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

Olusola Adefurin, Mohamed Hamady, Sander J. Zwart
Africa Rice Center, 01 BP 2031, Cotonou, Benin; Contact: s.zwart@cgiar.org

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

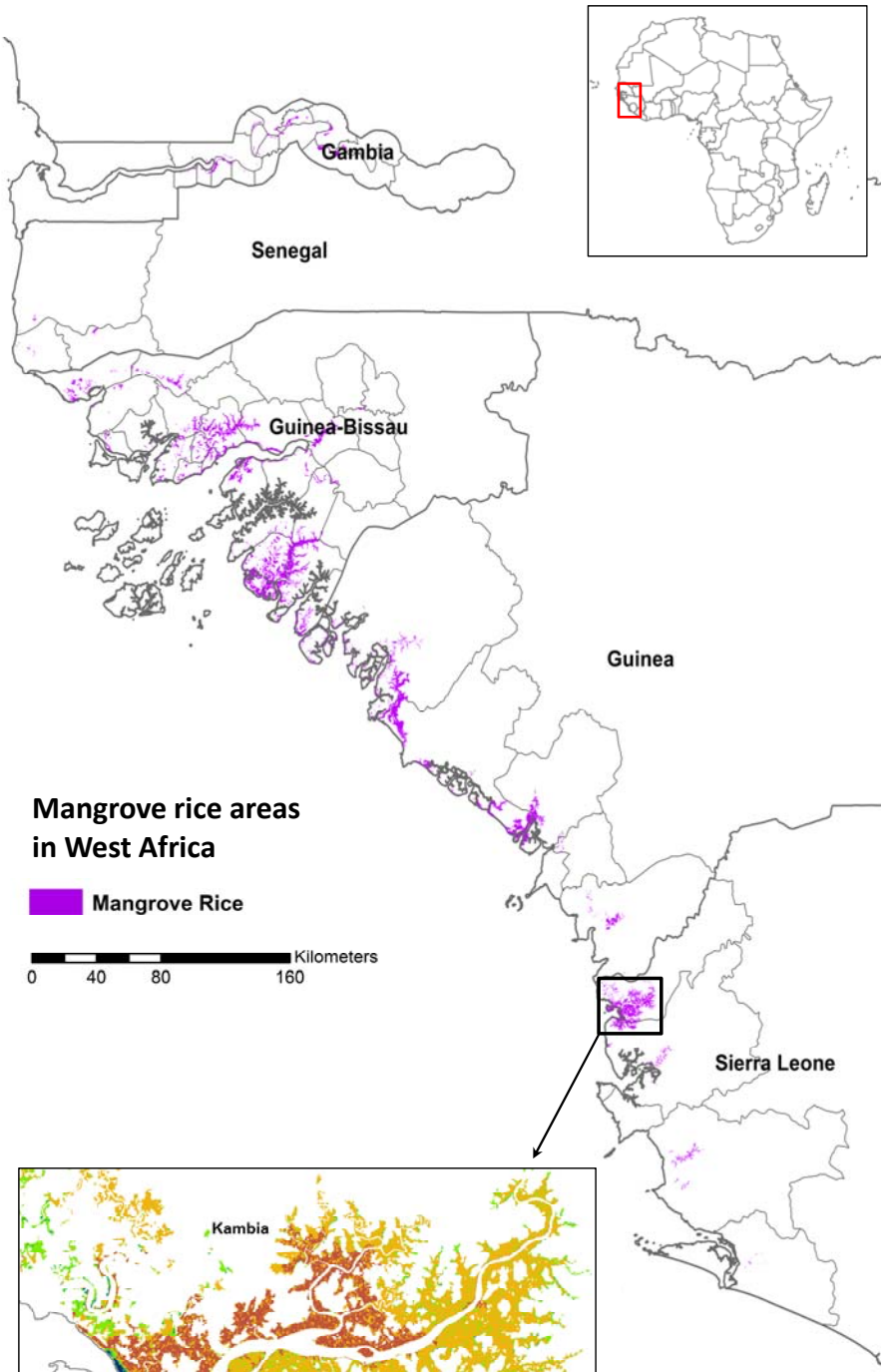
a) SRTM 1 Arc-Second Global Digital Elevation Model *for delineating low coastal areas*
b) Off-season Landsat 8 images *used in supervised classification*
c) GoogleEarth high-resolution and multi-temporal satellite imagery *for validation*

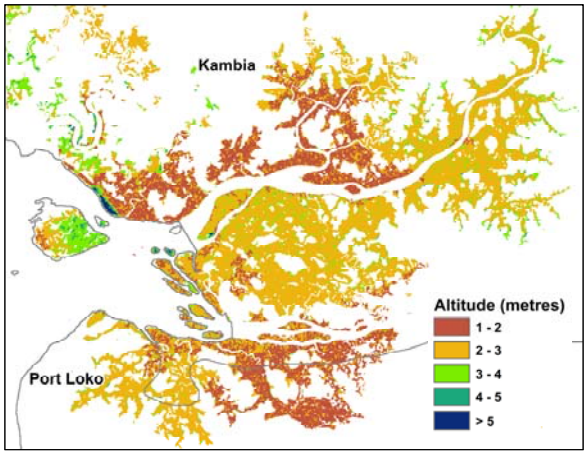
Output

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

Country	Mangrove Rice (ha)	Total Mangrove* (ha)
Sierra Leone	31,012	105,200
Guinea	54,418	203,900
Guinea-Bissau	102,100	299,900
Gambia	9,146	58,100
Senegal	1,194	128,700
Liberia	0	11,000
Total Area	197,870	806,800

* 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