Runoff and particles detachment of a soil under cultivated pastures in Cerrado (Brazil)First results on erosion micro-plots

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Introduction

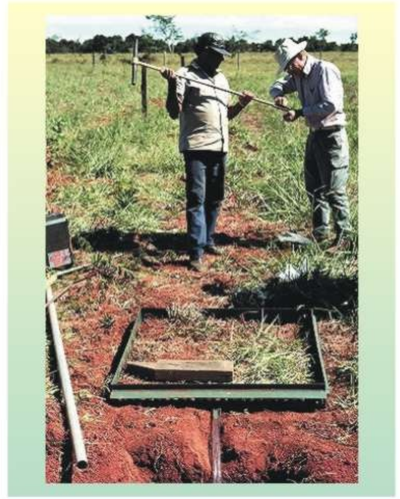
The majority of cultivated pastures in Cerrado are of low productivity, or even degraded. Among the degradation factors, are the runoff and particles detachment the important elements in the degradation process of these pastures?

An experimentation led on erosion micro-plots of 1 m^2 on clayey oxisol under cultivated pastures in State of Goias, during the rainy season 1999-2000, in order to assess these two factors.
The pluviometry of the experiment site located at 30 km from Planaltina (GO) was of 1084 mm from September 1999 to April 2000. The plots were installed on clayey Dark Red Latosol (oxisol) with 50 % of clay in the topsoil. The slope is around of 3.5 %.

Material and methods

Nine erosion micro-plots, of 1 m^2 each one, were placed according the topography (top, middle and bottom slope), at the rate of 3 by treatment on the followed pastures: a restored graminee, *Brachiaria brizantha*, in January 99, an association of restored *Brachiaria brizantha* and a legume, *Stylosanthes guianensis*, sown in February 99, and a control which is a *Brachiaria brizantha* of low productivity of 9 years old.

The runoff waters were collected after every rainy period (1 to 3 days after max.). The sediments of particles detachment were collected from the end of February, after the development of pastures' cover on the restored plots. In the same time, many measures of volumetric water content were carried out regularly, in order to follow the hydric profile of plots.



Results and discussion

The synoptic wiew of runoff during the rainy season shows that it is low. The most important runoffs occured in the first part of rainy season, due mainly at the high runoff of bottom slope plot of the association Brachiaria brizantha and Stylosanthes guianensis, after 2 rainy periods, respectively, of 64 and 119 mm.

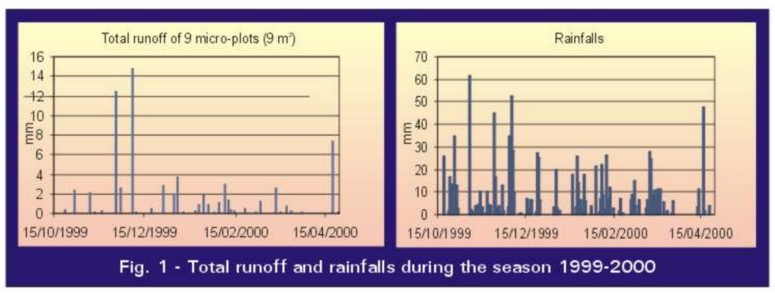


Fig. 1 - Total runoff and rainfalls during the season 1999-2000

The correlation between the incident rainy periods (3 days max.), which trigger the runoff, and the runoff of all micro-plots is low (r2 : 0.50). Below 60 mm of rain, the runoff is very low or inexistant (< 1 mm).

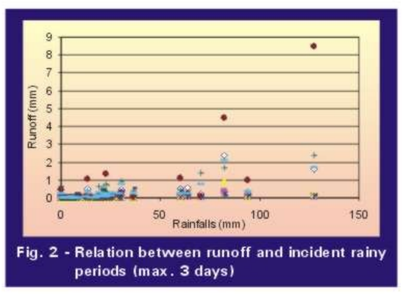


Fig. 2 - Relation between runoff and incident rainy periods (max. 3 days)

The topography is the determining factor of runoff on this site. It is more important in bottom slope than top and middle slope. The runoff coefficient (R.C.) is of 1.5 %, whereas it is of 0.75 % for the whole site.

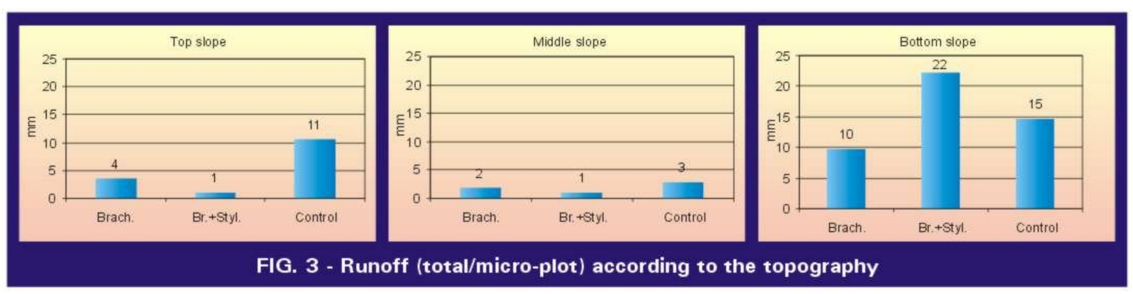


FIG. 3 - Runoff (total/micro-plot) according to the topography

The sediments collected during the 2 last months of rainy season mainly come from the control. During this period, the R.C. was higher than the others treatments. And the rate plant cover is of 60 %, whereas it is of 70 to 80 % in the 2 others treatments.

In bottom slope, where the runoff is the most important of site, the R.C. is conditionned by the rain intensity and the soil hydric state. This graph shows that, after periods of 9 and 10 days without rain, respectively, in November and January, the R.C. is, in the first case, of 0.53 % for a rainfall of 20 mm/h, and, in the second case, of 4.08 % for a rainfall of 39 mm/h. While after a rainy period of 83 mm in 9 days, the R.C. is of 3.48 % with a rainfall of 20 mm/h in November.

The low runoff of this soil implies a good capacity of infiltration. In the bottom slope control, after a periode of 16 days without rain followed of 63 mm in 6 days, the water volumetric content increased of 30 % at 30 cm deep, and 50 % at 60 cm deep.
This indicates the high macro-porosity in the topsoil.

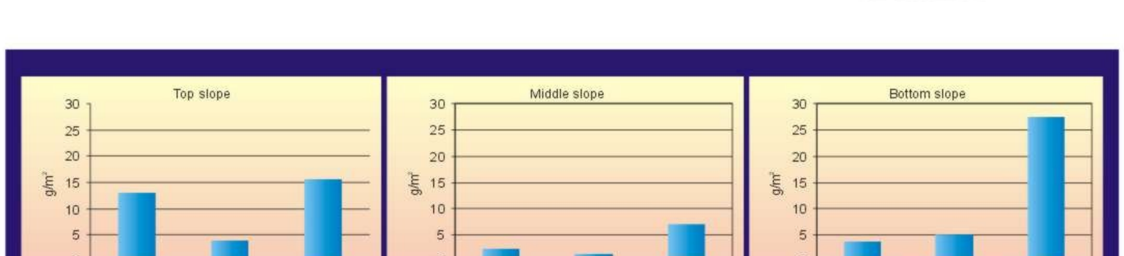


FIG. 4 -Collected sediments (g/m² per micro-plot)

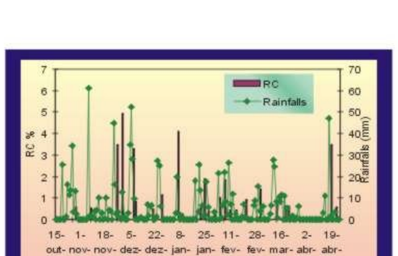


FIG. 5 - Mean runoff coefficient of bottom slope micro-plots according to the rainfalls

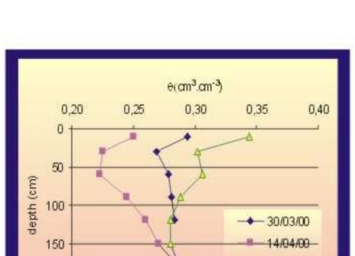


FIG. 6 -Reload of volumetric water content (cm³.cm⁻³) in bottom slope control

Conclusion

These results confirm those obtained in large plots. We observe a low runoff (R.C. < 1 %) of dark red latosol under pastures with small quantitites of collected sediments. After this first study year, we have not observed a significant difference between the restored pastures and the control.

At the scale of square meter, the runoff and the particles detachment intervene of a negligible way in the degradation process of these soils.

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