Geophysical Research Abstracts
Vol. 18, EGU2016-16558, 2016
EGU General Assembly 2016

C storage in Amazonia pastures, effects of age, climate and management

Katja Klumpp (1), Clement Stahl (2), Vincent Blanfort (3), Sebstien Fontaine (1), Benoit Burban (2), and Olivier Darsonville (1)

(1) INRA, Grassland Ecosystem Research (UR874), Clermont Ferrand, France , (2) INRA Kourou - UMR Ecofog – French Guiana, France, (3) CIRAD, UMR Selmet 112, Montpellier, France

The Amazonian region is one of the major C storing areas, with 36–60% of ecosystem C being stored in forest soils. During last decades, more than 15% of Amazonian tropical forest has been converted to pastures. A number of studies provide evidence that soil C stocks of topsoil (0-20 cm) can be higher in grasslands than in native forests after more than 20 years after conversion (e.g. Don et al 2011). As for younger pastures (< 20 years old), results are less evident, showing either an increase or decrease of in topsoil C stock. The absence of a clear pattern was mostly explained due to conjoined changes following deforestation, such as climate conditions and pasture management.
Accordingly, the question remains whether tropical permanent pastures can restore soil C stocks after deforestation and what is the capacity of tropical pastures to initiate a recurrent C storage. Pastures are largely affected by agricultural practices, influencing their carbon balance, in interaction with climate effect. In the past 10 years two major droughts (in 2005 and 2010 [2]) were reported for the Amazonian area. A better insight on effects of climatic variability and agricultural management on carbon storage is, thus, valuable to improve/maintain C storage of pastures in tropical regions.

Here we like to assess whether tropical permanent pastures i) can restore soil C stocks after deforestation; ii) and to what extend and iii) which role play management practices with respect to climate variability to maintain a recurrent C storage. To establish reliable estimates of soil C storage in Amazonian region, the net C balance of pastures and native forests was quantified by two independent and complementary studies in French Guiana: a chronosequence study including a soil inventory of soil C stocks (0-100 cm depth) in 24 pastures of various ages (i.e. 0 to 42 yrs after deforestation) and 4 native forests, and 5 years of eddy covariance flux measurements (EC) for a young intensively used pasture (established in 2008) and an old extensively used pasture (established in 1978).
Chronosequence provided evidence that soil of old pastures have a higher soil C stock than the native forests. This was confirmed by EC-measurements, showing a higher carbon storage potential of the old pasture compared to young pasture. Concerning grassland management and climate, the carbon balance of the old pasture was less affected by the dry season than the young pasture, supposedly due to a higher vegetation density and diversity (C3, C4 and legumes) preventing from soil drying and enabling the vegetation to maintain a photosynthetic activity.

[1] Pan, Y., et al 2011, Science. 333, 988–993.
[2] Lewis, S. L., et al 2010, Science, 331.6017.