Above ground: Below ground productivity ratios in natural mangrove forest of Gazi Bay, Kenya

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Abstract

Mangroves, a land-ocean interface ecosystem occupy only 0.4% of forested areas globally but among the most productive ecosystems on earth accounting for about 11% of the total input of terrestrial carbon into the oceans. The above ground carbon stock in mangroves has been estimated to be as high as 8000 g C/m^2; with similar figures reported for below ground components. In the context of climate change mitigation and carbon offset, there is need to estimate rates of carbon sequestration and storage across major carbon sinks. In this study in-growth cores and tagging techniques were used to estimate rates of roots and shoot productivity. For above ground productivity, tagging of shoots methods combined with measurements of stem diameters was used. Periodic measurements of environmental variables across the zones were also done. This study provides estimates of below and above ground productivity which can be used as a proxy for estimating the sequestered carbon. Among the four forest zones, *S. alba* had the highest productivity: 10.3 ± 0.7 t ha^{-1} yr^{-1} while *Ceriops tagal* had the lowest productivity 2.6 ± 0.8 t ha^{-1} yr^{-1}. There was significant difference in above ground productivity across zones $p = 0.001$, df = 5 and a significant difference in below ground productivity across zones $p = 0.035$, df = 5 while total productivity between zones is highly significant $p = 0.01$, df = 5. There was a positive weak correlation between below ground and above ground productivity ($R^2 = 3.9$ %). Results of this work will be used to model long-term carbon capture and storage in the mangrove forest of Gazi Bay. This model will give more accurate estimates of carbon stocks that would be available for sale through the voluntary carbon markets. The results are compared with similar studies elsewhere in the world.

Keywords
productivity zone, carbon stock, core and tagging