SP 06: Experimental Farming, riparian wetland carbon storage, and bioindicators

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Objectives

Natural conditions in tropical ecosystems favour a rapid mineralization of organic carbon forms, especially in agricultural soils (Martius et al. 2001). Especially in Brazil, a tremendous release of carbon dioxide can be anticipated (Jones et al. 2005).

Decomposition rate of organic matter varies with environmental characteristics and type of the material (Cadisch and Giller 1997).

Soil invertebrates have an important function in organic matter processing, enhance carbon storage (Pulleman et al. 2005), and can be used as bioindicators of the functioning of the entire soil ecosystem (Behan-Pelletier 1999).

Workplan

Timetable	Priority objectives and cooperation partners (*Fig. 1*)
End of 2011	Finding appropriate methods, substances and gears for the experimental SOM enrichment; beginning of analysis of biodiversity data, litter break down and C- and N-releases;
Mid of 2012	Completion of all site installations for field experiments;
End of 2012	1st analysis of SOM and soil parameters from enrichment and litterbag experiments;
End of 2013	2nd analysis of SOM and soil parameters from enrichment and litterbag experiments; end of soil fauna investigations;
Mid of 2014	Modelling spatial variance of decomposition rates, soil fauna, carbon-storage and sequestration;
End of 2014	3rd analysis of SOM and soil parameters from enrichment and litterbag experiments;
Mid of 2015	Completion of a mechanical SOM enrichment device; Presentation SOM enrichment techniques at “Expo-Agro 2015”; Final report on decomposition and soil fauna;
End of 2015	Application of the calculated models in practical agriculture;
Mid of 2016	Final report on carbon sequestration and carbon storage.

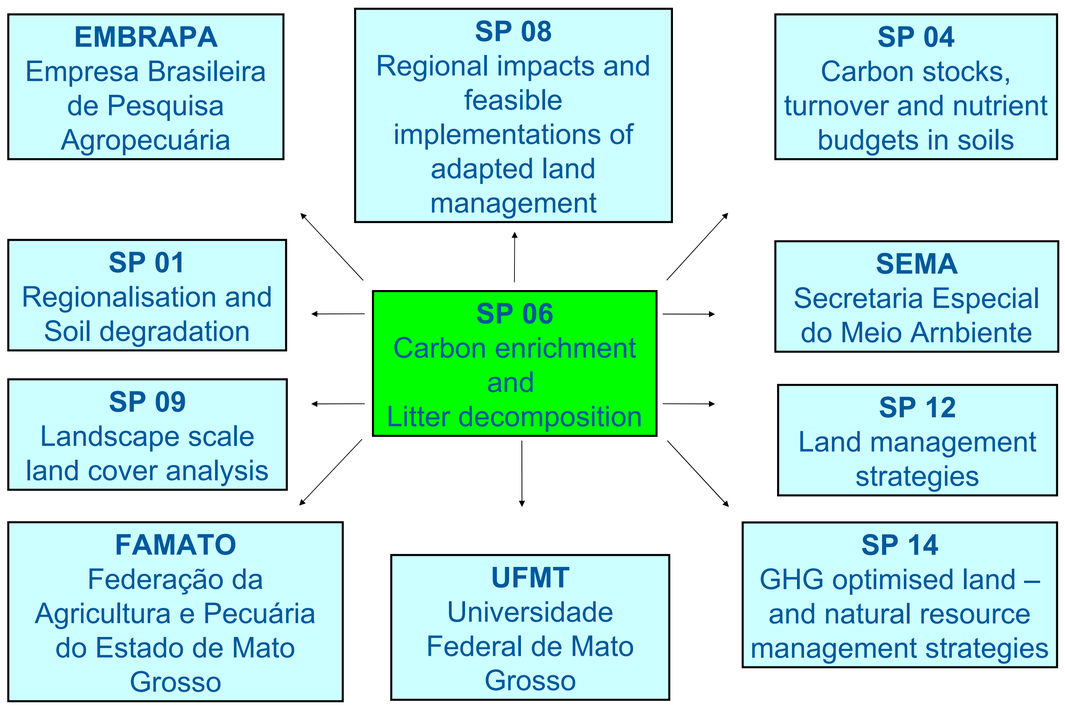

Fig. 1: Planned cooperation of SP 06 with other subprojects in CarBioCial

Methods

(1) Identification of materials appropriate for soil organic matter (SOM) enrichment in arable fields;

(2) Development of techniques for SOM enrichment;

(3) Contribution to the analysis of economical practicability;

(4) Analysis of the effects of SOM enrichment on soil carbon stock/yield;

(5) Assessment of carbon storage in riparian wetlands (see also *Fig. 2*);

(6) Mesh bag experiments with different substrates, C- and N contents of remains;

(7) Earthworm, Collembola and Oribatida densities recorded by hand sampling and/or using the Macfadyen Method;

(8) Determination of soil fauna that can be used as bioindicators for efficient SOM management;

(9) Set up a long-term ecological survey system.

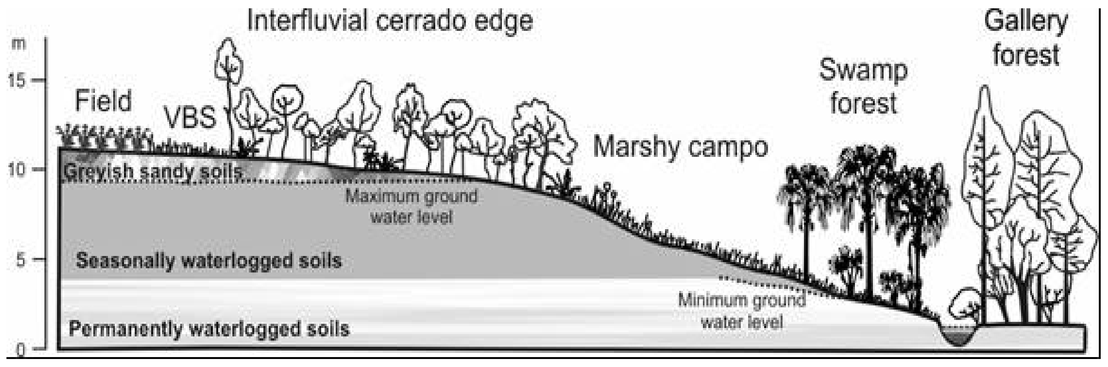

Fig. 2: Natural transect of the Brazilian Cerrado, ranging from arable fields (left) to carbon-storing marshy campos (veredas) and swamp or gallery forests (Wantzen et al. 2006)

Expected Results

The enrichment of SOM appears to be an efficient and feasible strategy to tackle global needs of carbon sequestration and soil quality improvement.

At the same time, it is providing multiple synergies through improved ecological functions of the landscape (e.g. water storage, nutrient turnover, biodiversity).

In close collaboration with the farmers of Mato Grosso, we will contribute to develop agro-technological devices and management schemes to optimize this process.

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