

## Summary

### Assessment of the condition of uncultivated agricultural land based on satellite imagery

**keywords:** satellite remote sensing, multi-temporal analysis, unused agricultural land, natural succession, vegetation indices

The time of political transition in Poland in the 1990s significantly contributed to changes in land use. At that time, the problem of agricultural land abandonment became apparent, the first visible result of which was the appearance of natural succession in these areas. Despite the continuous development in methods of collecting and managing databases and the apparent progress in the possibility of obtaining them, the inventory of unused agricultural land and its spatial recognition remains problematic.

The methods for assessing unused agricultural land, proposed in this paper, use time series of Sentinel-2 satellite imagery spectral indices and cadastral data from the LPIS system to spatially identify these areas and, in a further step, to assess the degree of natural succession on these lands.

To spatially identify the class of uncultivated agricultural land, by detecting natural succession, machine learning methods with the Random Forest algorithm were used. The land use classification carried out in the study area showed an overall OA accuracy of 92%. However, for the class of natural succession, the user accuracy UA was 97%.

In the second step, a deterministic natural succession assessment model was built for four satellite imagery acquisition dates, which can be a tool for assessing the adopted three classes of natural succession. The overall accuracy (OA) of the models was evaluated as average and ranged from 69.8% to 74.6%. However, the high accuracy of the producer for the 1st succession class, i.e. PA = 94% (date: February 19) and PA = 78% (date: August 28) for the 3rd succession class, provides the opportunity to accurately identify these areas.

Based on the results obtained and the inclusion of information on soil quality, 4 directions for the development of these areas were proposed: return to agricultural production, the possibility of growing Perennial Industrial Crops, performing pro-ecological functions, and other non-agricultural and non-forest functions.

The results made it possible to confirm the research hypothesis, namely that Sentinel-2 imagery analysed together with cadastral data could be the primary source of information for identifying unused agricultural land, assessing its condition in terms of natural succession and modelling the possibility of land development.

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