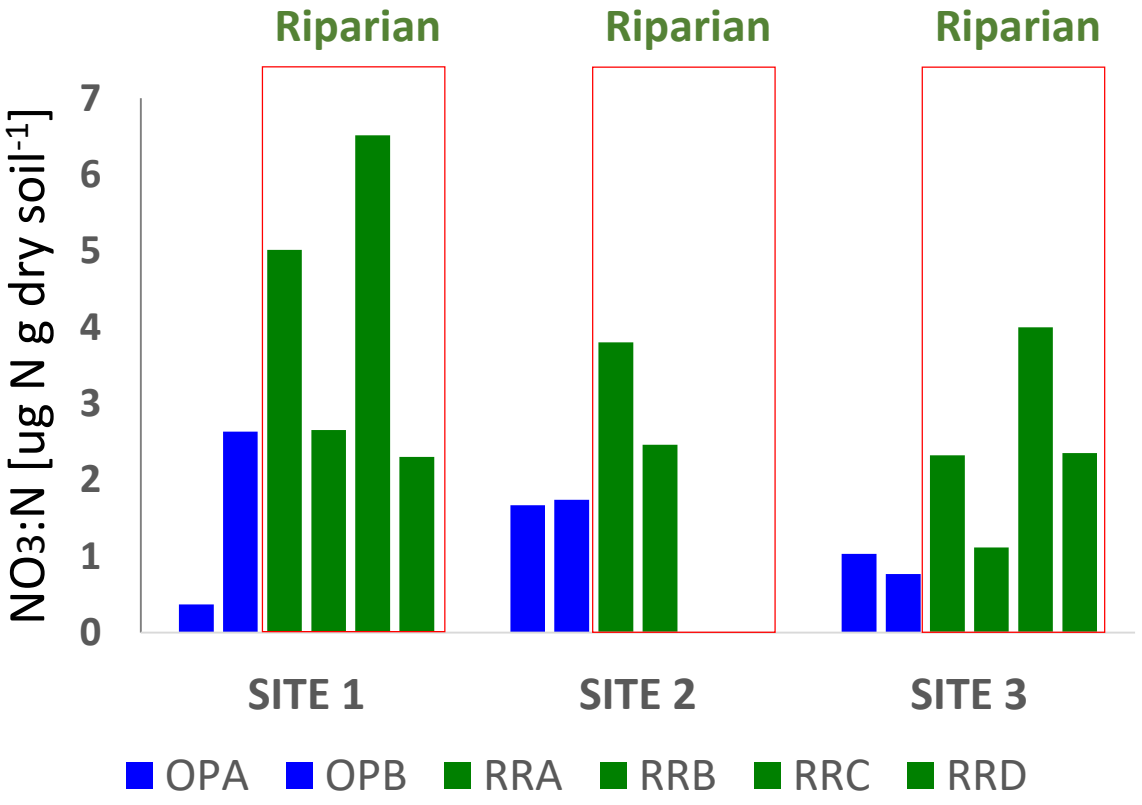


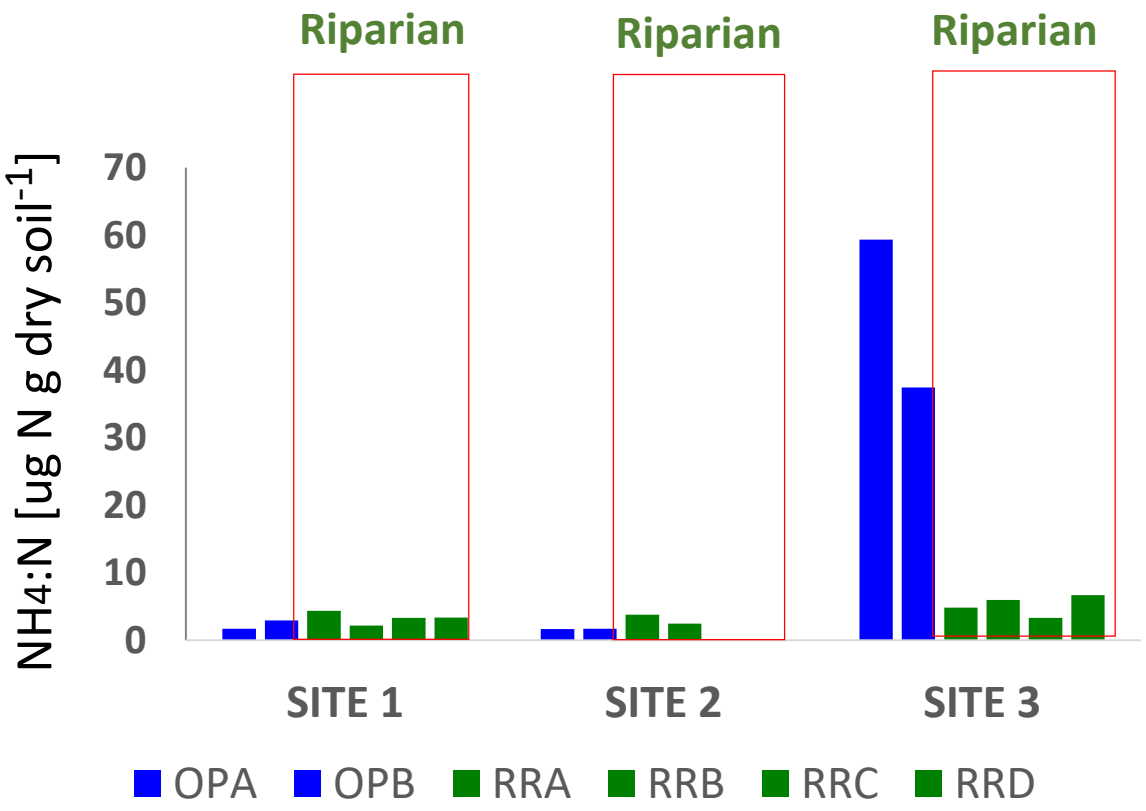
Meteorological and environmental factors?

Descriptive	Oil Palm	Riparian
Ground cover	Less	A lots
Organic Matter	Less	A lots
Litter	Less	A lots
Temperature	Slightly lower	Slightly higher
Soil Moisture	Slightly Higher	Slightly lower
Bulk Density	High	Low

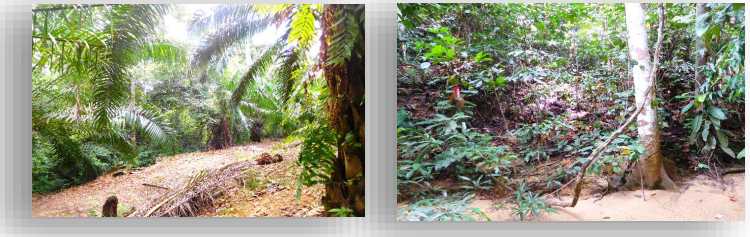


Nutrients: NO_3 and NH_4





SITE 1



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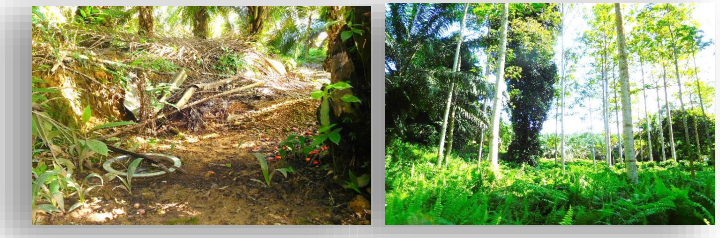
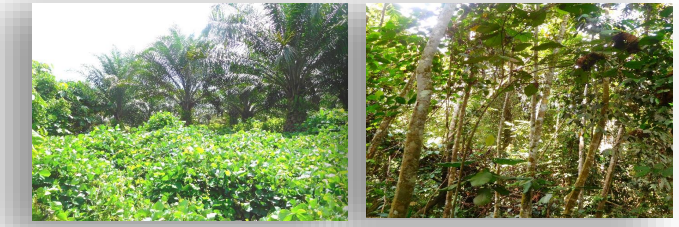
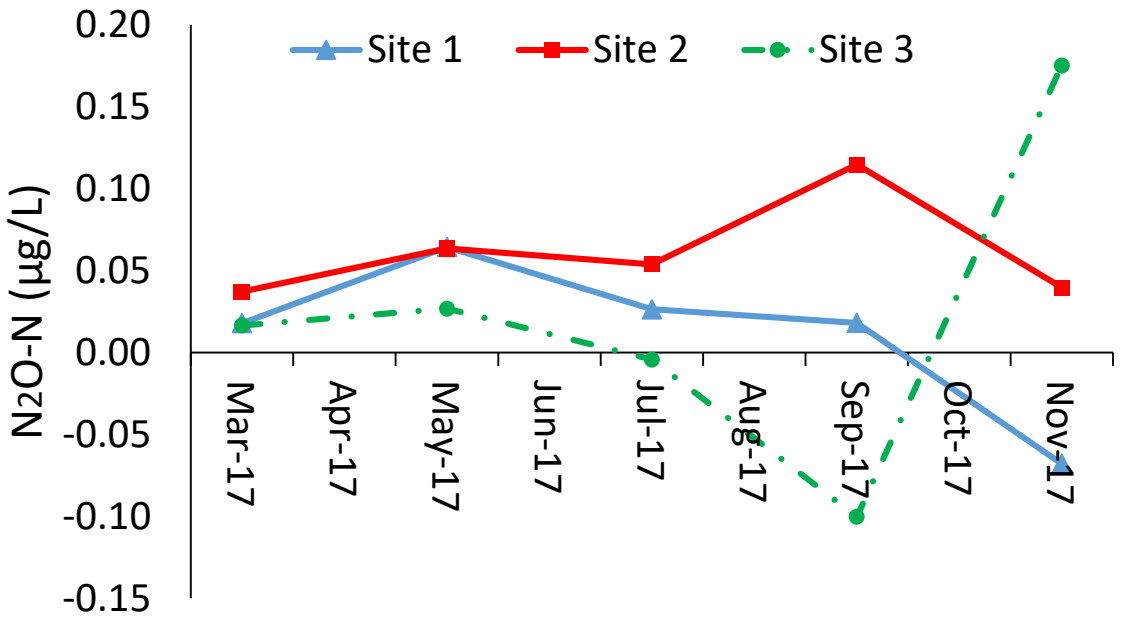
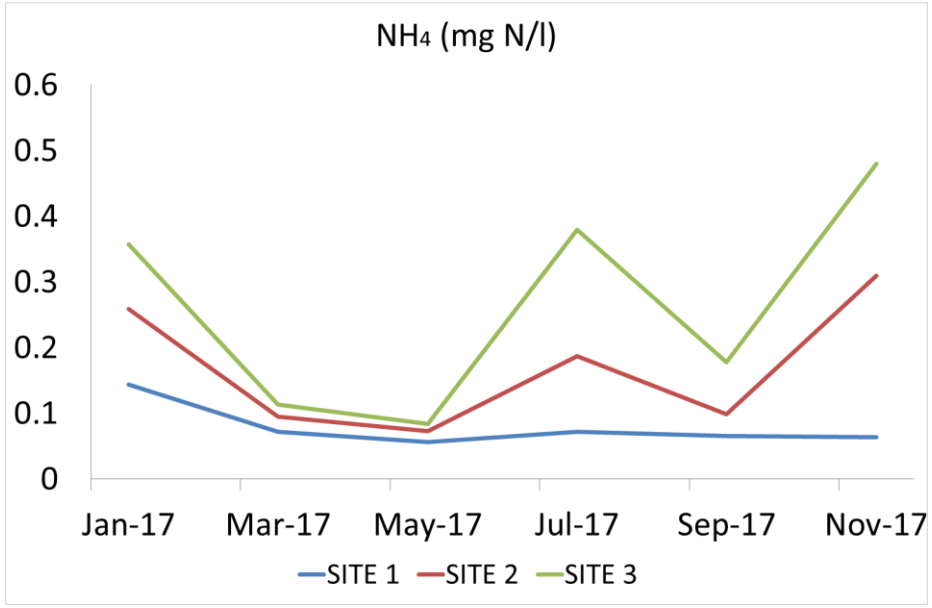


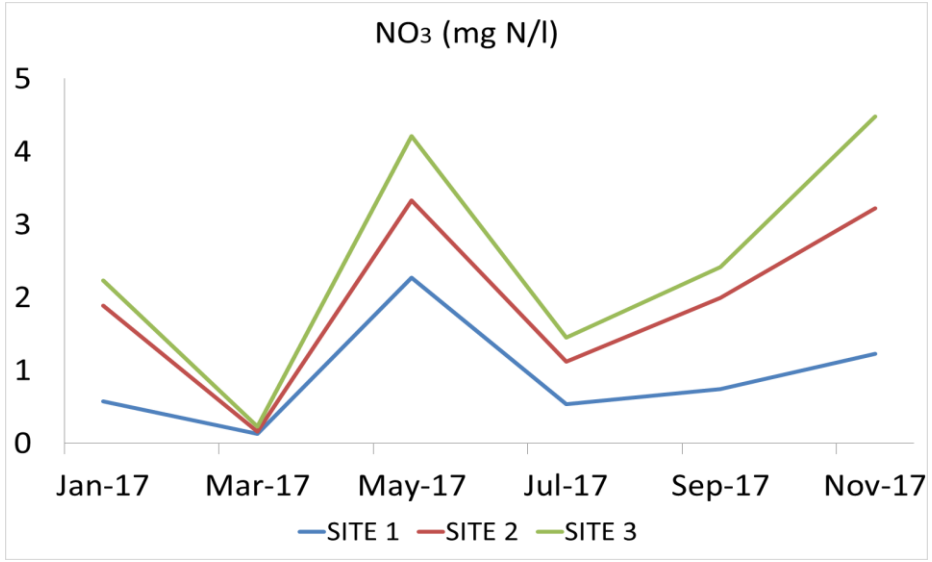
SITE 3



River Concentrations







Summary

The efficiency of riparian buffer strips to retain nitrogen

- Small differences OP vs RR – nutrient and Greenhouse Gases
- We need to establish if OP management or inherent differences between OP and RR are the cause for the small differences observed
- River concentration - low

The importance of riparian buffer strips as a source of GHG emissions

- Riparian is importance source of N_2O and CO2 emissions
- CH4 uptake is higher in riparian

Thank you