

Multi-scale Methods for Monitoring Mixed Cropping Systems in support of Low Carbon Agriculture Program: No-tillage and Crop Livestock and Forest Integration. GEO-ABC Project

Margareth SIMÕES^{1,2*}, FERRAZ, R.¹, BÉGUÉ, A.³

Universidade do Estado do Rio de Janeiro - PPG-MA - Rua São Francisco Xavier 542, BL F sala 12005 Maracanã, Rio de Janeiro, RJ, Brasil-20.550-900; Embrapa Solos - Rua Jardim Botânico 1024, Rio de Janeiro, RJ, Brasil - 22.460-000; Maison de la Télédétection 500 rue JF Breton Code Postal: 34093 Ville: Montpellier - França

E-mail address of presenting author*: margareth.simoes@embrapa.br

Introduction Agricultural powers have launched ambitious programs, such as GAP (Good Agricultural Practice) guidelines or the Low Carbon Agriculture Program (Program ABC). Those programs give a special role to multifunctional landscapes in the process to establish a sustainable agriculture. The purpose of this work is to present the Geo-ABC Project, an innovative project aiming at developing methods to monitoring, at local scale, sustainable cropping system (practices), such as: crop-livestock-forest integration and, at regional scale, *cropland sustainable system* (landscape patterns) in order to provide spatial indicators to support the ABC Program.

Material and Methods

A mixed of different methodological approaches will be applied to study how the local variables are scaled-up to the regional scale, and what spatial, temporal and textural indicators derived from coarse-resolution satellite images can be used to represent *cropland system* at landscape level. Crop specific distribution modelling, traditional up-scaling and new methods approaches based on indirect satellite-derived variables (temporal, spectral, spatial indicators) will be applied and tested in study cases at Tocantins state (Matopiba Region) and at crop-livestock-forest integration sites.

Results and Conclusions

The complete set of methodological approach constitutes one of results of this work, establishing methodological protocols to obtain systematic *spatial* indicators, at multi-scale level providing metrics to the ABC Program. At the political context, GeoABC will provide spatial-temporal metrics that can be used as inputs for: the monitoring the ABC Program goals (***How much?***); the survey of information about the adoption of the ABC Program (***Where?***); the planning of monitoring GHGs within the Sectoral Plan of Climate Change Mitigation and Adaptation (***Where to go?***); the processes of political decision-making in the assessment of ABC Program (***What to do?***). At the scientific context, those methods will provide inputs for scientific studies: on the dynamics of land use related with the adoption of low carbon agricultural production systems, for assessment of trends and establishment of future scenarios (***land use dynamics***); on the dynamics of land use, based on the expansion of low-carbon agriculture production related to the *mitigation of environmental impacts* (***environmental impacts***); on the dynamics of land use, based on the expansion of low-carbon agriculture production related to the *mitigation of the greenhouse effect*: (a) carbon stocks in soil and biomass; (b) reduction of GHGS; (c) water balance-*ecosystem services*; (iv) on the dynamics of land use, based on the expansion of low-carbon agriculture production and the relation with *Climate Change* (***climate change***).

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