

A large-scale method to assess the role of tree cover in climate change effects in mediterranean silvopastoral systems

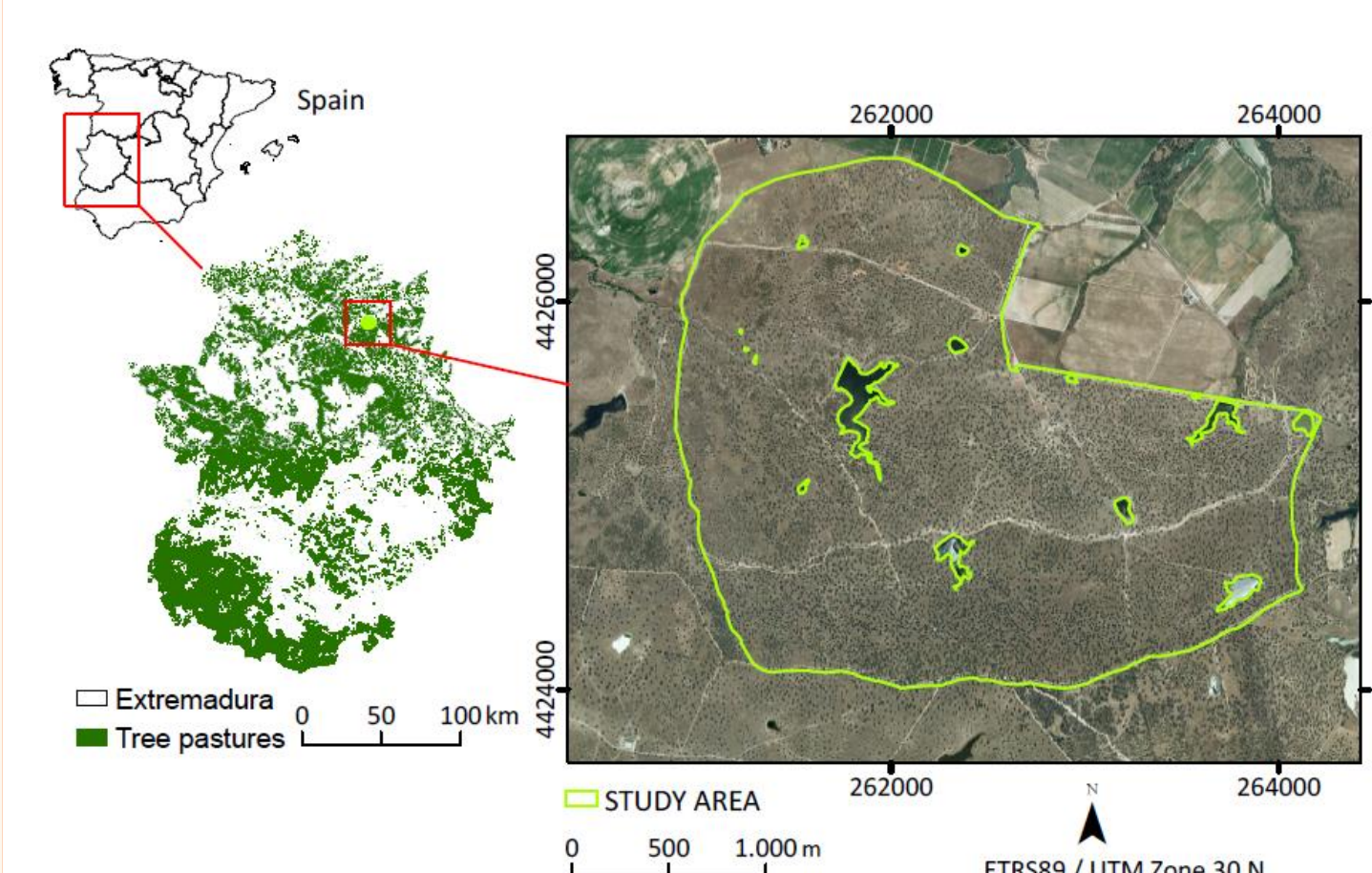
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Introduction

The Iberian Dehesa, one of the most widespread silvopastoral systems in Europe, have been identified as an example of useful adaptation to face the effects of the climate change on Mediterranean grasslands. Although it is known that trees in Mediterranean wood pastures can favor grass growth, studies at large spatial and temporal scale are needed since the relationship of competition and facilitation between trees and grass depends on the edaphoclimatic conditions. The aim of this study is to evaluate, through the examination of long series of satellite images, the buffering effects of trees in pasture yield variability in the Mediterranean silvopastoral systems in Western Spain.

Materials and Methods

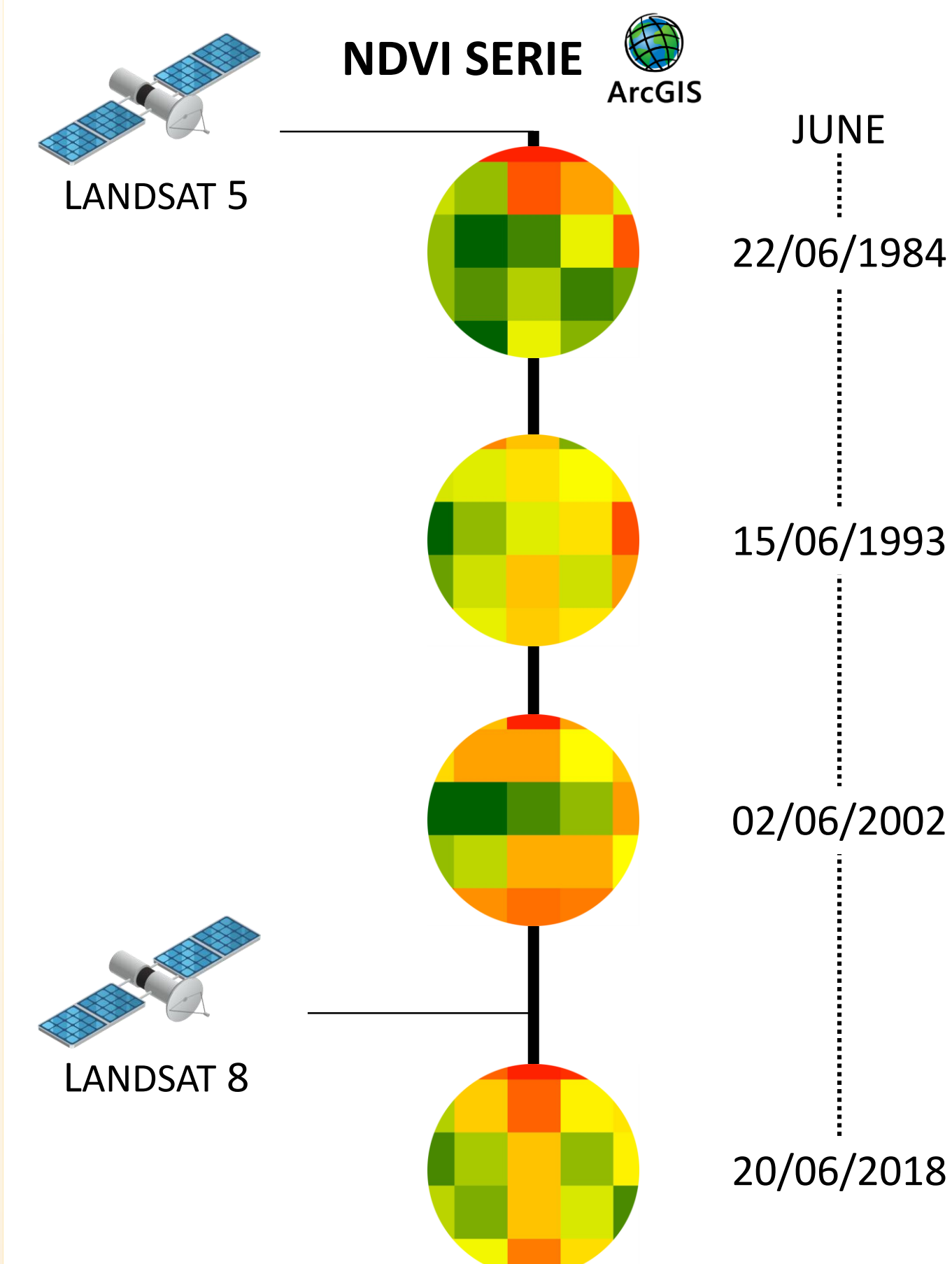
01 AREA



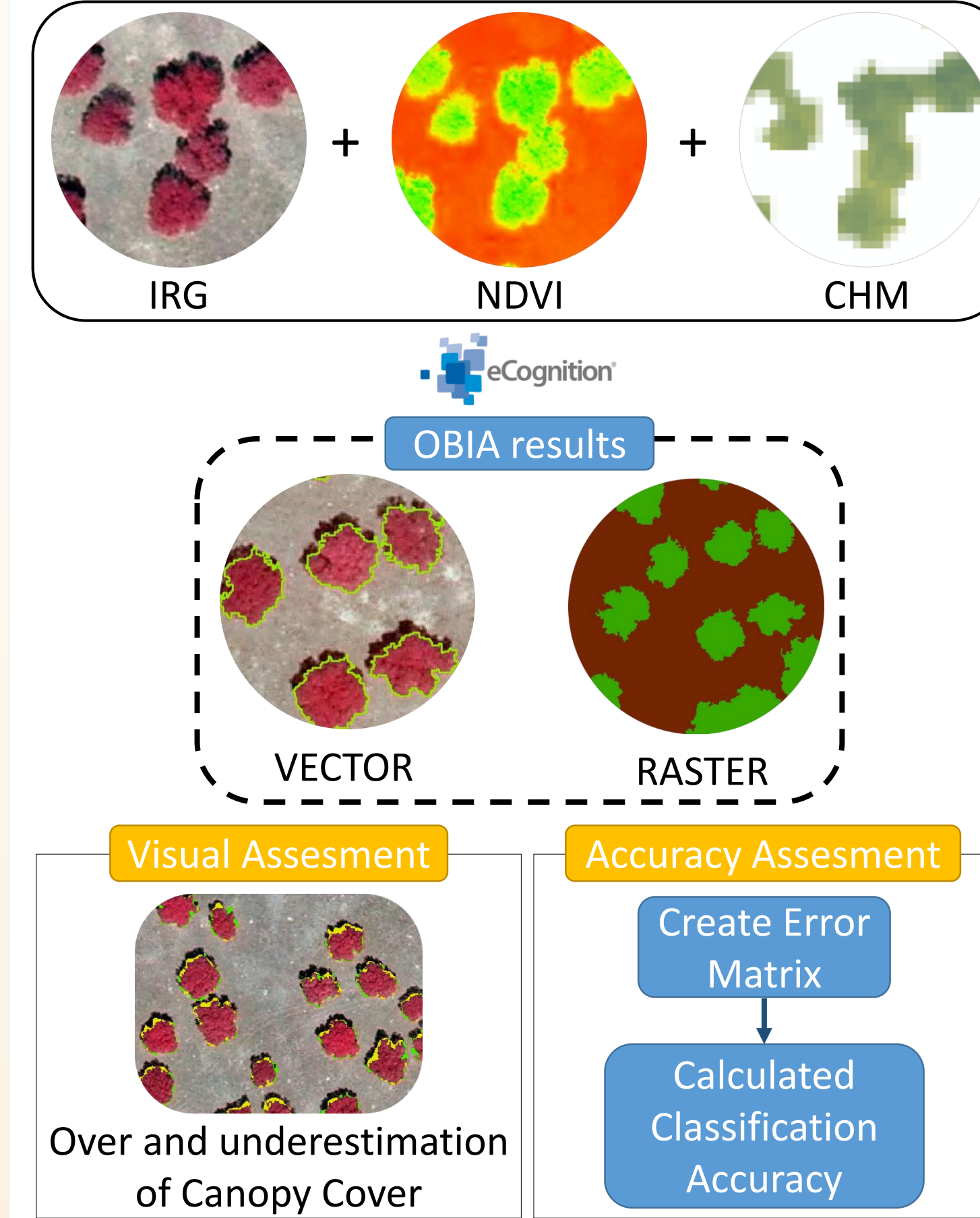
Our study was carried out in a dehesa with an area of 162.37 ha, located in western Spain.

This area presents two very different vegetation layers: the tree layer, composed of scattered oak trees, with *Quercus ilex* as a main species, and the grass layer that compromised a rich variety of annual species.

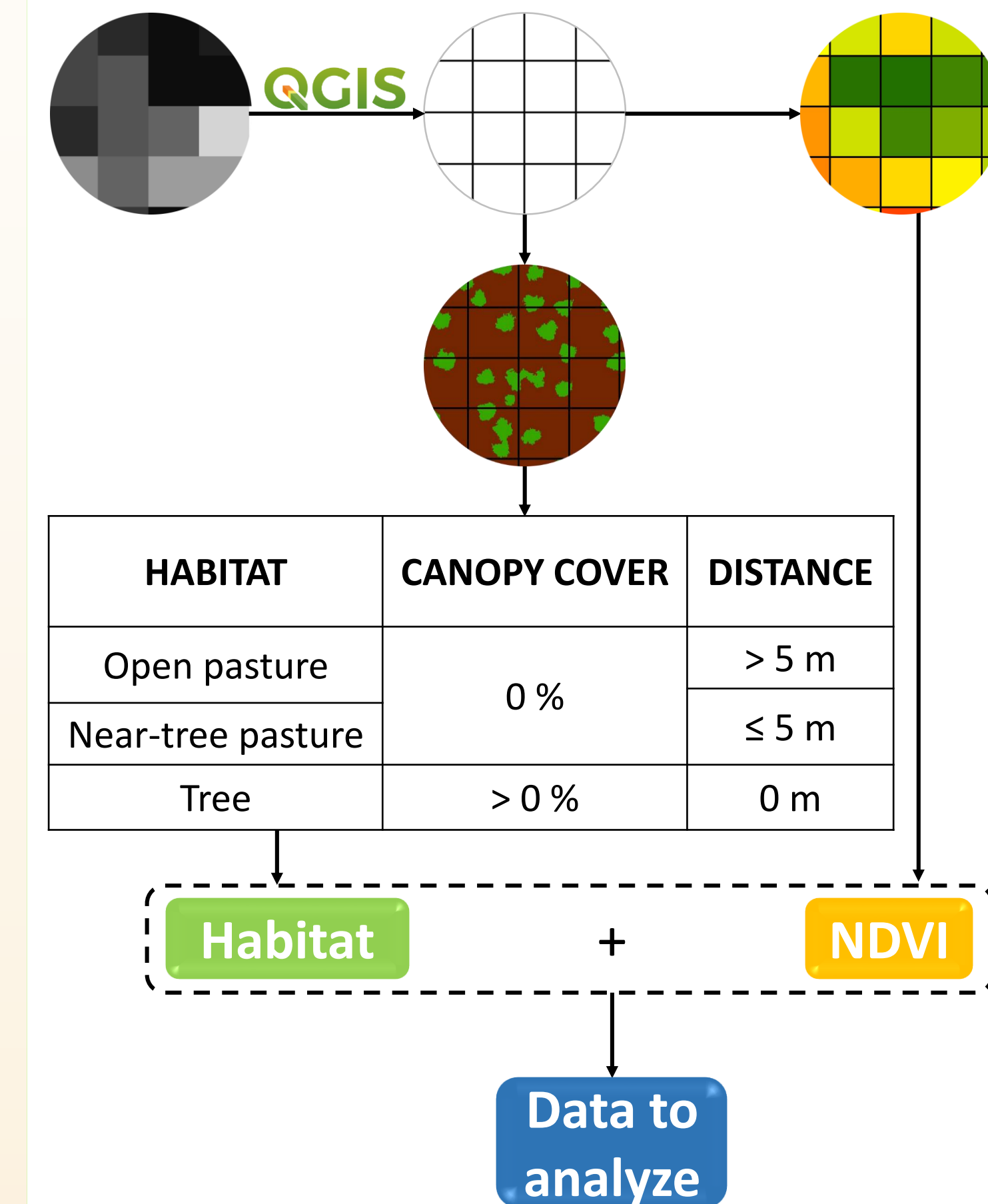
02 NDVI



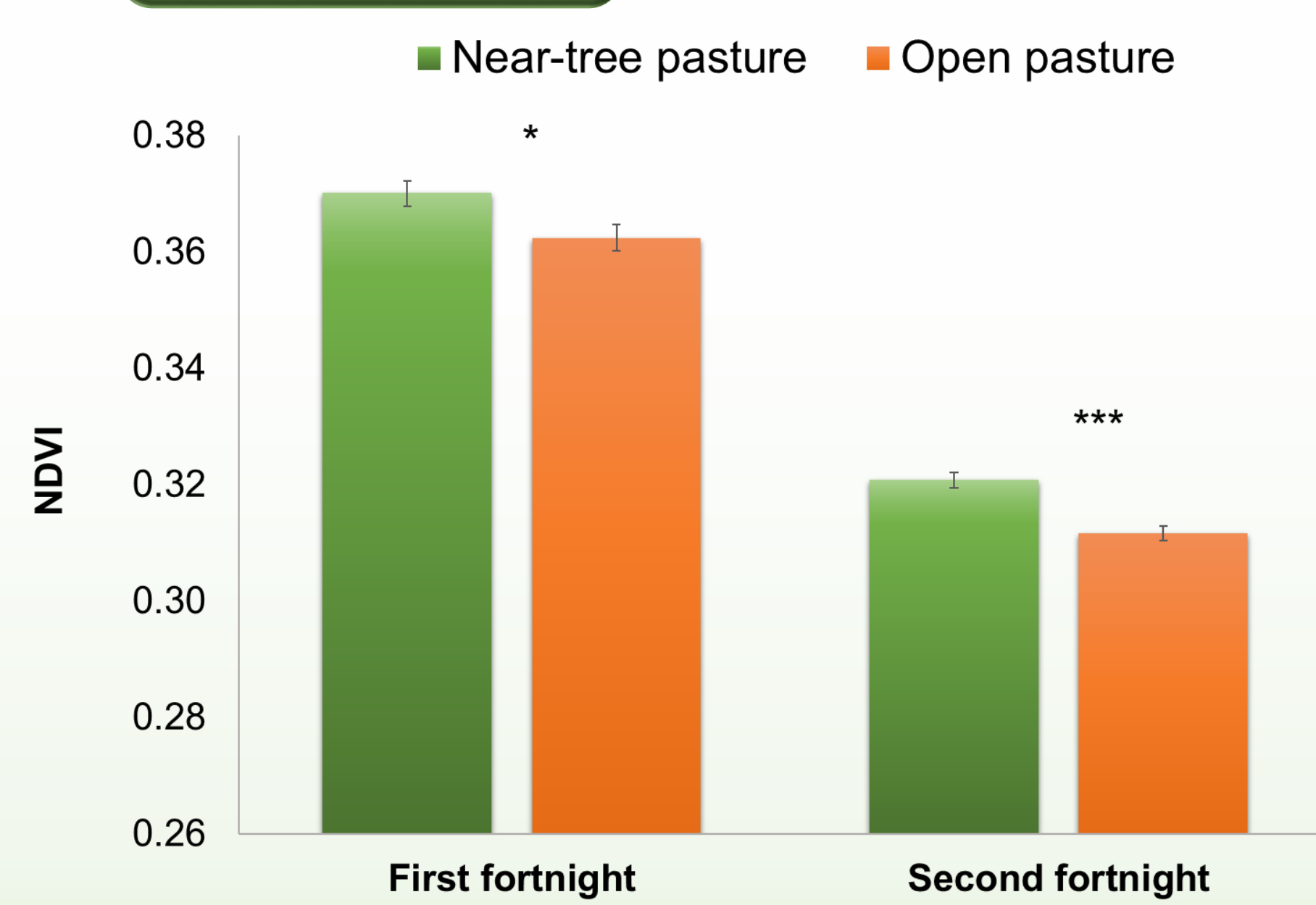
03 OBIA



04 HABITAT

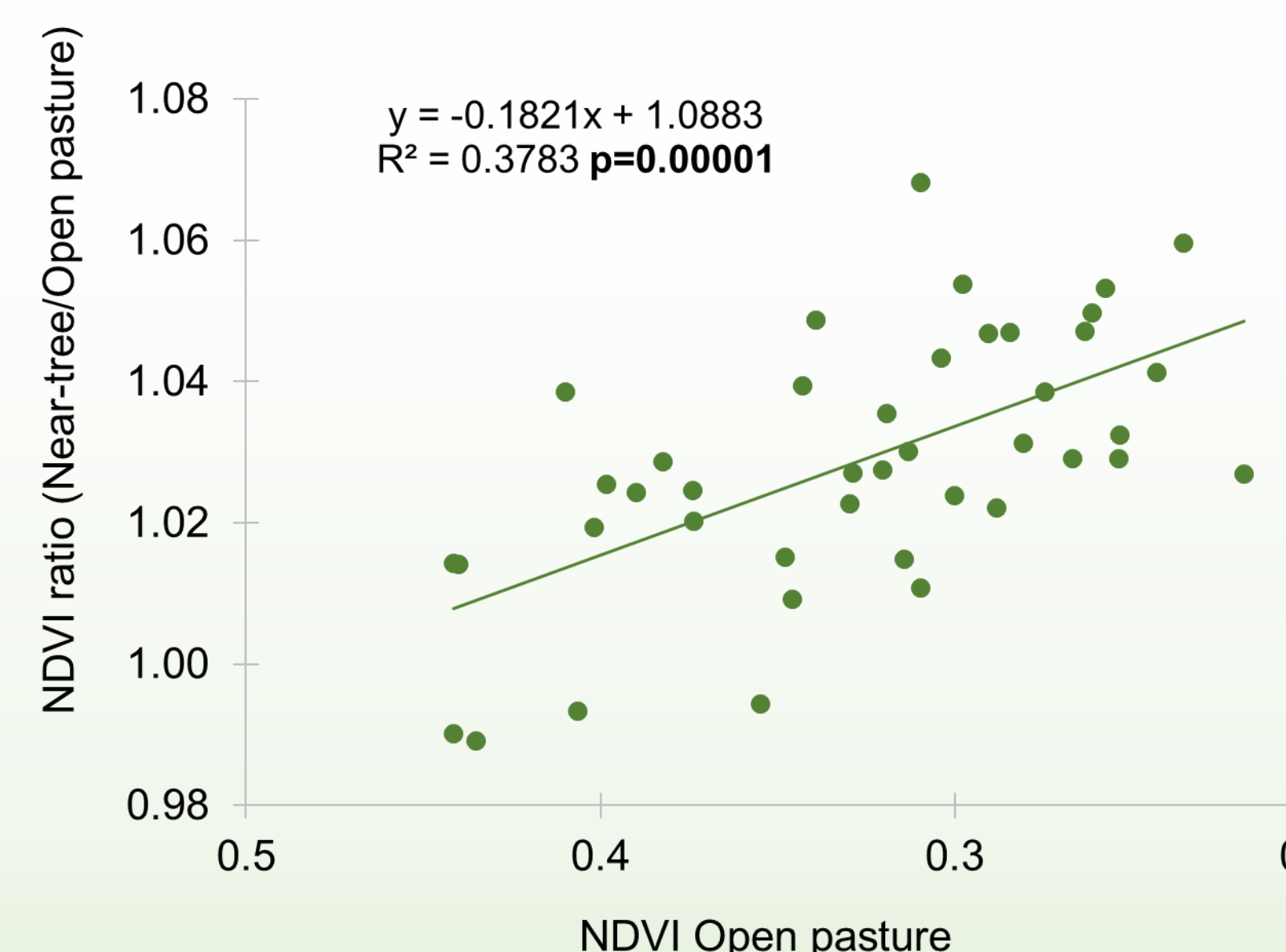


Results



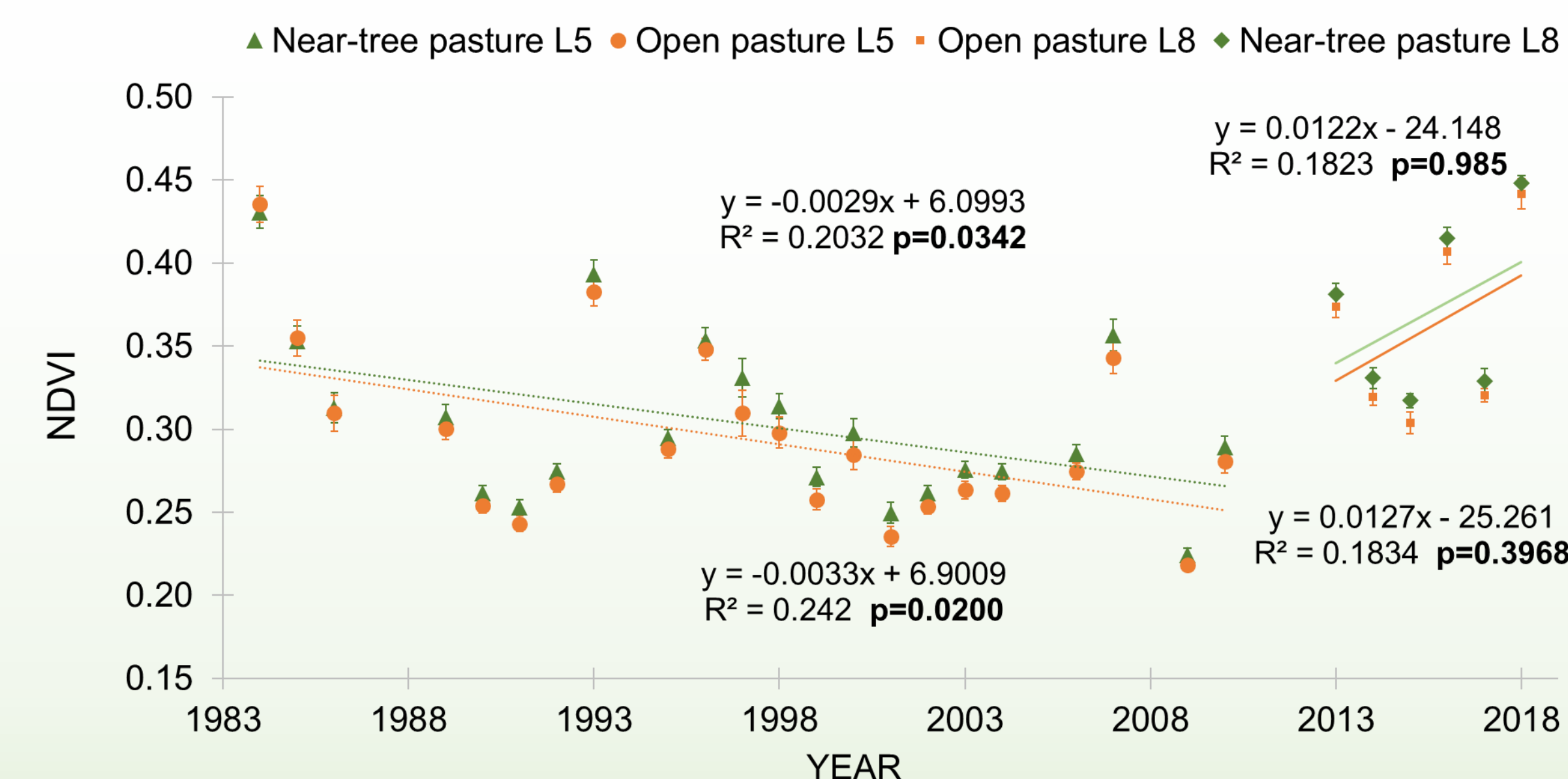
Taking into account both satellites employed (Landsat 5 and Landsat 8), the differences between NDVI of Near-tree and Open pasture are especially significant in the second half of June, when the moisture and temperature conditions are more restrictive for the grass.

Tree effects on pasture NDVI



The Near-tree/Open pasture ratio was higher in the driest years (lowest NDVI in Open pastures), showing that the positive tree effect is especially relevant in these conditions.

NDVI evolution in the second fortnight of June



The NDVI values in the second fortnight of June present a negative trend during the period 1984 – 2012 (Landsat 5), but not during the period 2013 – 2018 (Landsat 8).

Conclusions

This study shows that pasture in Iberian dehesa dried in spring progressively quicker (earlier) in the period 1984 - 2012 (Landsat 5), although the trend is not confirmed for the last years (2013 - 2018; Landsat 8). We also show that scattered trees can buffer in some extent this negative trend. For driest years, the ratio among NDVI of near-tree respect to open pasture was higher, indicating that the worse years (shorter growing period), trees play a more positive effect. On average, this positive effect, although slight (NDVI only 3% higher near the tree), was significant for the second fortnight of June. Although from the satellite images it is not possible to compute the NDVI for pasture that grow beneath canopy, this remains green still for longer.

The temporal extension of green pasture (more palatable and protein rich) in strongly seasonal Mediterranean pastures is highly appreciated by farmers, and in this way trees are playing a positive effect for the grazing schedule in Iberian dehesas.

References

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