Predicting Nitric Oxide Emissions from Cover Crop Management in Brazilian Cerrado with DNDC model

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Presentation outline

- Introduction
- Site description
- Field measurements and simulations
- Results
- Conclusion

Introduction

Brazil has one of most important crop producers of world:

- 48,8 millions hectares of area cultivated;
- Production: 187 millions of grain.

(IBGE, 2013)

Machinery harvesters before harvest soybean farm in Tangara da Serra, in Cuiabá (Andre Penner / AP)

Introduction (cont.)

- **NO emissions** remain poorly characterized for many practices and many regions of world, including Brazil;
- Mathematical models can help fill these data gaps but most models have not been widely validated in several ecosystems and agricultural systems;
- Li, C. (2000) is a validation study comparing NO emissions from DNDC predictions against experimental measurement.

Li, C., 2000. Modeling trace gas emissions from agricultural ecosystems. Nutrient Cycling in Agroecosystems 58, 259–276.

Introduction (cont.)

- **But,** there is few studies about NO emissions from cover crop management system.

- **Objective in this research** is to assess the ability of DNDC model for predicting NO emissions from cover crop management in the Brazilian *Cerrado*.

Site description

- **Experiment at Embrapa Cerrado**: Mar-2002 To Jun- 2003
- **Experimental design**: randomized block design, with three replications and split plot.
- **Soils**: clay
- **Soil Organic Carbon (SOC)**: 23.6 g $.kg^{-1}$
- **Bulk density (BD)**: 0.85 g cm^{-3}
- **pH** 6.2 ($CaCl_2$)
- **Mean annual rainfall**: 797 mm
- **Mean Air temperature**: 23°C

Field measurements and simulations

Observed data:

➢NO flux was measured with use of dynamic chamber technical combined with chemiluminescence analyzer and data logger.

Predicted data:

➢Observed flux data , local climate, soil and management information were utilized to test DNDC95 version its applicability for cover crop management in Conventional and No-Tillage System for:

- *Crotalaria juncea;*
- *Mucuna pruriense;*
- *Natural fallow.*

Results

For cover crop in Conventional Systems:

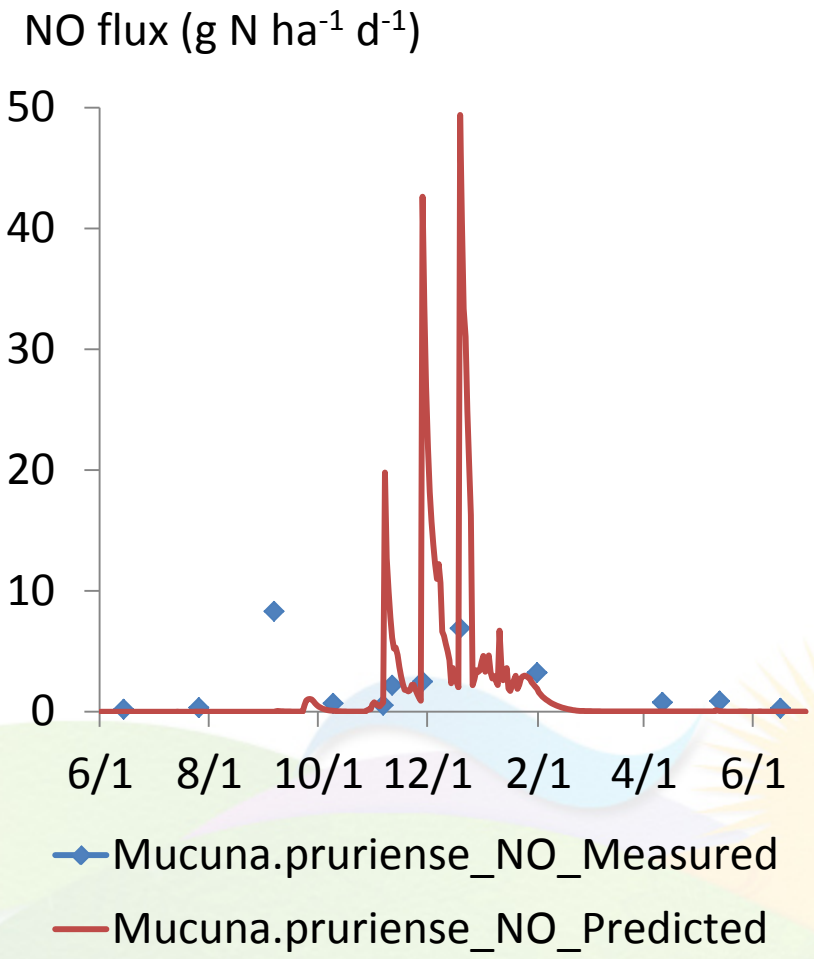
➢Predicted emissions were very similar to the collected data with mean, 0.8 kg NO-N. ha^{-1} yr^{-1} , T test = 0,69

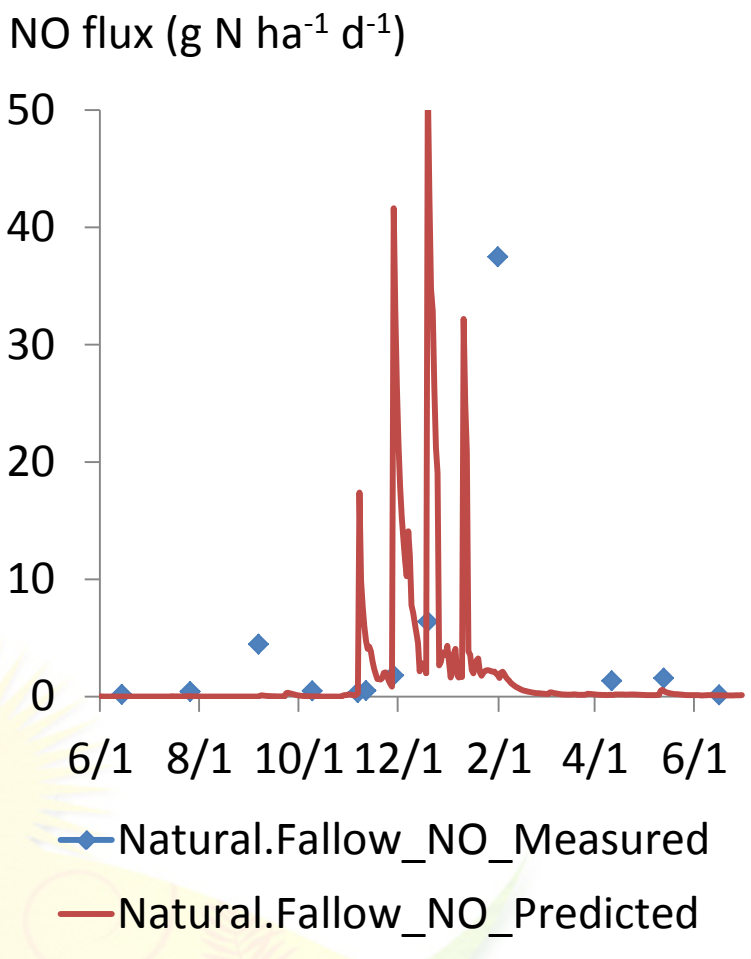
For cover crop in No-tillage Systems:

➢Predicted emissions were mean, 0.7 kg NO-N ha^{-1} yr^{-1} , lower than collected data for Mucuna pruriense (mean, 1.3 kg NO-N ha^{-1} yr^{-1})

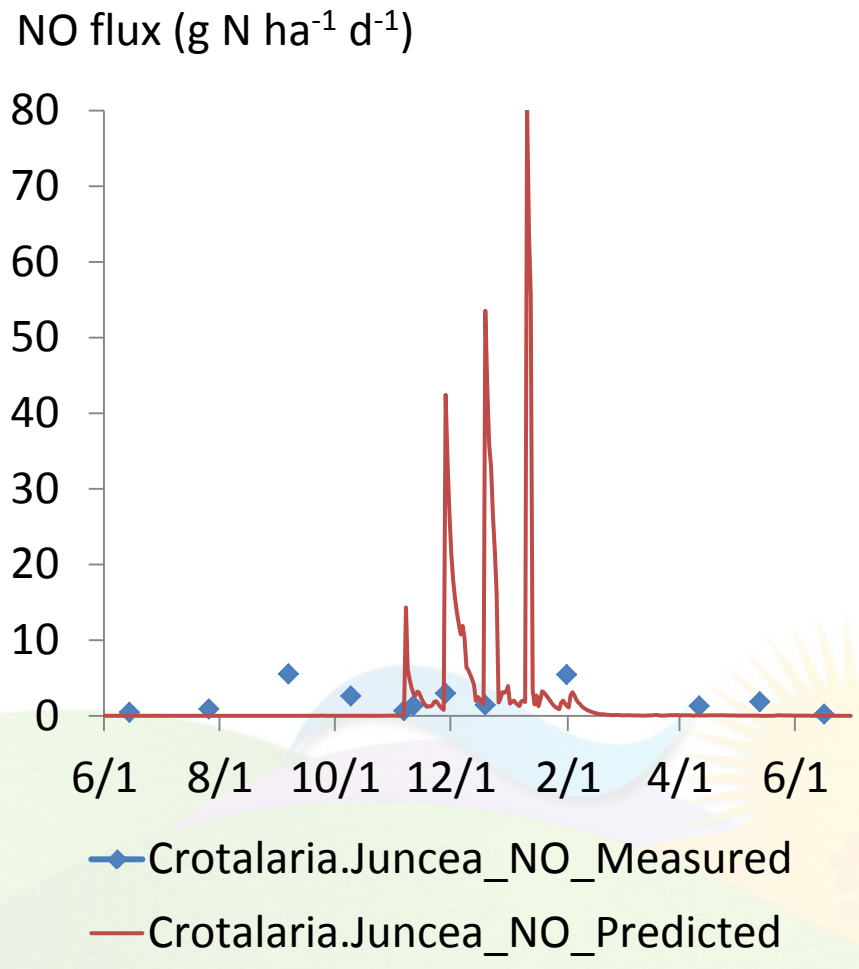
➢Predicted emissions from Crotalaria juncea and Mucuna pruriense both were higher than emissions from natural fallow (mean, 0.59 kg NO-N .ha^{-1} yr^{-1})

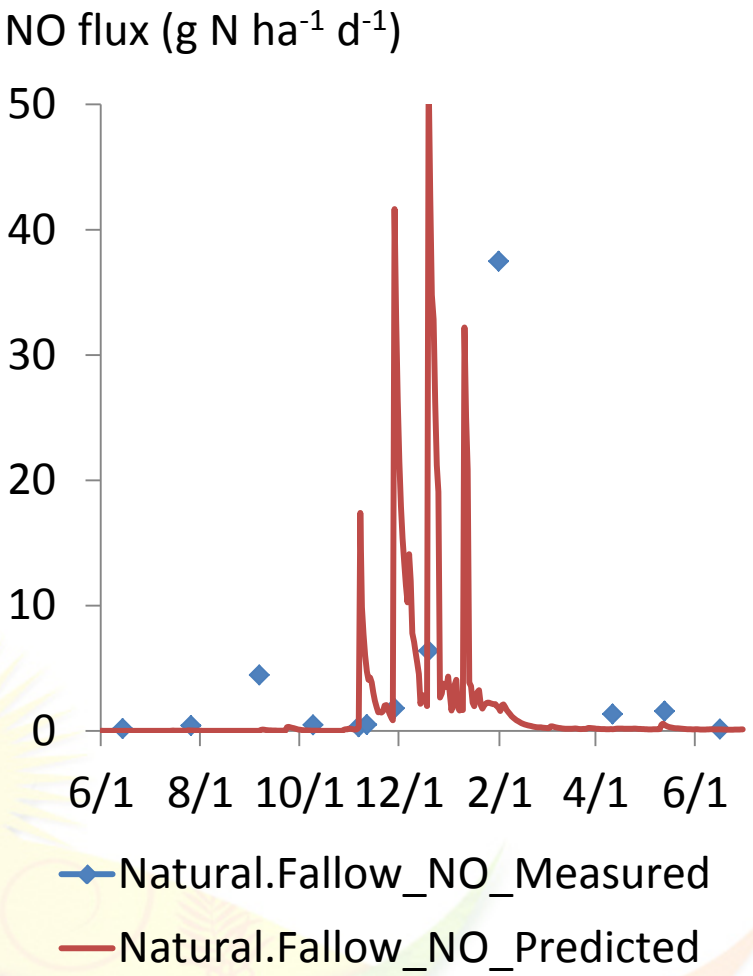
Measured and predicted NO fluxes from *Mucuna pruriens* and Natural fallow in conventional management





Measured and predicted NO fluxes from *Crotalaria Juncea* and Natural fallow in conventional management





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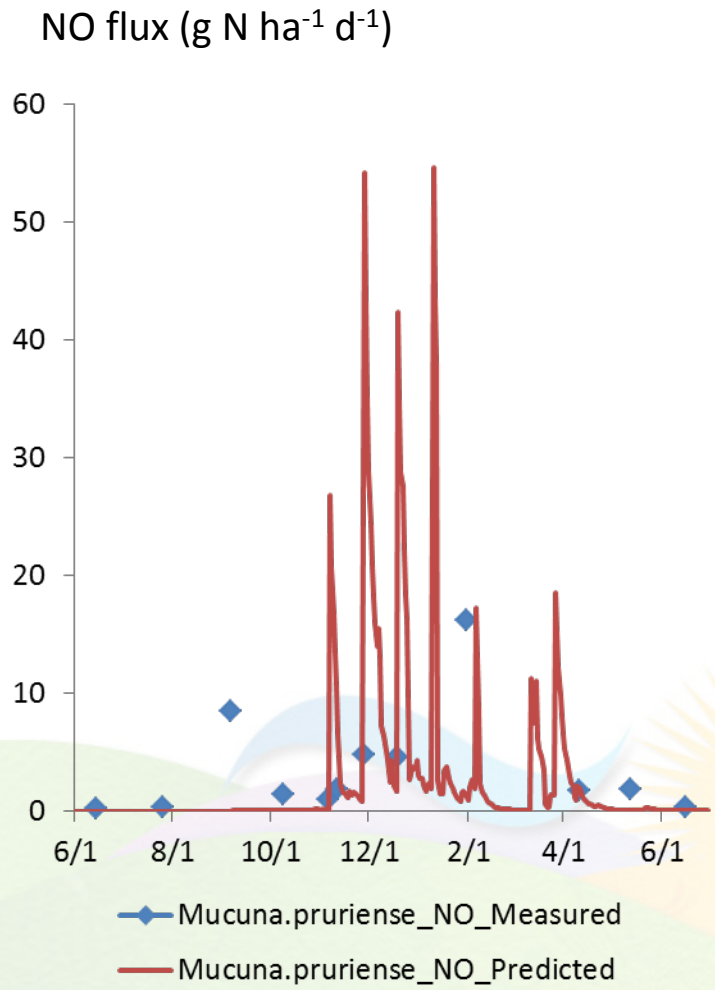
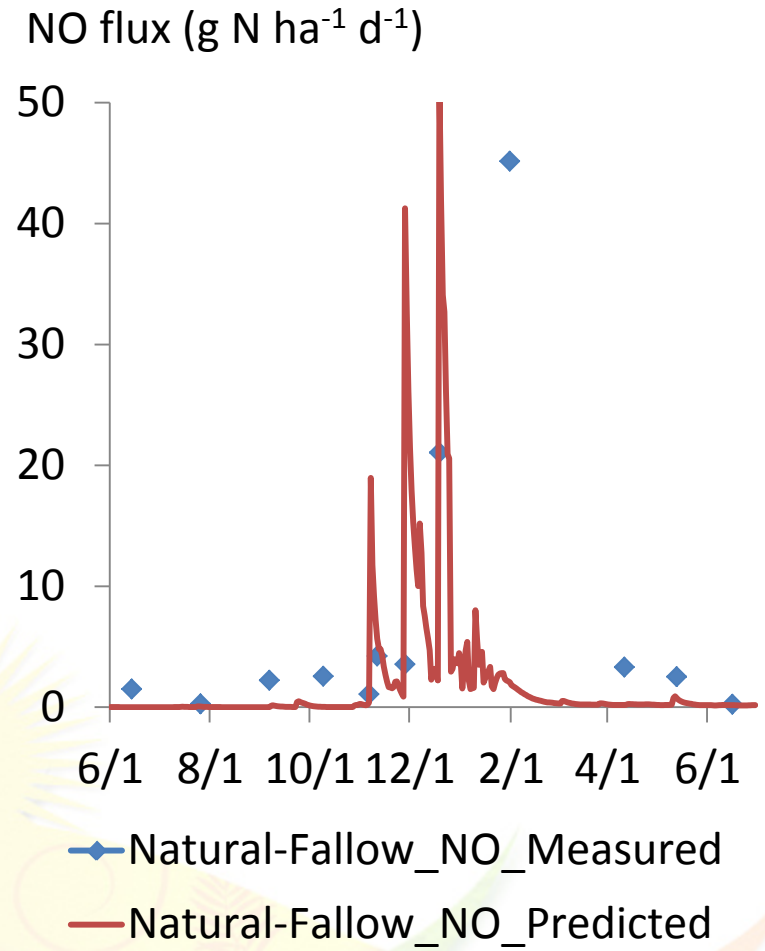
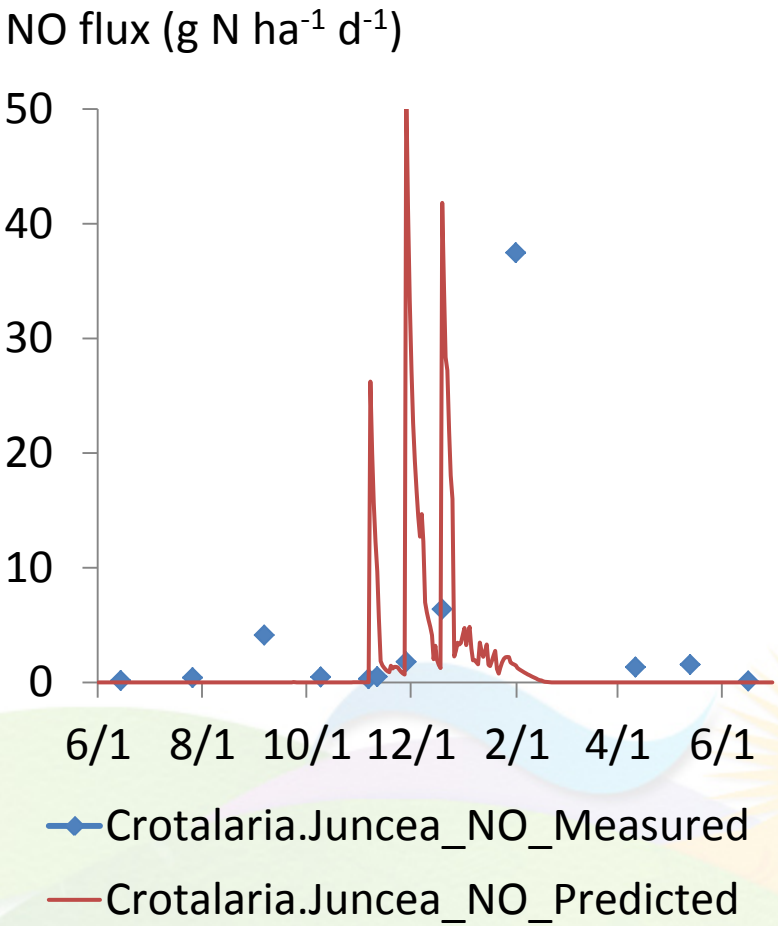
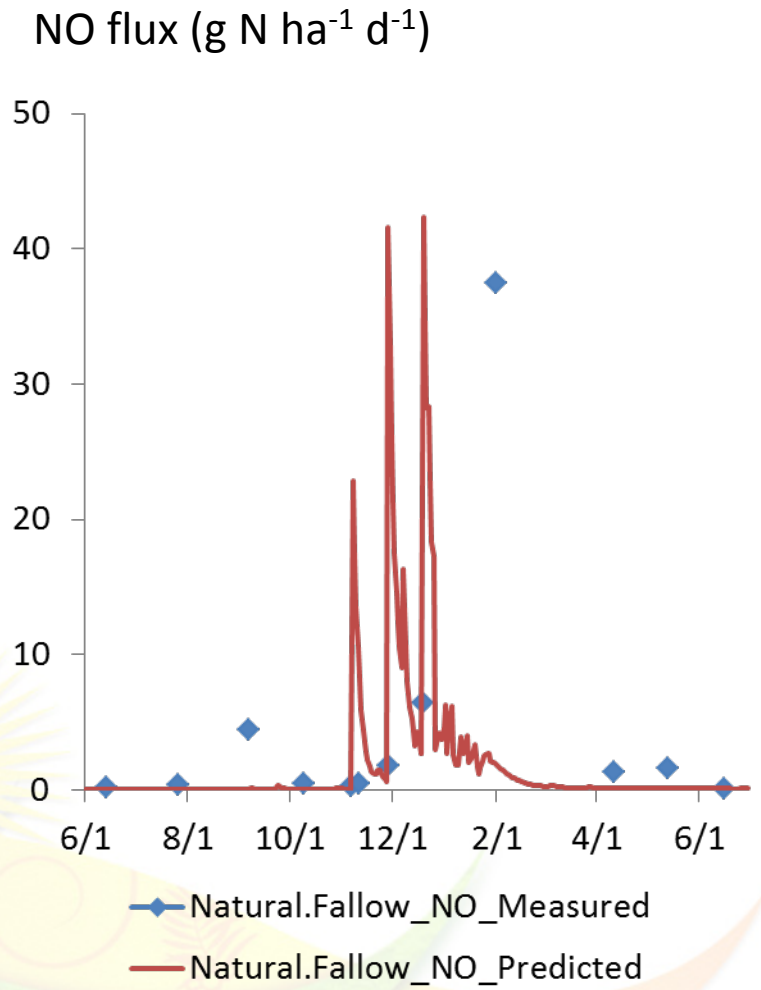
Measured and predicted NO fluxes from *Mucuna pruriens* and Natural fallow in No-Tillage management





Measured and predicted NO fluxes from *Crotalaria juncea* and Natural fallow in No-Tillage management





Conclusion

- Results reveal that the DNDC model yet requires calibration for application in no-tillage systems cultivated in Brazilian *Cerrado*.

Thank You!!!

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