Monitoring natural regeneration and revegetation of Holm-oak in the Alentejo region, Portugal

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Introduction and Objectives

Alentejo:
• Located in a semiarid region, prone to desertification
• Requires adaptation measures to minimize the impacts of climate change

[Map showing historical and current aridity]
Introduction and Objectives

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Ecosystem services provided by holm-oak:
- Erosion reduction
- Promotes biodiversity
- Climate regulation (temperature, relative humidity, .....)
- ..........
Introduction and Objectives

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- Climate regulation (temperature, relative humidity, ……)
- ………

We must to develop a cost effective way to monitor/track the presence/regeneration of Holm oak trees.

Is Normalized Difference Vegetation Index (NDVI) a surrogate of holm-oak changes in space and over time?
Methodology

Within a macroclimate gradient (aridity), 8 sites with homogenous landcover and diverse topographic conditions, were selected.

At each site, samples were selected (stratified) along a microclimatic gradient (PSR)
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Manually draw the crown of the tree using digital aerial photos (1 m spatial resolution).

Normalized Difference Vegetation Index (NDVI) from Landsat (30 m spatial resolution).

<table>
<thead>
<tr>
<th>Sample</th>
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<tbody>
<tr>
<td>BAR</td>
<td>5</td>
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<tr>
<td>ESC</td>
<td>3</td>
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<tr>
<td>EVO</td>
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Reduction of "noise" from annual vegetation.

Timing:
- Late Spring
- Summer
Methodology

Within a macroclimate gradient (aridity), 8 sites with homogenous landcover and diverse topographic conditions, were selected. At each site, samples were selected (stratified) along a microclimatic gradient (PSR) and manually drawn the crown of the tree using digital aerial photos (1 m spatial resolution). Normalized Difference Vegetation Index (NDVI) from Landsat (30 m spatial resolution).

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Late Spring  
Summer  
Reduction of “noise” from annual vegetation
Results

Is NDVI a surrogate for changes in Holm-oak cover along an aridity gradient in space?

Highly significant correlation between NDVI and % canopy cover.

Translation of NDVI into canopy is possible
**Results**

Is NDVI a surrogate for changes in Holm-oak cover over time?

Significant correlation between NDVI and % canopy cover.

Is possible to track holm oak over time

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**NDVI vs. % tree canopy over TIME**

**temporal changes**

NDVI versus % canopy cover

\[ R = +0.65 \quad p<0.001 \]
Results

Can we track holm oak reforestation success over time along a climatic gradient?

Significant correlation between precipitation and increment of NDVI from 1999-2014.

Reforestation success can be tracked using remote sensing techniques in a more cost-effective way.
Main Findings

• The % of crown cover was significantly related to NDVI, along a large macro and microclimate gradient, sugestig a wide applicability over the holm oak distribution;

• This very significant correlation was observed, both in space and over time. This may allow the use of NDVI to track the influence of climate change on holm-oak;

• Other possible applications include the monitoring of tree growth in reforestation processes and also on natural regeneration.
THANK YOU FOR YOUR ATTENTION

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