# APPLICATION OF LANDSAT TM IMAGES TO MAP LONG TERM CROPPING PATTERNS

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## INTRODUCTION & OBJECTIVES

The present work proposes a method that allows mapping long term cropping patterns using time-series of crop maps derived from supervised classification of remote sensing data. These maps allow implicit spatial and temporal relationships among the crops growth in an agricultural area. **Cropping pattern** is understood as the spatial distribution of associations between crops or crops and uncultivated land in the same fields (although not in a definite succession) along the years of the analysed time-series.

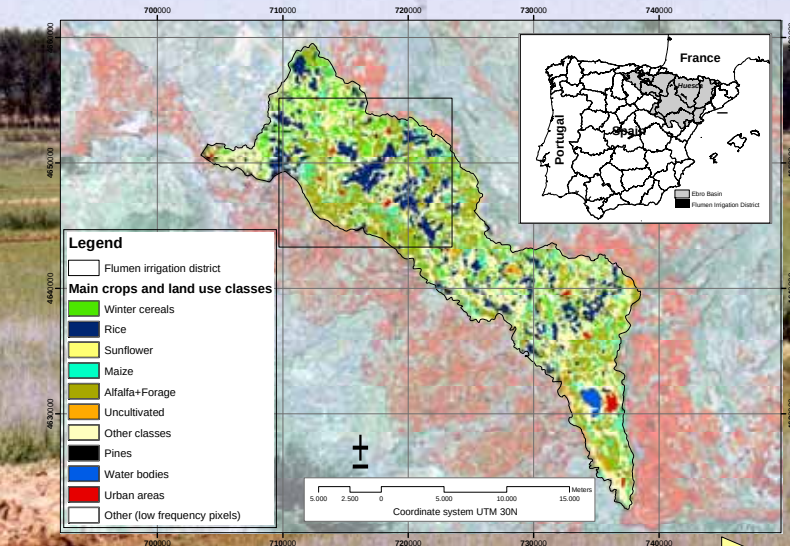



Figure 1. Main crops and land use classes.

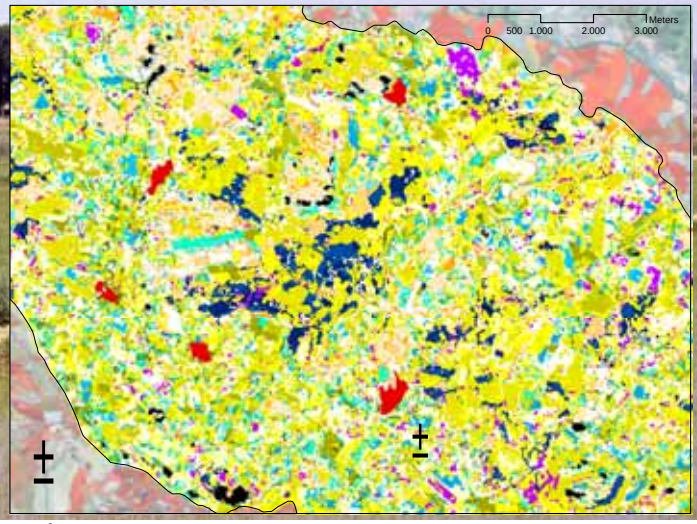



Figure 2. Cropping patterns

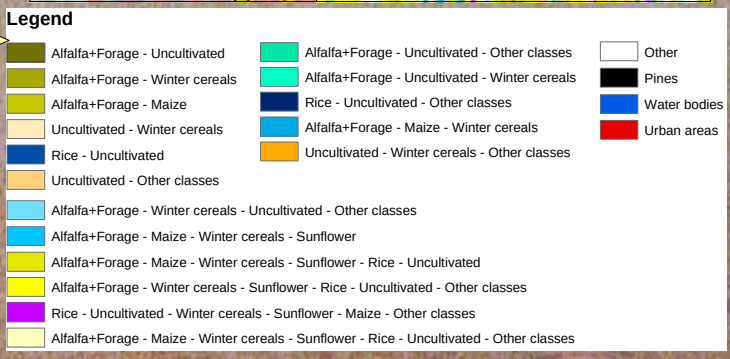
## MATERIALS & METHODS

The method was applied to map the long term cropping patterns in the Flumen irrigation district (33000 ha), located in the Ebro Valley (north-eastern Spain). A 7-year time-series (1993, 1994, 1996, 1997, 1998, 1999 and 2000) of crop maps derived from Landsat 5 TM and Landsat 7 ETM+ images were used to obtain the yearly crop maps from which to derive the long term cropping patterns. For that, the method looks for the spatial and temporal relationships among the main crops present in the study area in their typical locations (areas where the crops are most frequently located) and the alternate crops that have been in those locations in any of the years of the analysed time-series. GIS overlay analysis operations, mainly cross-classification operations, are applied to derive the spatial and temporal relationships among crops.

The land use classes mapped were: Winter cereals, Rice, Sunflower, Corn, Alfalfa, Fallow, Forest, Water, Urban areas and other classes.

## RESULTS

The resulting cropping pattern map has 22 classes. Patterns with more than six crops represent 41% of the study area, being the pattern that includes the main crops growth in the irrigation district the most frequent one: Alfalfa+Forage – Maize – Winter cereals–Sunflower – Rice – Uncultivated (21% of the area). Another relevant pattern is a variation of the previous one that does not include Maize but other minority crops: Alfalfa+Forage – Winter cereals – Sunflower – Rice – Uncultivated – Other classes, representing 12% of the area. The rest of the agricultural land follows typical patterns of two to four crops.




## CONCLUSIONS

The proposed method goes beyond the characterization of crop spatial distribution within a specific campaign or the succession of crops in two consecutive years. **It identifies specific spatial relationships among crops along the years.** In the present case study, the results showed the high spatial and temporal variability of some crops, closely related to UE subsidy policy. One **limitation** of the method is that it **does not identify the order of crop succession** within the rotation but only the spatial association of crops along the study period.