

BELOWGROUND CARBON STOCK IN A CERRADO VEGETATION IN BRAZIL

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INTRODUCTION

Forests play an important role in mitigating the effects of global warming. In environments such as the Brazilian cerrado *stricto-sensu* which has a high ratio root: shoot and well-defined seasonality, the belowground (BWG) carbon to 1 m depth corresponds to 80% of total C and should be considered in REDD + projects as a strategy to recover and preserve the biome.

OBJECTIVE

The aim of this study was to evaluate the seasonal variation of SOC and C present in the roots up to 1 meter depth and total BWG carbon.

MATERIALS AND METHODS

The cerrado object of this study is located in Botucatu, State of São Paulo, Brazil. The weather is kind CWA (Köppen) with seasonality clearly demonstrated. One of the peculiar characteristics of the Cerrado studied is the occurrence of annual frost.

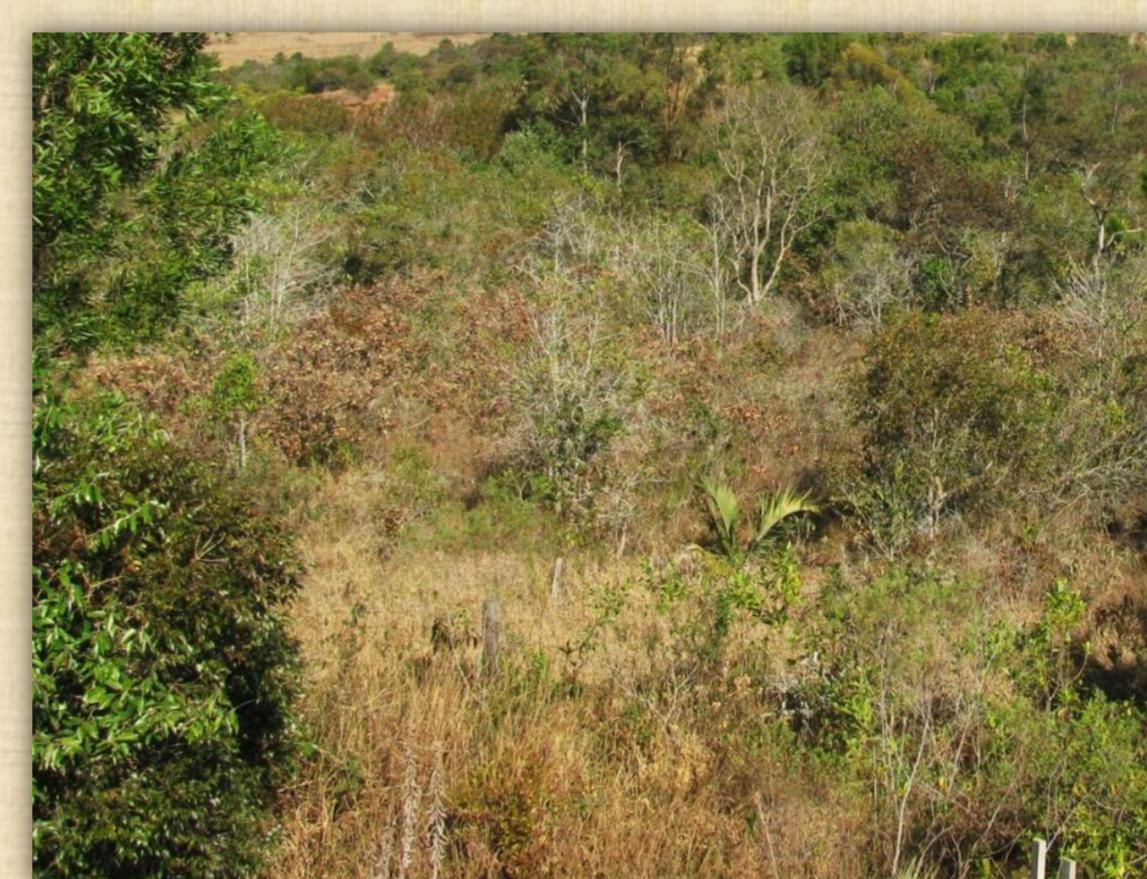


Figure 1. Cerrado Vegetation

Forty simple samples were collected for analysis of SOC as well as density cores in an irregular sampling grid to assess the content C. The data were analyzed by Tukey Test 5%.



Figure II. Soil Samples

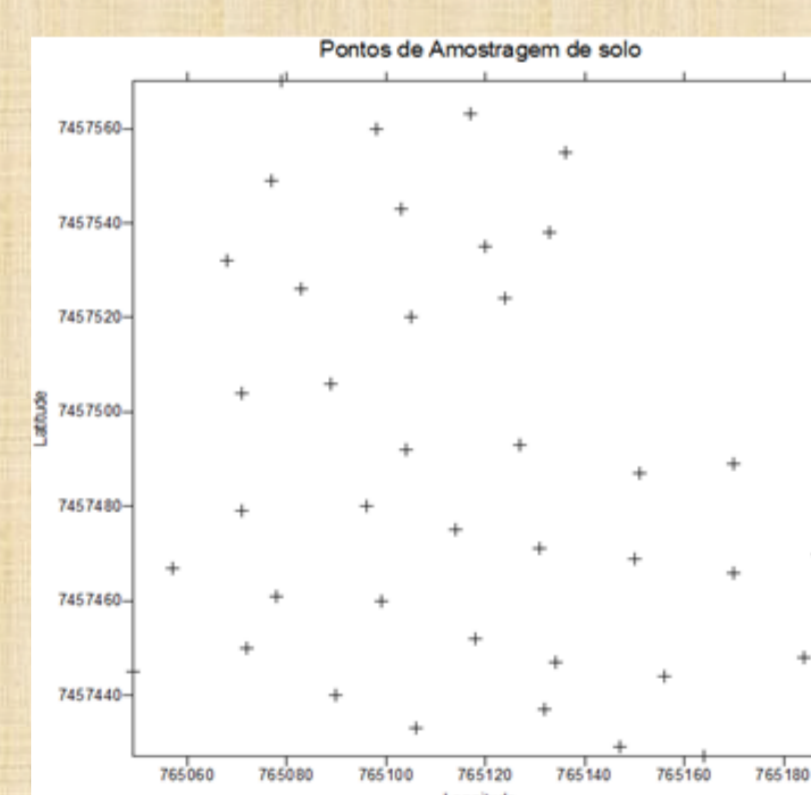


Figure III. Sampling grid



Figure IV. Samples for bulk density

Roots were collected in 5 trenches of 0.25 m x 0.25 m x 1m and divided into the following diameter classes: <2 mm, 2-5mm, 5-10mm and > 10mm; also, the roots were dried, weighed and analyzed for C content. The total C stock was obtained from the sum of the SOC stock and roots C stock.



Figures V. Trenches to collect roots



Figure VI. Roots sorted by diameter class

RESULTS AND DISCUSSION

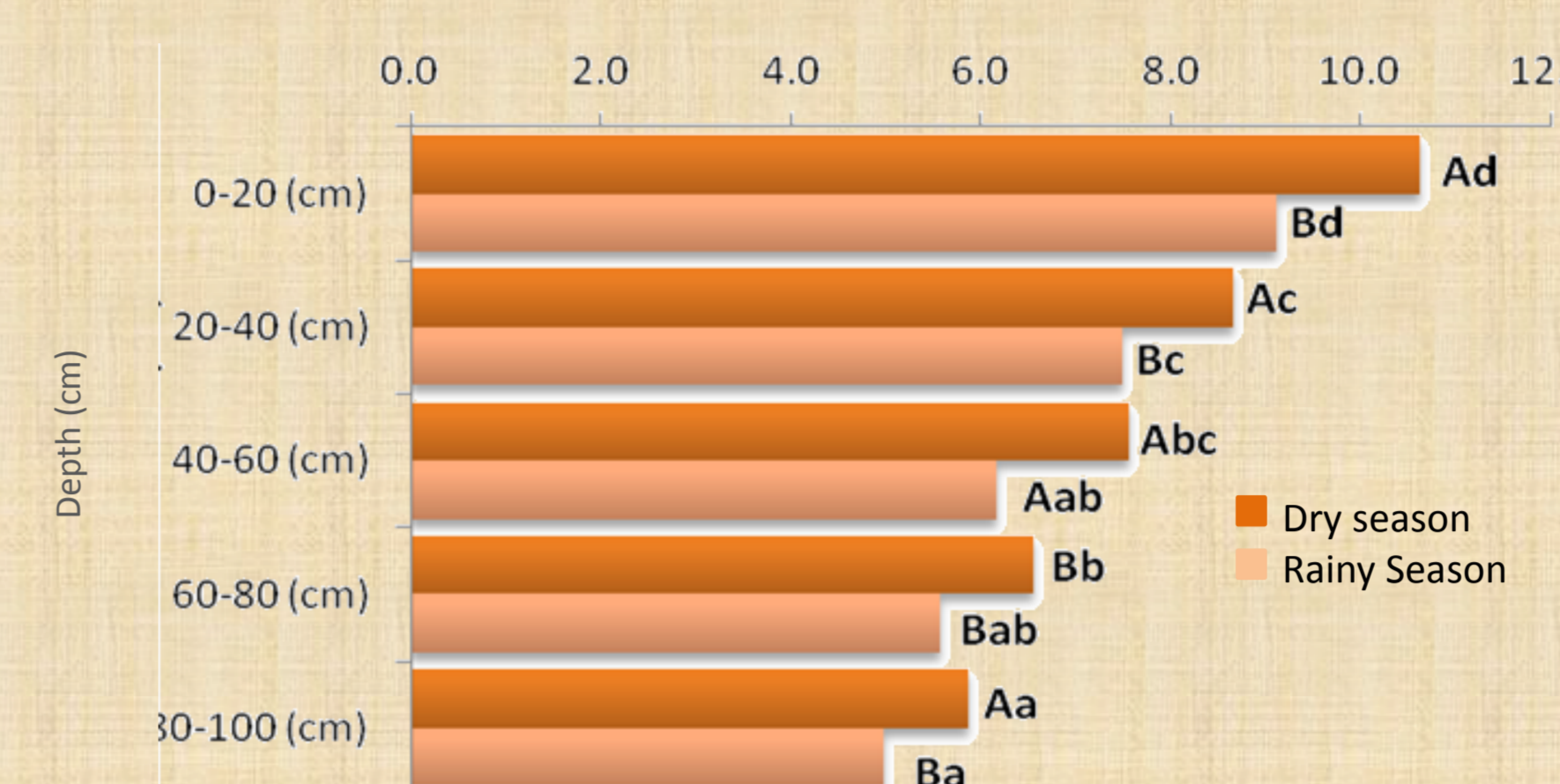


Figure VII. Soil Organic Carbon (g dm⁻³)

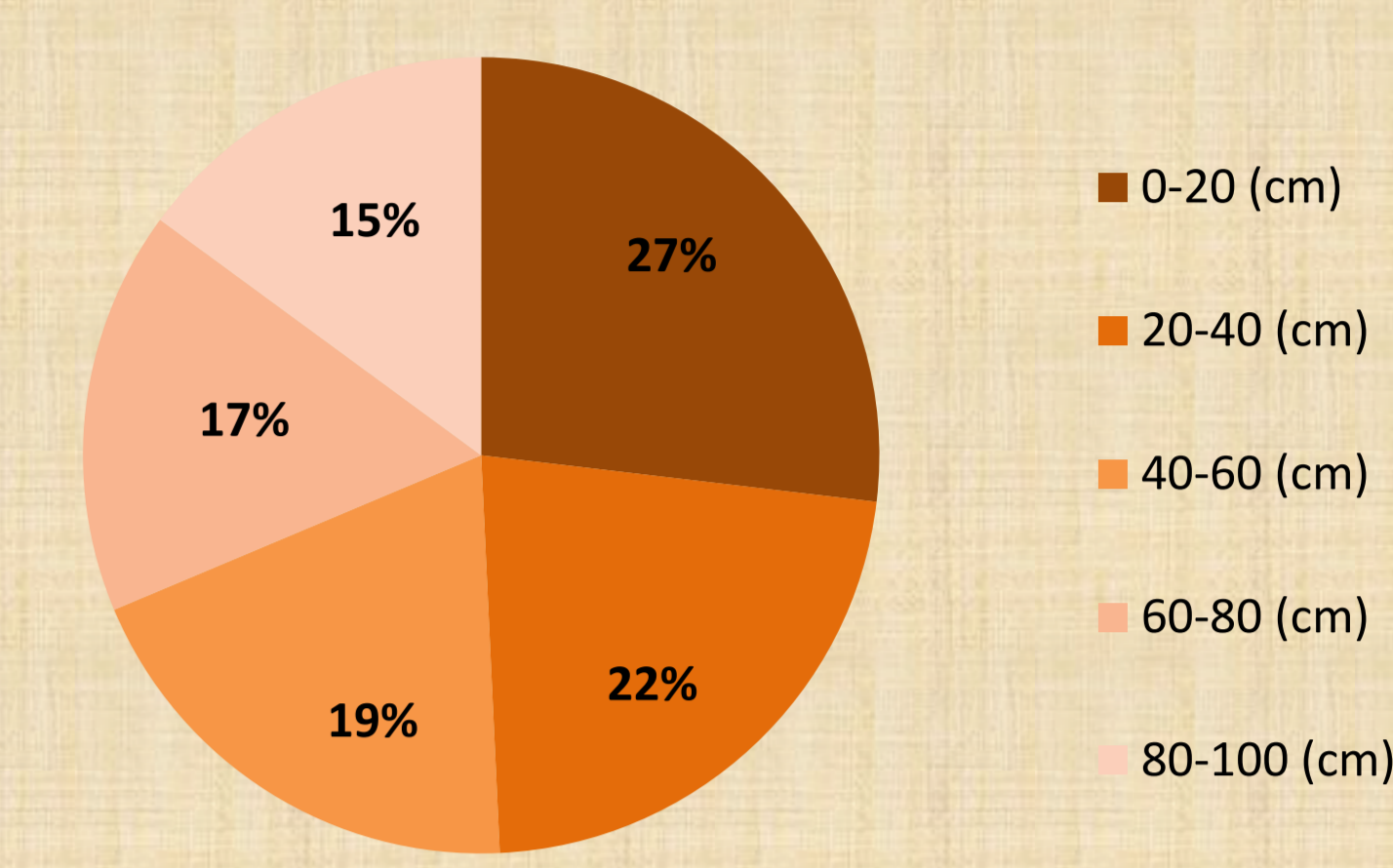


Figure VIII. Percentage of Carbon per Depth

Soil carbon contents were influenced by the depth and seasonality with lowest values in the deepest layers (Fig. VII). This occurs because the carbon is directly related to the organic matter in the surface in higher quantities due to litter, soil aeration, and decomposing microorganisms activity. The decomposition rates of litter are slower in the Cerrado than in other forest types causing a high accumulation of biomass in the absence of fire as the area used of this study. The increase in carbon content in the soil during the dry period was associated with the greatest amount of biomass produced in summer and added to the surface with progressive decomposition and incorporation of organic matter to the soil. The results show a significant difference for the carbon content between the seasons.

When considering the profile studied, 50% of the SOC was found in the first 40cm, both in summer and winter (Fig. VIII).

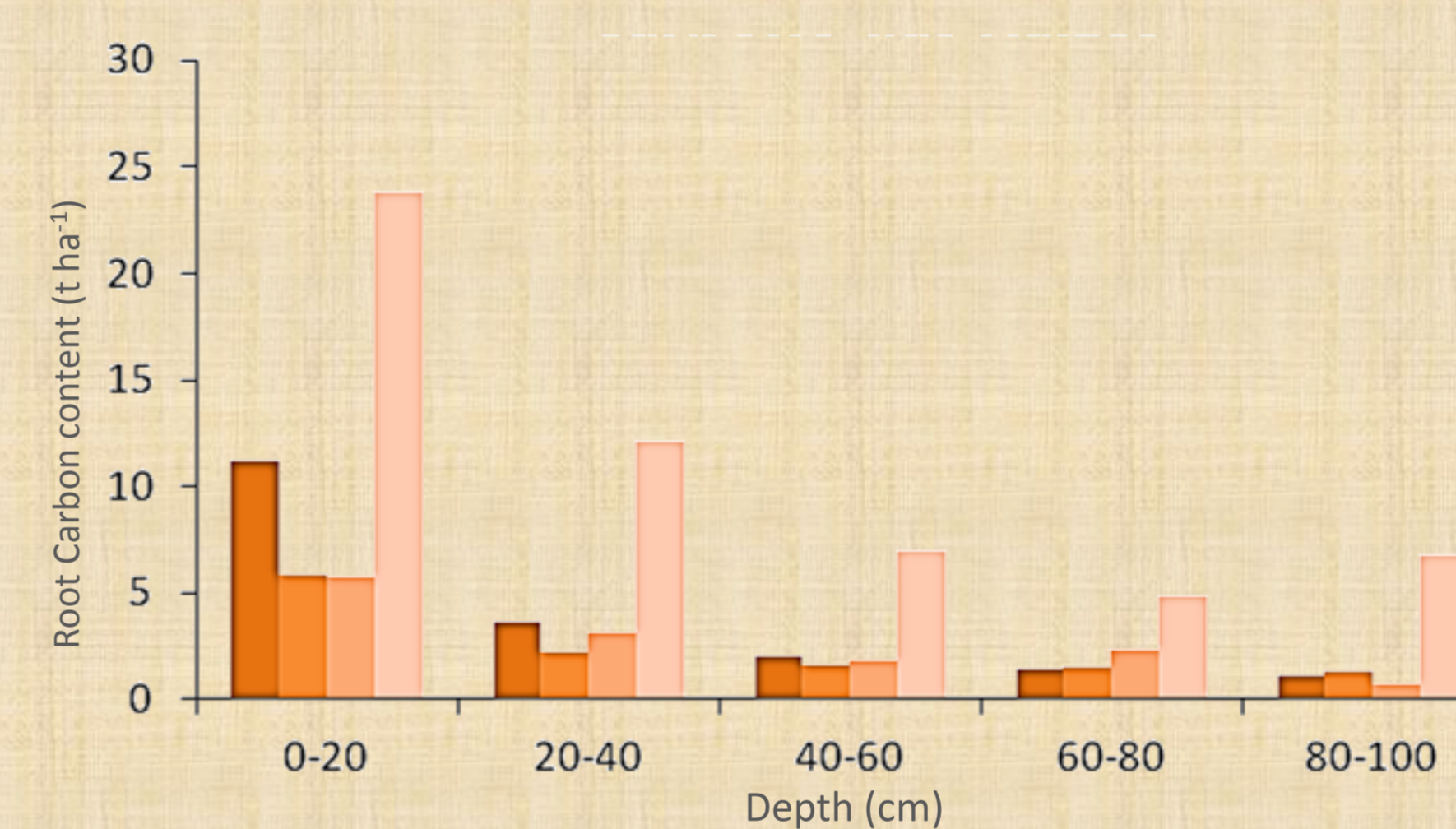


Figure IX. Root Carbon Content per Depth

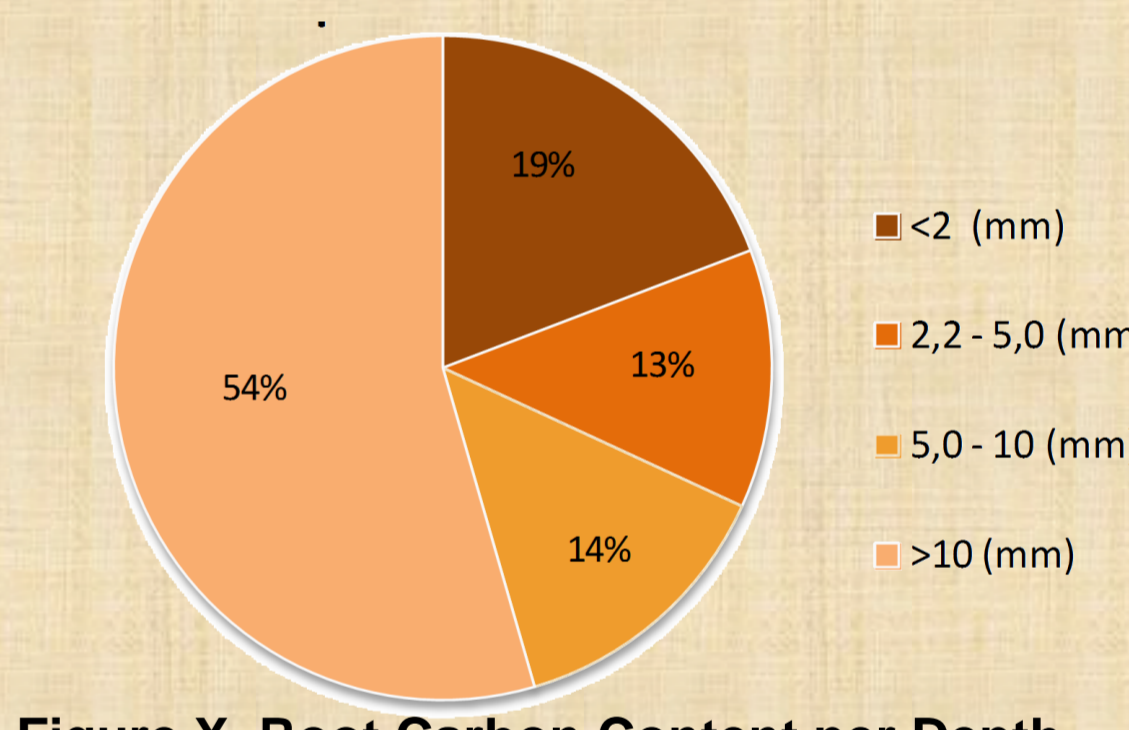


Figure X. Root Carbon Content per Depth

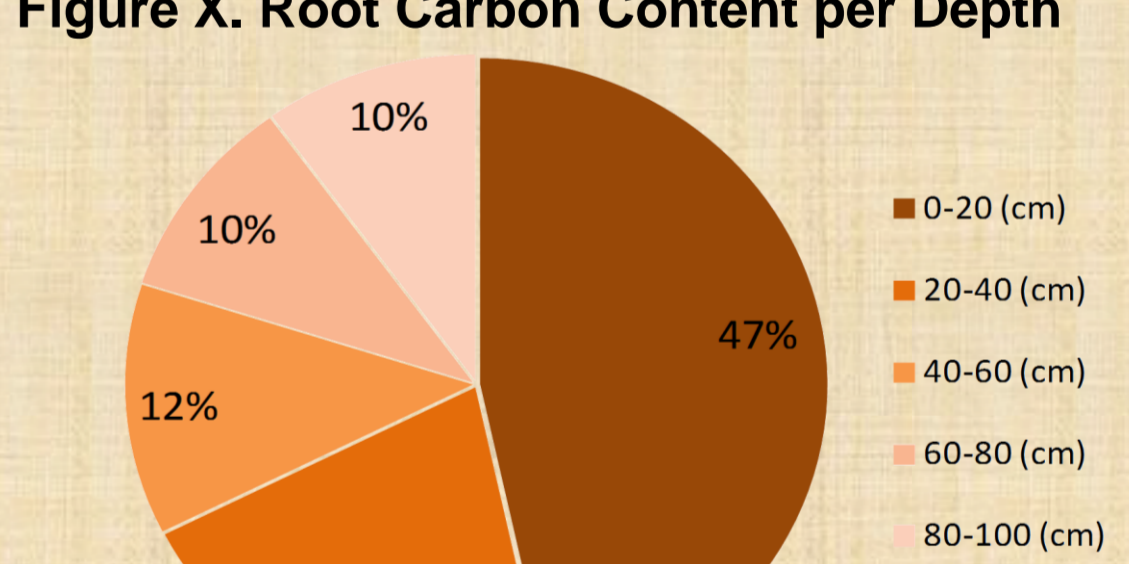


Figure XI. Root Carbon Content per Depth

68% of the carbon in roots are found in the first 40 cm. This carbon is trapped mainly by the roots greater than 10 mm diameter followed by thin root diameter (less than 2 mm).

Depth (cm)	Dry Season	Rainy Season
0-20	43,72	39,41
20-40	31,49	27,71
40-60	25,65	29,69
60-80	22,72	25,74
80-100	20,80	17,32
0-100	144,38	139,86

The total difference of soil carbon stock is not significant when considering the seasonality. On the other hand, the difference tends to increase with larger areas and other types of forest. It is also clear that to consider only 30 cm of depth in the verification of environmental services provided by the ground, as requested by standards as IPCC, overlooks over than 50% of the existent soil carbon.

CONCLUSION

There were significant differences in the SOC stock among the soil layers in the dry and rainy seasons.

The carbon stock up to a meter is approximately 2 times greater than those considered on the methodologies of BWG quantification available nowadays.

The amount of thick roots exceeds the amount of fine roots at all depths.

The carbon content in the soil was 3.6 times greater than the carbon in the roots.