PLASTIC COVER GREENHOUSES REFLECTANCE SPECTRA FROM DIFERENT OPTICAL SATELLITE IMAGERY

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Commission II

OUTLINE

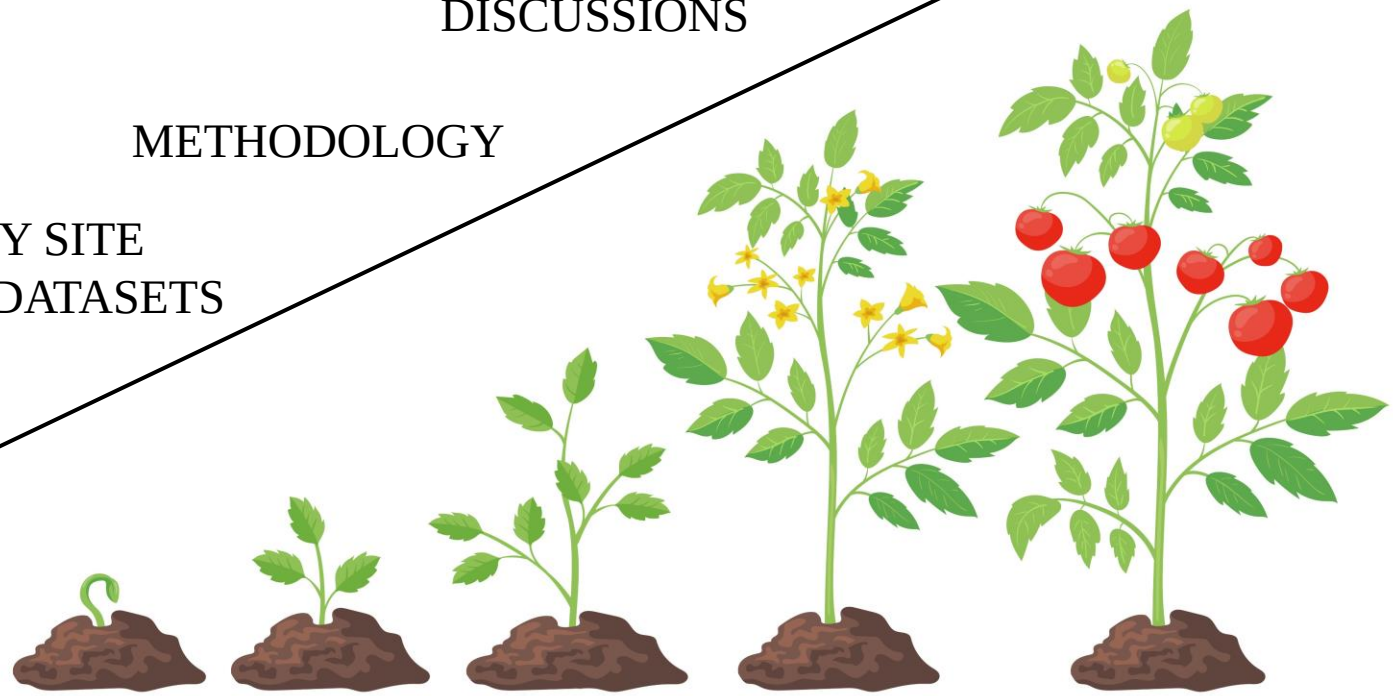
CONCLUSIONS

RESULTS AND
DISCUSSIONS

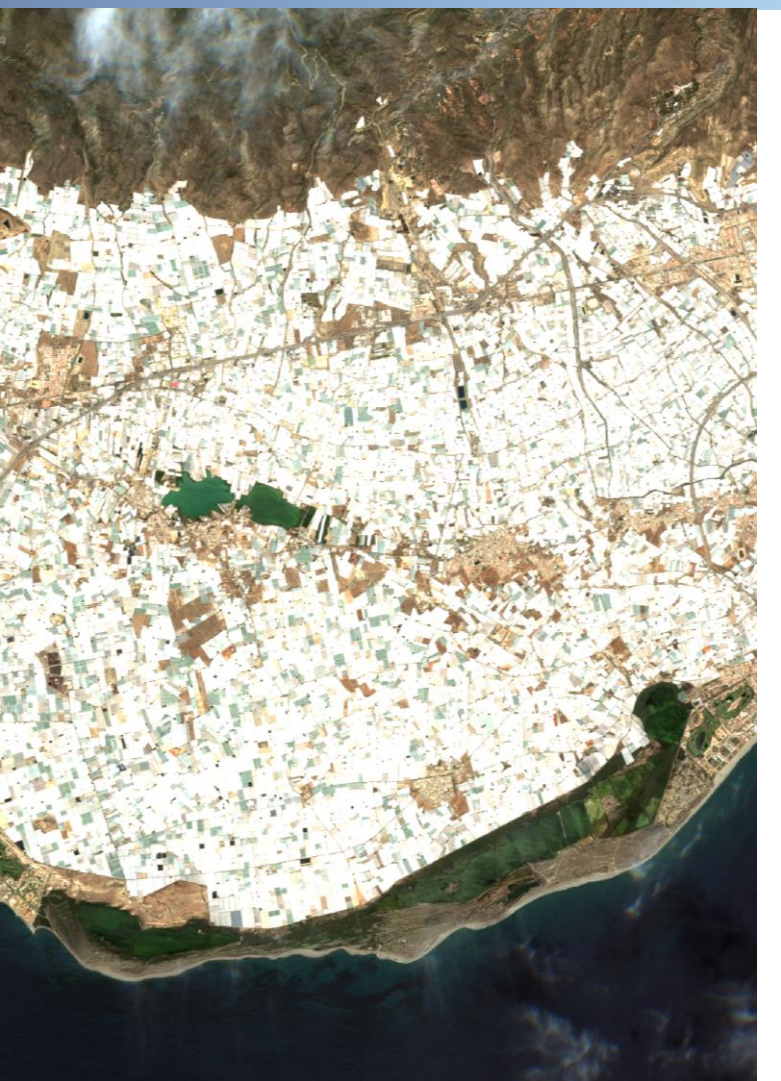
METHODOLOGY

STUDY SITE
AND DATASETS

INTRODUCTION

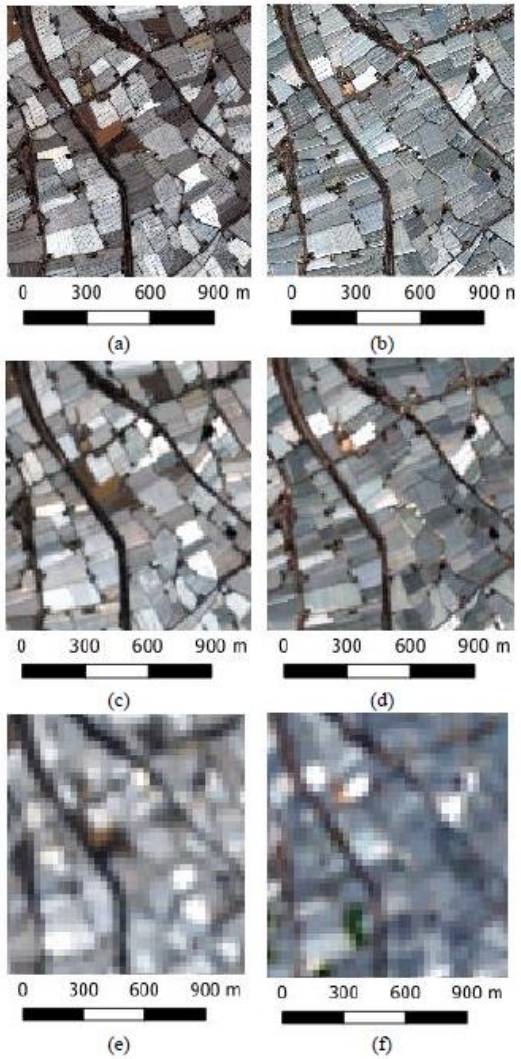


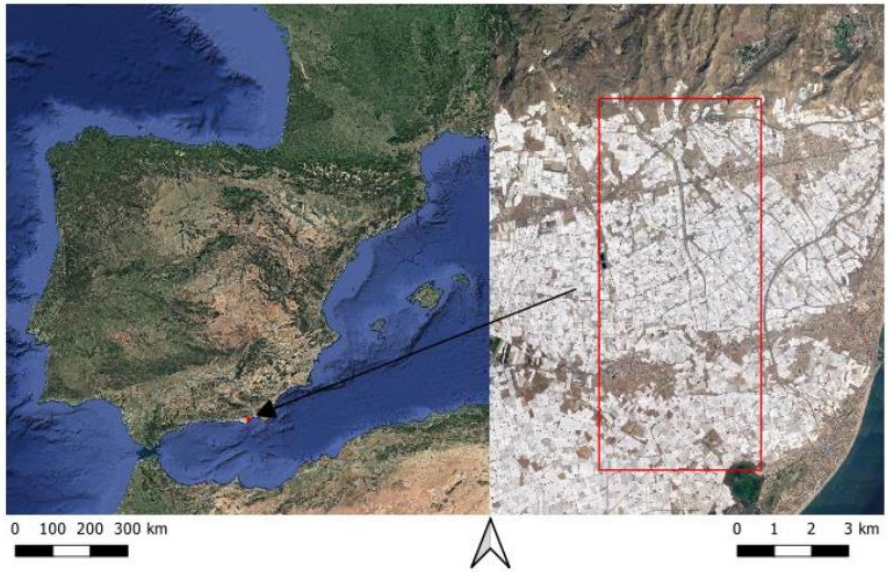
INTRODUCTION



- The province of Almería, located in the semi-arid coastal plain of Southeast Spain, has a plastic covered greenhouses (PCG) area of 31,614 ha and an even larger crop-growing surface (45,680 ha), thanks to the scheduling of two growing cycles per year
- Remote sensing is the most cost-effective method for large scale monitoring and analyses in agriculture
- Object-based image analysis (OBIA) provides a framework that can be used to integrate more complex data than the raw remote sensing signal by including different levels of spatial information

STUDY SITE AND DATASETS

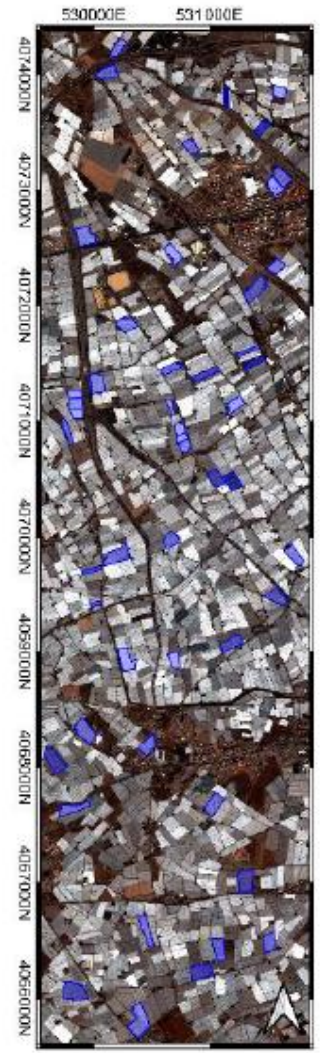


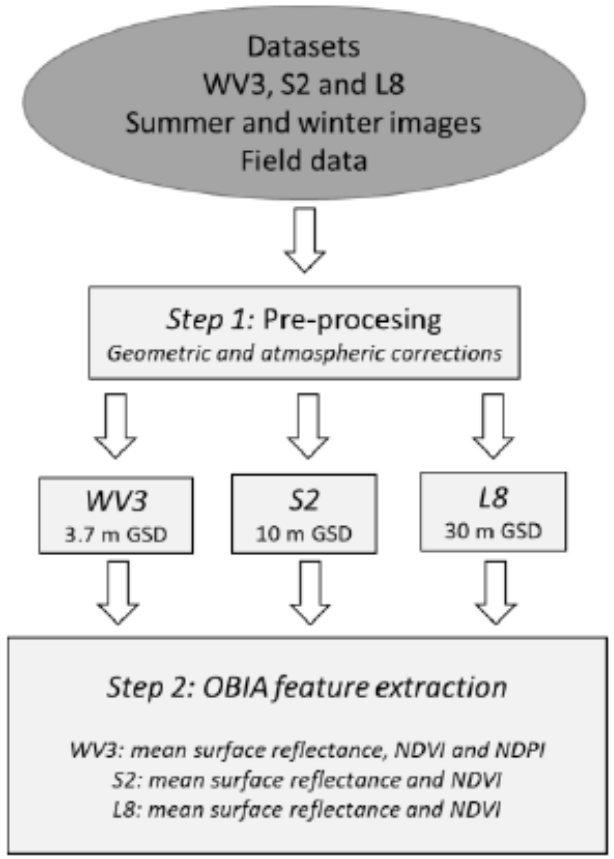


- This investigation was conducted in Almería, located in the Southeast of Spain, specifically over an area with a great concentration of PCG
- Seven cloud-free satellite images were acquired in 2020. They were taken in two dates (summer and winter) from three different sensors: WorldView-3 (WV3), Landsat 8 (L8) and Sentinel-2 (S2). S2 data include both Sentinel-2A and 2B images

WorldView-3		
Name	Range (nm)	Resolution (m)
Coastal	397–454	1.2
Blue	445–517	1.2
Green	507–586	1.2
Yellow	580–629	1.2
Red	626–696	1.2
Red Edge	698–749	1.2
NIR1	765–899	1.2
NIR2	857–1039	1.2
SWIR9	1184–1235	3.7
SWIR10	1546–1598	3.7
SWIR11	1636–1686	3.7
SWIR12	1702–1759	3.7
SWIR13	2137–2191	3.7
SWIR14	2174–2232	3.7
SWIR14	2228–2292	3.7
SWIR16	2285–2373	3.7
Sentinel-2		
Name	Range (nm)	Resolution (m)
Blue	458-523	10
Green	543-578	10
Red	650-680	10
Red Edge 1 (RE1)	698-713	20
Red Edge 2 (RE2)	733-748	20
Red Edge 3 (RE3)	773-793	20
NIR8	785-899	10
NIR8a	855-875	20
SWIR1	1565-1655	20
SWIR2	2100-2280	20
Landsat 8 OLI		
Name	Range (nm)	Resolution (m)
Coastal	435-451	30
Blue	452-512	30
Green	533-590	30
Red	636-673	30
NIR	851-879	30
SWIR1	1566-1651	30
SWIR2	2107-2294	30

METHODOLOGY



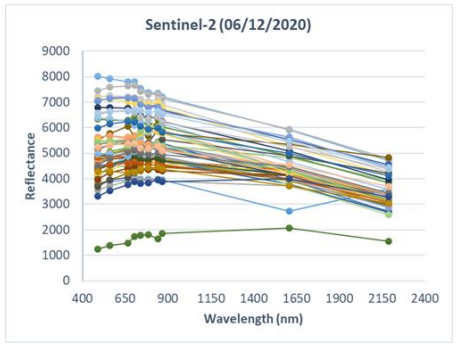


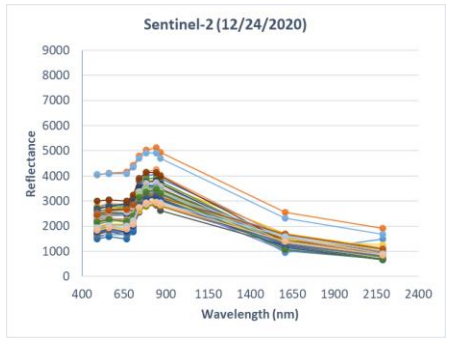
- In this study, spectral signatures collected from WV3, S2 and L8 images were first analysed to identify spectral difference in single bands.
- In addition, NDVI and NDPI were evaluated.
- Object Based Image Analysis Using Trimble eCognition Developer v. 9.4 software was employed for the extraction of the mean surface reflectance values of all the pixels inside of each reference polygon from each products.

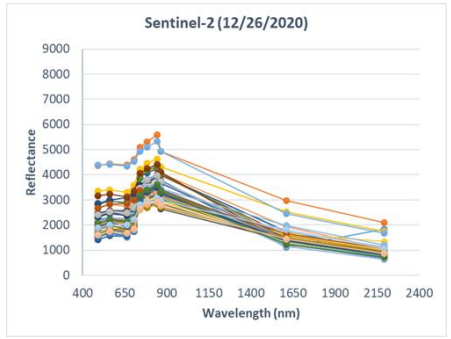
$$NDVI = \frac{(NIR - R)}{(NIR + R)}$$

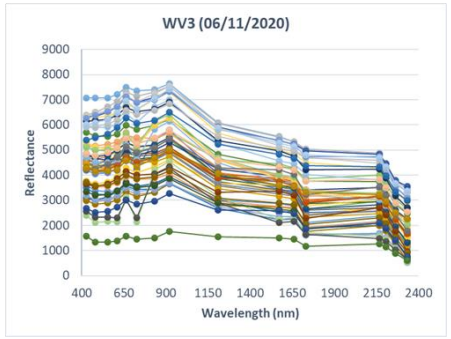
$$NDPI = \frac{(SWIR10 - SWIR12) + (SWIR13 - SWIR16)}{(SWIR10 + SWIR12) + (SWIR13 + SWIR16)}$$

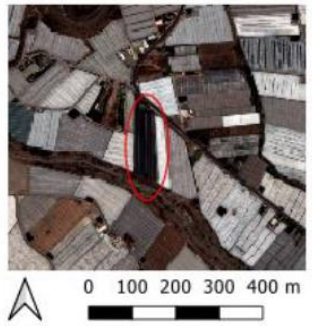
RESULTS AND DISCUSSIONS

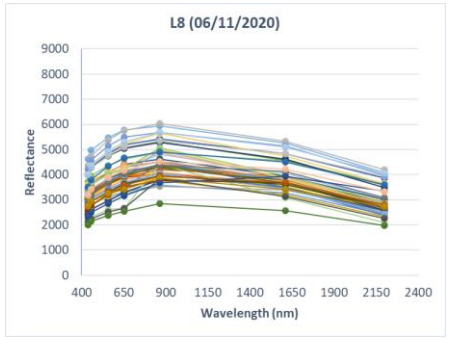


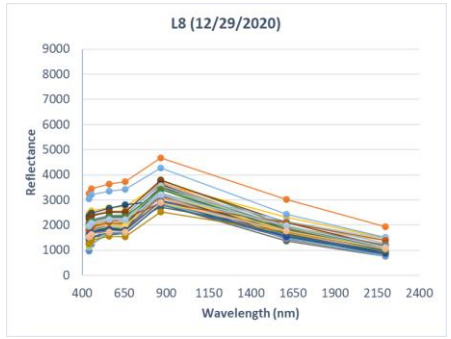


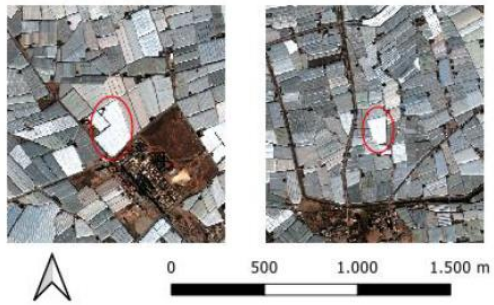






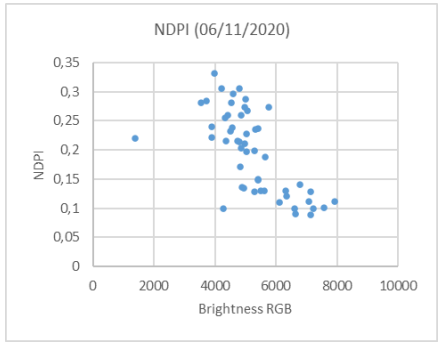


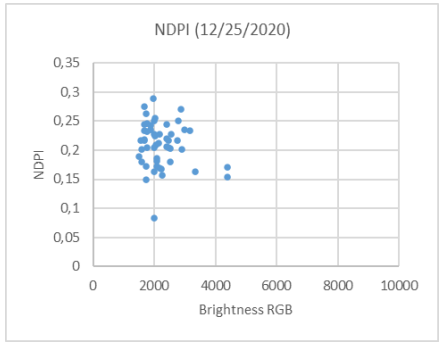




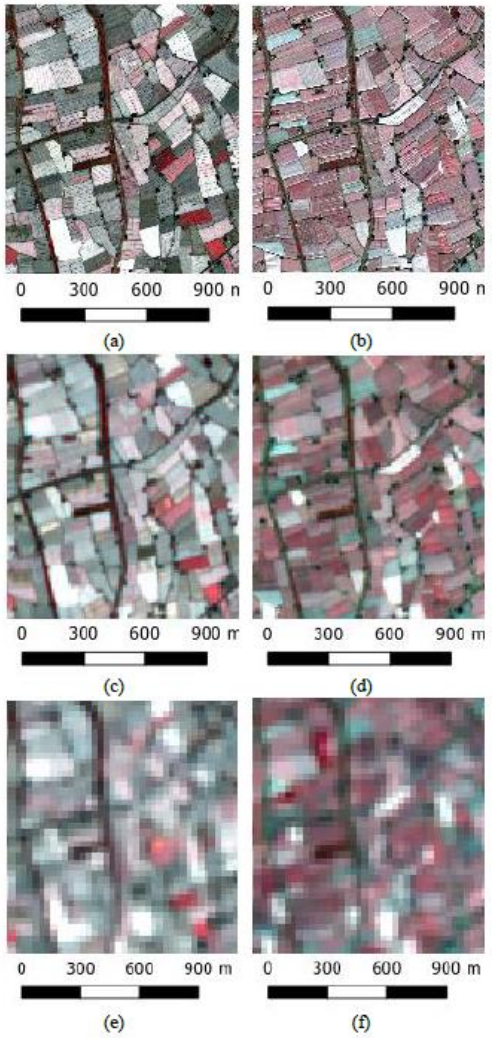
- The spectral signature presented higher variability over the summer period.
- This fluctuation of the three sensors between periods, due to occasional sun glint effects and the presence of eventual roof greenhouse whitewash (greenhouse shading) that temporally masked the spectral signature of the plastic film

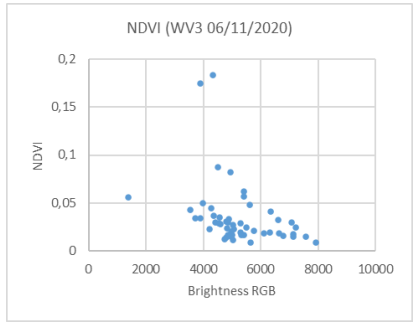
RESULTS AND DISCUSSIONS

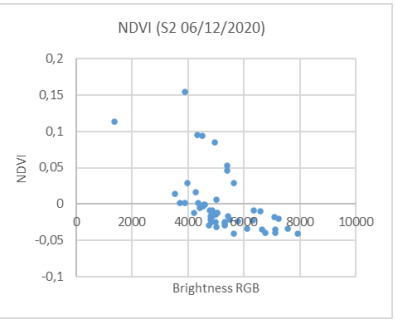


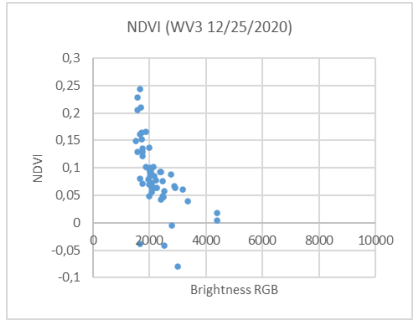


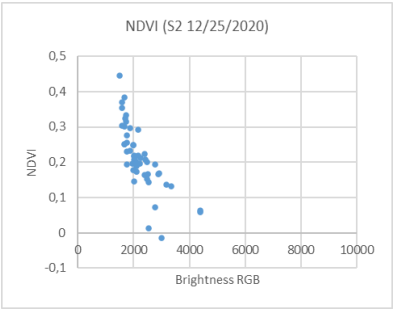
- The NDVI values obtained during winter were higher than those obtained during summer.
- Brightness was computed as the average of the visible (RGB) bands.
- During the summer months, greenhouses, in addition to being mostly whitewashed, do not house growing crops or they are in very early stages.











CONCLUSIONS

- When observing the extracted reflectance values, the first finding that stands out is the different spectral capacity of each of the sensors, being WV3 the sensor that collects the most wavelengths with the highest resolution (16 bands with a maximum 3.7 m GSD)
- It was observed a high variability between the objects classified as greenhouses in the study area.
- Finally, the agricultural practice of greenhouse bleaching or whitewashing masked the original spectral properties of the greenhouse cover plastic.

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https://w3.ual.es/Proyectos/SentinelGH/

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