Mapping and characterizing mangrove rice growing environments in West-Africa using Landsat-8 imagery and secondary data

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Introduction
Rice is one of the major staple foods consumed in Africa. Although mangrove rice productivity is low it contributes for a major share to the regional rice production. Sea-level rise and reduction in river discharges, caused by the effects of climate change, lead to salt-water intrusion and are a potential threat to the mangrove rice production and regional food security. Information about rice areas is crucial to provide informed decision and management with the aim of safeguarding and improving rice production in those areas. However, till date such information is very limited or unavailable at all.

Aim
To map out rice cultivated areas within the mangrove ecosystem in West Africa and to characterize those systems in terms of e.g. altitude using secondary data and spatial analysis.

Methods
We used a supervised classification on a set of off-season Landsat-8 images obtained between December 2012 and May 2013. The rice season runs from August to early December, but cloud coverage is persistent on all recent images. The classified images were validated using GoogleEarth observations.

Datasets used
a) SRTM 1 Arc-Second Global Digital Elevation Model for delineating low coastal areas
b) Off-season Landsat 8 images used in supervised classification
c) GoogleEarth high-resolution and multi-temporal satellite imagery for validation

Output
A complete high-resolution baseline map of mangrove rice cultivated areas in 2013 and derived statistics.

<table>
<thead>
<tr>
<th>Country</th>
<th>Mangrove Rice (ha)</th>
<th>Total Mangrove* (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sierra Leone</td>
<td>31,012</td>
<td>105,260</td>
</tr>
<tr>
<td>Guinea</td>
<td>54,418</td>
<td>203,900</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>102,100</td>
<td>299,900</td>
</tr>
<tr>
<td>Gambia</td>
<td>9,146</td>
<td>58,100</td>
</tr>
<tr>
<td>Senegal</td>
<td>1,194</td>
<td>128,700</td>
</tr>
<tr>
<td>Liberia</td>
<td>0</td>
<td>13,000</td>
</tr>
<tr>
<td><strong>Total Area</strong></td>
<td><strong>197,870</strong></td>
<td><strong>806,800</strong></td>
</tr>
</tbody>
</table>

* Giri et al., 2010

Altitude of mangrove rice systems above sea-level and vulnerability to climate change induced sea-level rise

Landsat 8 and DEM preprocessing
Derive vegetation indices (Tasseled cap Wetness Index)
Decision trees Classification (with DEM & Tasseled cap Wetness Index)
Supervised classification (maximum likelihood)
Validation with high resolution Google Earth
Validated Rice map