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Estimating soil organic and aboveground woody carbon stock in a protected dry Miombo ecosystem, Zimbabwe: Landsat 8 OLI data applications

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1 **Estimating soil organic and aboveground woody carbon stock in a protected dry** 2 **Miombo ecosystem, Zimbabwe: Landsat 8 OLI data applications**

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12 13 **Abstract**

14 Accurate and reliable soil organic carbon stock estimation is critical in understanding
15 forest role to regional carbon cycles. So far, the total carbon pool in dry Miombo
16 ecosystems is often under-estimated. In that regard this study sought to model the
17 relationship between the aboveground woody carbon pool and the soil carbon pool,
18 using both ground-based and remote sensing methods. To achieve this objective, the
19 Ratio Vegetation Index (RVI), Normalized Difference Vegetation Index (NDVI), and
20 the Soil Adjusted Vegetation Index (SAVI) computed from the newly launched
21 Landsat 8 OLI satellite data were used. Correlation and regression analysis were used
22 to relate Soil Organic Carbon (S.O.C), aboveground woody carbon and remotely
23 sensed vegetation indices. Results showed a soil organic carbon in the upper soil layer
24 (0-15cm) was positively correlated with aboveground woody carbon and this
25 relationship was significant ($r = 0.678$; $P < 0.05$) aboveground carbon. However, there
26 were no significant correlations ($r = -0.11$, $P > 0.05$) between SOC in the deeper soil
27 layer (15-30 cm) and aboveground woody carbon. These findings imply that
28 (relationship between aboveground woody carbon and S.O.C) aboveground woody
29 carbon stocks can be used as a proxy to estimate S.O.C in the top soil layer (0-15cm)
30 in dry Miombo ecosystems. Overall, these findings underscore the potential and
31 significance of remote sensing data in understanding savanna ecosystems contribution
32 to the global carbon cycle.

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34 **Keywords:** carbon pool, soil layer, tree height, vegetation indices, woody biomass,
35 satellite data

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