Remote sensing patterns of primary productivity of the Great Limpopo Transfrontier Conservation Area (GLTCA) in relation to land use and land tenure

**INTRODUCTION**

Primary productivity (i.e. NPP) refers to the amount of solar energy converted to biomass through photosynthesis by plants per unit area per unit time.

- ton ha$^{-1}$ yr$^{-1}$ or gm$^{-2}$yr$^{-1}$.

The ecological, as well as economic significance of NPP makes it important to study.

In any ecosystem, all heterotrophs ultimately depend on biomass, thus consequently on NPP.

It is important to test the relationship between NPP and land use and land tenure patterns within multiple use areas such as the GLTFC A.

Relationships are currently unclear and yet have a direct bearing on sustainable development, human livelihoods, biological conservation and the management of animal diseases and ecosystem health.

In this study we explore whether land tenure and land use variations can explain the spatial and temporal variations in NPP.

**INTRODUCTION**

Remote sensing: an invaluable approach to determine the spatial and temporal distribution of NPP at large spatial scales.
Estimated NPP using a remote sensing model based on the micrometeorological approach and derived from the Monteith equation

The equation is given as follows:

\[ \text{NPP} = \text{LUE} \times \text{APAR} \quad (1) \]

where APAR refers to absorbed photosynthetically active radiation and LUE is the light use efficiency.

Radiation modeling

Calculated radiation by latitude for each month (72 maps overall)

Output radiation is in KJ/m^2/day

Output was converted to MJ/m^2/day

Used MODIS images for the calculation of NPP.
RESULTS

- Data was tested for normality and found to be normally distributed.
- Parametric tests applied
- Variance in NPP differed across landscape.

Chiredzi Land-use, NPP April 2008

Variance in NPP in at least one of the land-use areas differed significantly from the others (i.e. LSCFA) (One-Way ANOVA, p<0.05)

April NPP across the SELZ

<table>
<thead>
<tr>
<th>Chiredzi Land-use</th>
<th>Mean April NPP (g/m^2/day)</th>
<th>Mean±SD</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communal Land</td>
<td>27.45</td>
<td>14.4</td>
<td>40.57</td>
</tr>
<tr>
<td>National Park</td>
<td>27.74</td>
<td>14.48</td>
<td>41</td>
</tr>
<tr>
<td>LSCFA</td>
<td>33.03</td>
<td>17.41</td>
<td>48.65</td>
</tr>
<tr>
<td>Safari</td>
<td>26.75</td>
<td>19.44</td>
<td>34.06</td>
</tr>
<tr>
<td>SSCFA</td>
<td>26.47</td>
<td>22.03</td>
<td>36.91</td>
</tr>
</tbody>
</table>

A significant variation in NPP between LSCFA and other land uses, (p<0.05, Scheffe multiple comparisons tests).
Variance in NPP differed across national parks within the GLTFCA (One-Way ANOVA, p<0.05)
February NPP vs September NPP

CONCLUSION

- February: little difference between zones (Wet Season).
- April: Maps indicate differences at large and small spatial scales
- Differences within the same land-use zone and also across the GLTFCA.
- August-October: Great variability across the landscape (peak of dry season). NPP levels very low (senescence).
- Study still investigating the spatial and temporal variations in NPP in more detail.

THANK YOU

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