Development of a SOC Baseline:
Experiences from Otjozondjupa, Namibia

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Otjozondjupa

Area: 105,000 km²
Population: 142,000 people
Average Precipitation: ~450 mm yr⁻¹


Soils and Landscapes for Sustainability (CIAT) and Geosciences Lab (ICRAF)
Legend
- Proposed Sample Locations
- 25km grid
- Otjozondjupa administrative boundary
- AfSoilGrid predicted SOC in topsoil (g / kg)
  - High: 39.33
  - Low: 1.33
Final Product:

Sample Locations
Target: 325
Reached: 237
Usable profiles: 219
Contextualizing the SOC Baseline

“... we know the criteria for MRV.”

– Martial Bernaux

- Consistency
- Completeness
- Accuracy
- Transparency
- Comparability

Local Concerns:
1. LDN must be locally owned including data collection, data analysis, and baseline production.
2. LDN must be integrated with ongoing policies and activities.
Density map of shrubs (height < 1.5m) in Otjozondjupa region, Namibia. It is derived from satellite images (Landsat 8 OLI/TIRS) and field data collected in April-May 2016. The maps are available for download as GeoTIFF files from this link.

Date of release: August 2016

Density of shrubs (less than 1.5m)

Shrubs per hectare:
- <1000
- 1000 - 2000
- 2000 - 3000
- 3000 - 4000
- 4000 - 5000
- 5000 - 6000
- >6000
We have Land Cover, what about Land Use?
Contextualizing the SOC Baseline

“Socio-economics was the main driver”
- Johan Six
The role of stakeholder engagement

“For any LDN project to be effective, **governments must:**

- Develop inclusive, participatory consultation and outreach programmes
- to engage stakeholders in the co-production of knowledge and mutual learning
- at both the national and local levels, ... accomplished through
- the establishment or leveraging of multi-stakeholder platforms
- at each relevant scale, with established links across scales” (p. 67).
Conclusions

• We have enough tools to develop SOC baselines
  • Build on existing freely available data such as SoilGrids
• Contextualize SOC - make the data relevant!
  • Integrated Landuse Planning

Understanding how farmers and communities transition to self-governance (as opposed to centralized control and management) requires more attention by the SOC community in order to achieve soil carbon sequestration.
Scientific Conceptual Framework for Land Degradation Neutrality (UNCCD Science Policy Interface)

LDN Indicators:
Land Cover (land cover change)
Land Productivity (net primary productivity)
Carbon Stocks (soil organic carbon)
Bush Encroachment (bush density)

Source: Orr and Cowie, 2017
Themes

Situating the Problem
  developing the baseline

Contextualizing SOC
  making the baseline relevant
## Digital Soil Mapping

<table>
<thead>
<tr>
<th>Method</th>
<th>Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverse Distance Weighting (IDW)</td>
<td>Medium</td>
</tr>
<tr>
<td>Kriging</td>
<td>Medium-High</td>
</tr>
<tr>
<td>Regression Kriging with SoilGrids</td>
<td>High</td>
</tr>
<tr>
<td>Regression Kriging with small covariate stack</td>
<td>High</td>
</tr>
<tr>
<td>Random Forest with large covariate stack</td>
<td>Very High</td>
</tr>
</tbody>
</table>
Contextualizing the SOC Baseline
<table>
<thead>
<tr>
<th>Land cover change type</th>
<th>Total SOC stock (kg)</th>
<th>Average SOC stock (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bush land to Grassland</td>
<td>224,835</td>
<td>1.59</td>
</tr>
<tr>
<td>Grassland to Bush land</td>
<td>152,676</td>
<td>1.28</td>
</tr>
<tr>
<td>Grassland to Grassland</td>
<td>55,817</td>
<td>1.67</td>
</tr>
</tbody>
</table>
Contextualizing the SOC Baseline

2. “... the approach embraces integrated landuse planning.”
   – Barron Orr

Two ongoing national projects and policies:
1. Integrated Regional Landuse Planning (IRLUP)
2. Debushing Program
“... until a theoretical explanation – based on human choice – for self-organized and self-governed enterprises is fully developed and accepted, major policy decisions will continue to be undertaken with a presumption that individuals cannot organize themselves and always need to be organized by external authorities.”

— Elinor Ostrom, *Governing the Commons*, p.25
“Time is the natural resource in shortest supply.”

— Elinor Ostrom