



Research overview/introduction

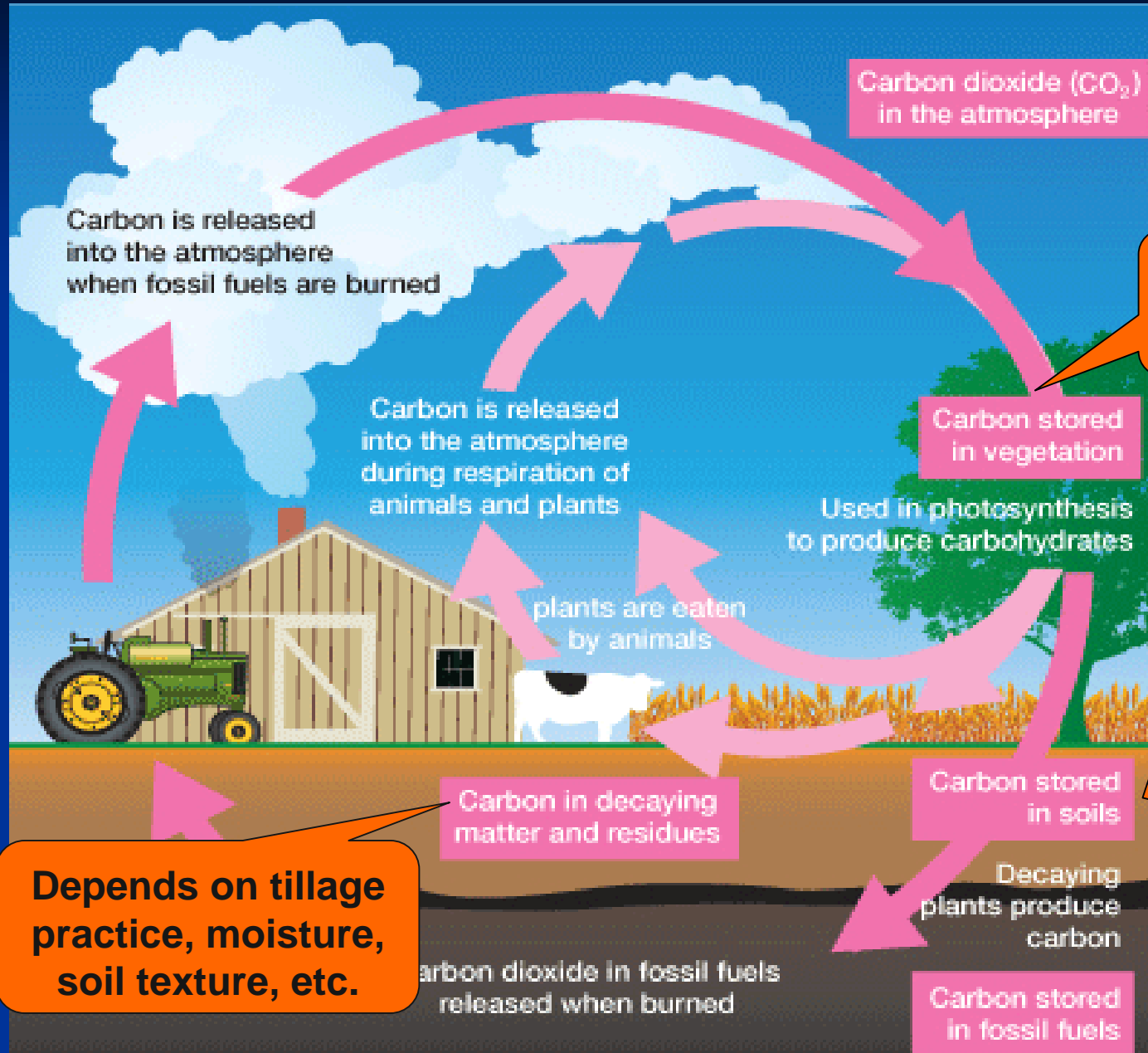
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Overall Research Focus:

Environmental and management impacts on ecosystem C and N dynamics and ecosystem function

- Quantification of GHG emissions – inventory methods, modeling, field methods
- GHG mitigation – decision support systems
- Sustainability of agricultural and forest bioenergy feedstocks
- Climate change impacts on agricultural systems

Ecosystem emissions- soil C

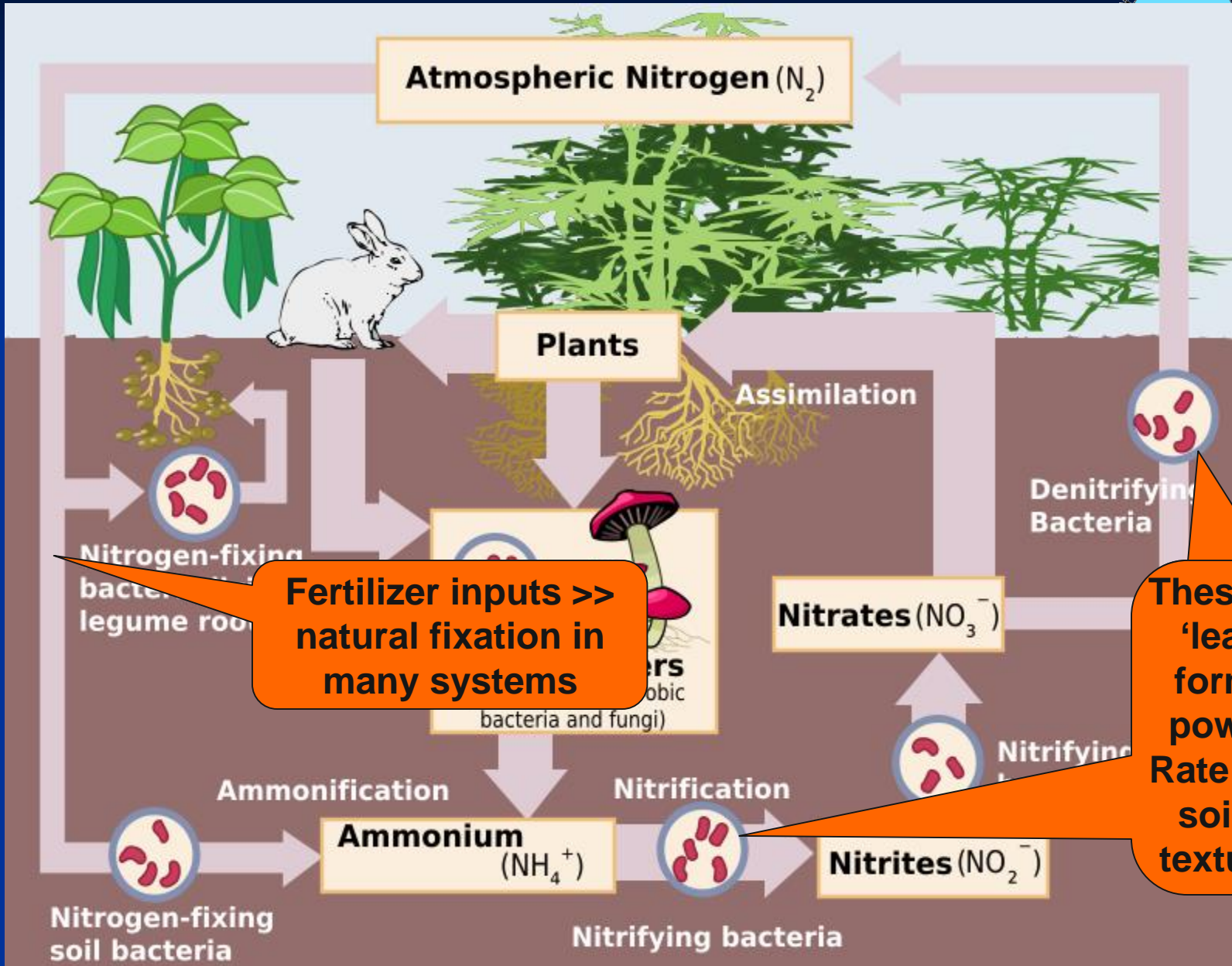


Depends on system productivity

~3x greater than standing biomass C globally. Depends on the balance between inputs, outputs. Losses in SOM = net CO₂ emission to atmosphere

Depends on tillage practice, moisture, soil texture, etc.

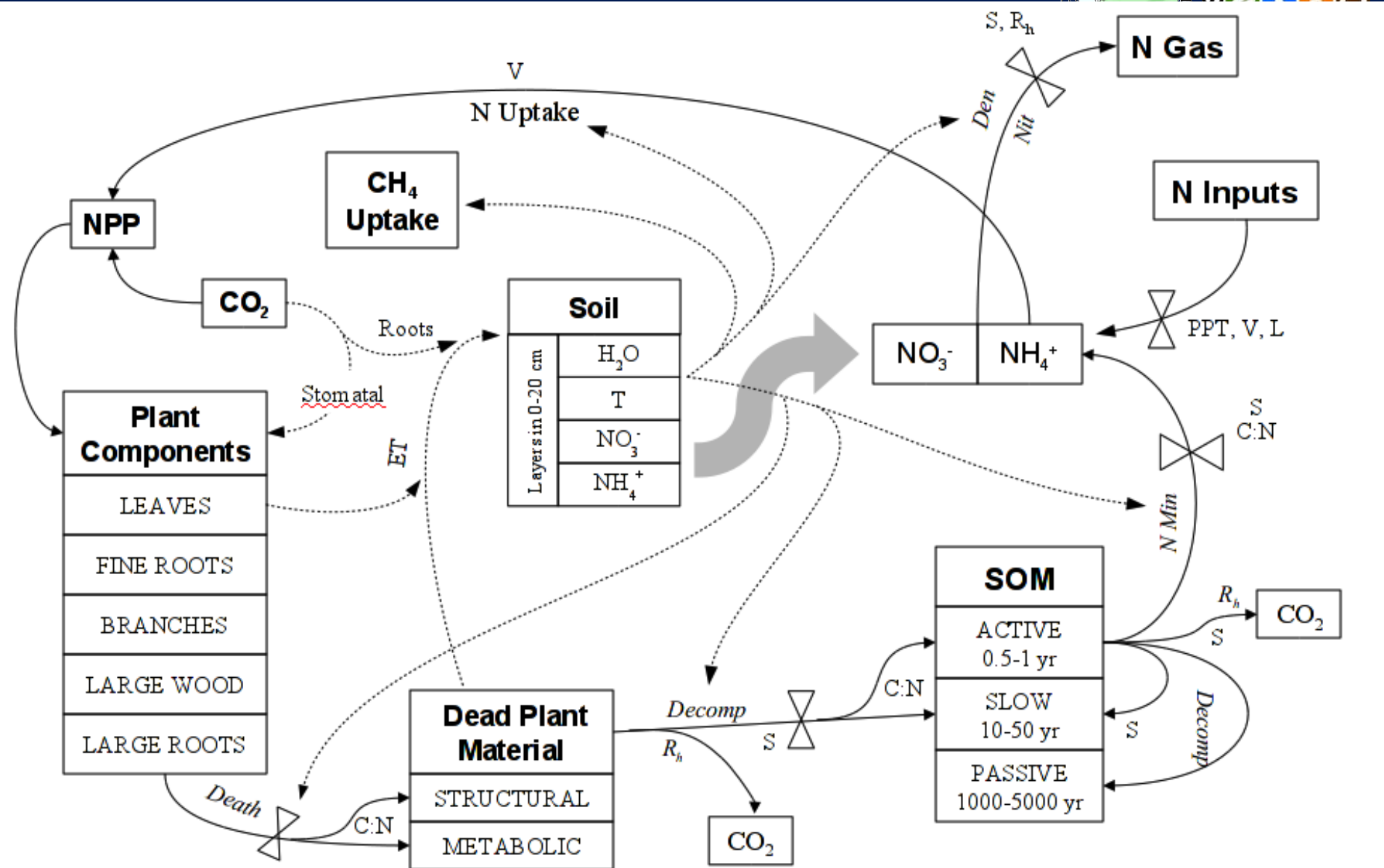
Ecosystem emissions- N_2O



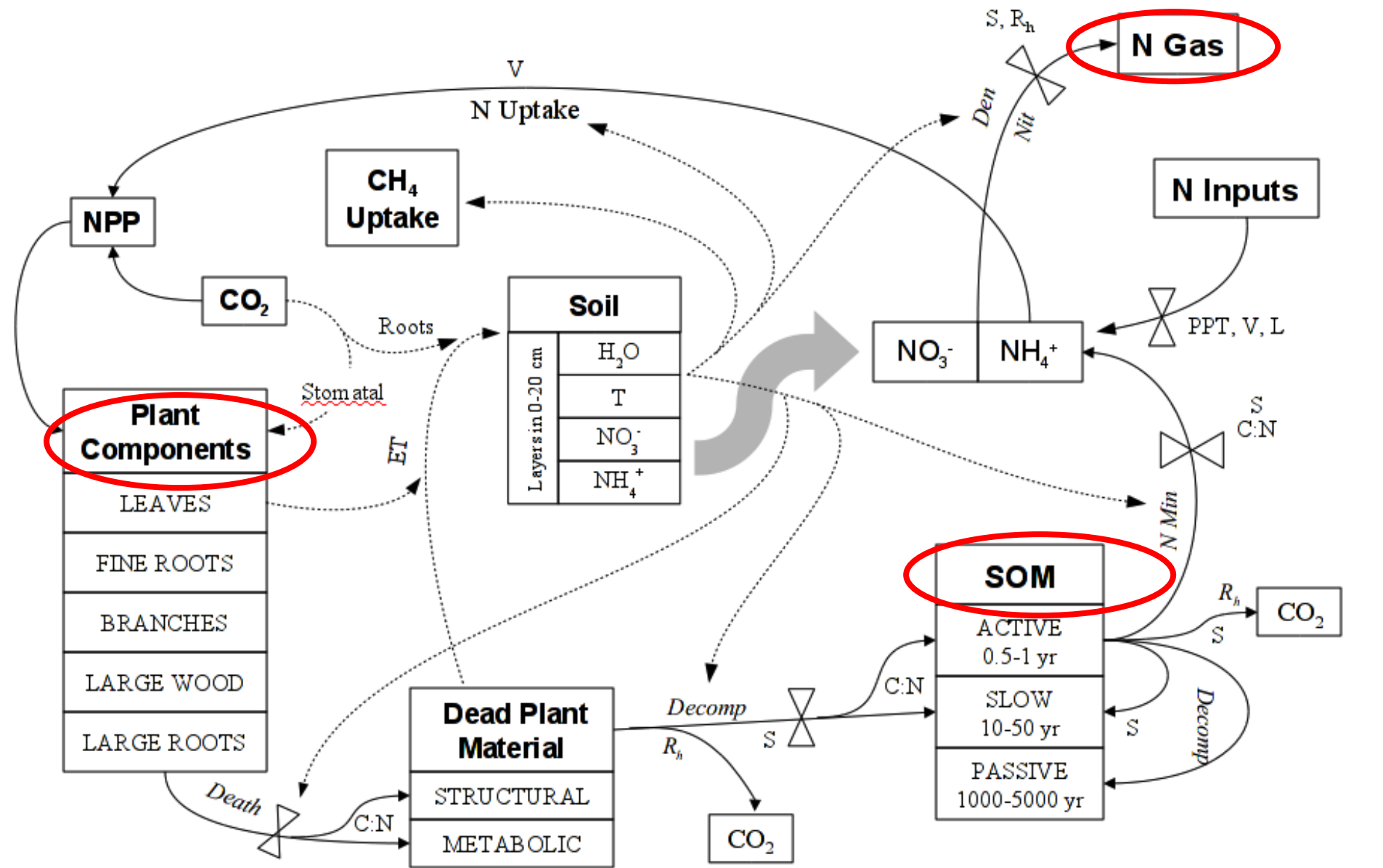
Fertilizer inputs >> natural fixation in many systems

These processes 'leak' N in the form of N_2O , a powerful GHG. Rate depends on soil moisture, texture, pH, etc.

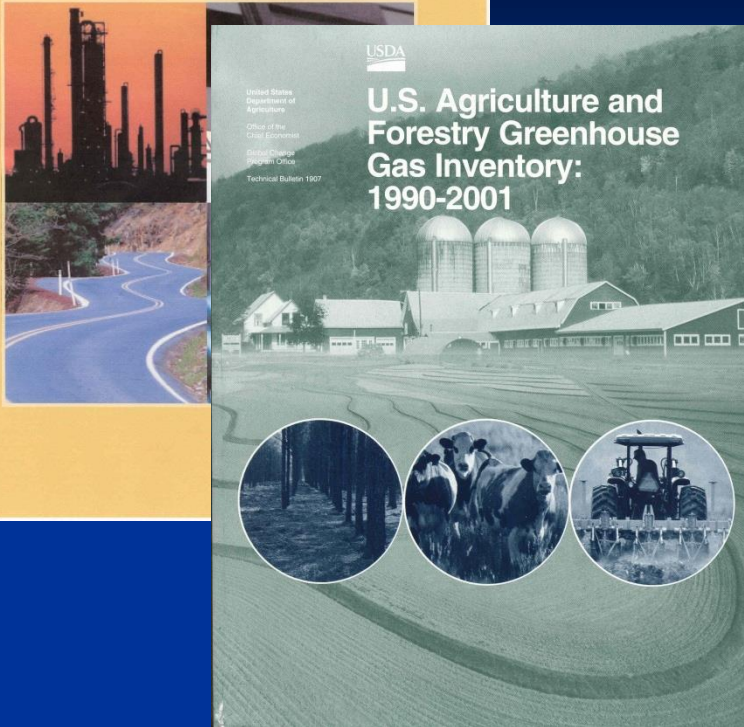
DayCent biogeochemistry model



DayCent biogeochemistry model

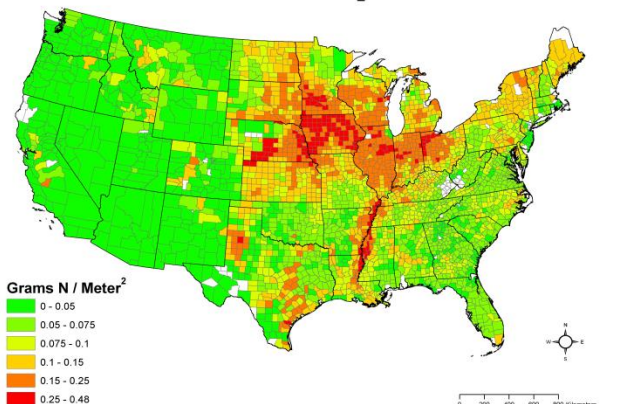


National GHG inventory methods

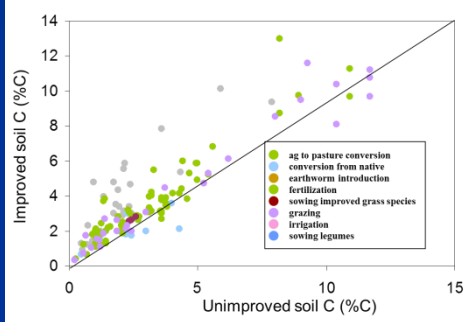


- Convening Lead Author for 2006 IPCC National Guidelines for GHG inventories
- Developed soil GHG methods for US inventory reporting to UNFCCC & provide estimates annually to US-EPA
- Tools for supporting agriculture, forestry and other land uses (AFOLU) GHG inventory in developing countries (GEFSOC, ALU)

DAYCENT N₂O



Pasture C dynamics

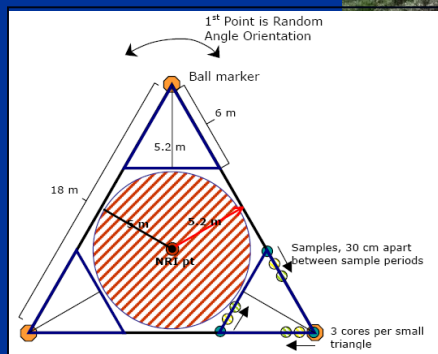


- Field studies on the impacts of land use history and improved pasture management on soil C changes

- Comparative and chronosequence studies at several sites in Southeastern US

- Field studies of grazing management systems in western US

- Development of a pilot national soil C monitoring network in US, including pastures



Entity-scale GHG accounting: COMET-Farm

- All GHG sources/sinks (soil, biomass, livestock, energy)
- Dynamic, web-based application – full spatial interface
- Incorporates recently-released USDA GHG methodologies
- Users – farmers, consultants, management agencies

COMET-FARM™ whole farm and ranch carbon and greenhouse gas accounting and reporting

Home Tool News

What is COMET-FARM™?

COMET-FARM™ is a **whole farm and ranch carbon and greenhouse gas accounting system.**

The tool guides you through describing your farm and ranch management practices including alternative future management scenarios. Once complete, a report is generated comparing the carbon changes and greenhouse gas emissions between your current management practices and future scenarios.

[Get Started >>](#)

Choose Activities

Choose the management activities you want to audit – field management, livestock, and/or energy use.

Define Management

Enter the management data and future management scenarios for the chosen activities.

Run Report

Run the report to see how greenhouse gas emissions based on your current management compare to future management scenarios.

Why should I use COMET-FARM?

COMET-FARM estimates the 'carbon footprint' for all or part of your farm/ranch operation and allows you to evaluate different options. [more...](#)

How do I use COMET-FARM?

Choose the management activities you want to investigate. Describe the management practices and possible future management scenarios. [more...](#)

What information do I need?

You will need information on your field and livestock management practices. Find out more here. [more...](#)

Is my information safe?

You may use COMET-FARM in one of two ways – as a registered or unregistered user. [more...](#)

How are my results calculated?

The system uses your information on management practices with information on climate and soil conditions to run a series of models. [more...](#)

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<http://cometfarm.nrel.colostate.edu/>

GHG accounting for sustainable land management (SLM) in developing countries

- Developed to support GEF-funded SLM projects
- Incorporates all land-use related GHG sources and sinks
- Implements IPCC Tier 1 and Tier 2 methods
- Utilized for projects in Brazil, China, Ethiopia, Kenya, Niger, Nigeria, Swaziland

Carbon Benefits Project: Modelling, Measurement and Monitoring

How do you want to define your project intervention areas?

Map: Draw intervention areas on a map. Use with moderate to high connections speeds.

Coordinates: Define intervention areas with coordinates. Use with low connections speeds.

Upload: If you already have your intervention areas

Carbon Benefits Project: Modelling, Measurement and Monitoring

Plan / Zoom Base Map Add Area Add Area by point Modify Area Delete Area Full-Screen Normal

Carbon Benefits Project: Modelling, Measurement and Monitoring

Project Description Guidance Analysis Tools Reports Help

1 Baseline Situation 2 Baseline Scenario 3 Project Scenario

Annual Crops : Cropping Systems

Forestland 8000 ha

Grassland

Settlements 750 ha

Wetlands

Annual Crops 9000 ha

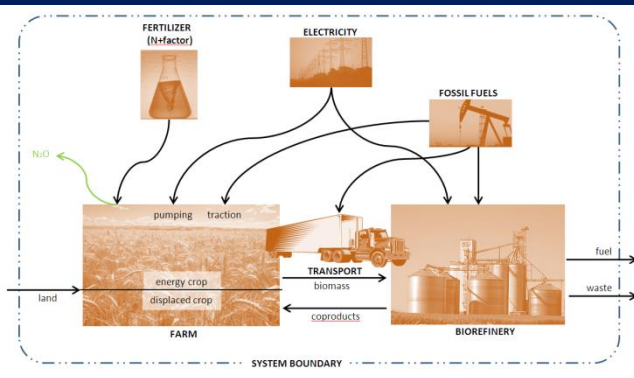
1. Cropping Systems

Crop	Improved	Tillage	N Fert.	Residues	Rice Residues	Area (ha)
Intercropped maize/soybean/millet and beans/legume	yes	full	1-10	rem	n/a	1000
Continuous Maize/Sorghum/Millet	yes	full	10-20	rem	n/a	150
total						1150

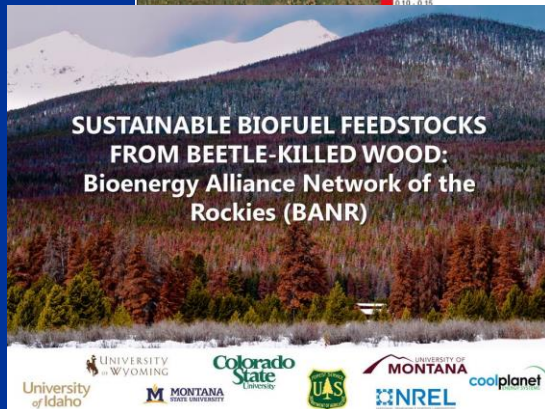
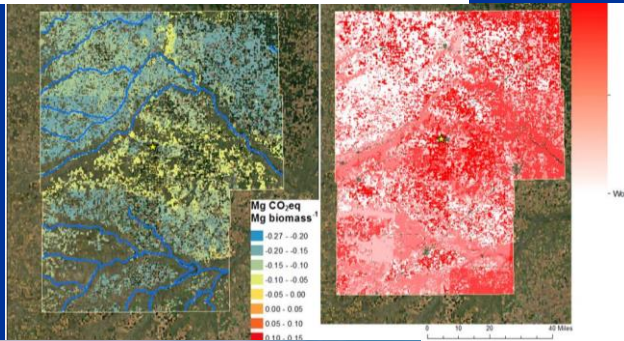
Total Area Allocated (ha): 1150 of 1500

http://hqweb.unep.org/cbp_pim/

Sustainability of biofuel feedstocks



- Focus on quantifying GHG footprint of biofuel feedstock production – corn, corn stover, switchgrass, sugarcane in Brazil
- Developing tools for spatially-explicit modeling and LCA of feedstock production at biorefinery scale
- New center on utilization of waste wood in Rocky Mtns



Recent and ongoing projects with EPA, Gevo, USDA, Shell

Decision support system development

- Goal: develop a web-based, high-resolution spatially-explicit decision support system for bioenergy feedstock GHG assessment
 - Individual Farm
 - Regional/Biorefinery
- DayCent model
 - Yields, SOC, N₂O
- Builds on experience with:
 - COMET GHG reporting tools
 - EPA national GHG inventory

The screenshot displays the USDA United States Department of Agriculture website for the COMET-Farm tool. The header includes the USDA logo and navigation links: Home, About COMET-Farm, Contact Us, Help, Tool, and Wh. Below the header is a progress bar with three steps: 1 Choose Activities, 2 Define Farm/Ranch Management (currently active), and 3 Run Report. The main content area is divided into a left sidebar and a right map area. The sidebar contains sections for 'Crop Production, Grazing, and Agroforestry' (with sub-sections for Farm and Field Locations, Historic Land Management, Current Land Use, and Future Land Use Scenarios), 'Energy Usage' (with sub-sections for Fuels for Traction), and a note stating 'These categories and steps depend on what activities are selected on the previous page.' The map area shows a satellite view of a farm with yellow field boundaries and a red rectangular selection box. A 'Smith Farm' entry is visible in a table at the bottom of the map area, with options to 'remove' or 'add field'.

Collaborations with Brazilian scientists

- National-scale soil C modeling: GEFSOC (GEF/UNEP)
- Project-scale GHG tools: CBP (GEF/UNEP)
- Soil C and GHG impacts of LUC and sugarcane (Shell, DeltaCO₂)
- COMET-Global – extension of COMET tool to EU, Australia & Brazil
- Exchanges with Brazilian graduate students (C.B. Brandini, C.E.P. Cerri, L. Frazao, M. Galdos, A.M. Silva-Olaya, L. Zotarelli)