

## AGRICULTURE CAP SUBSIDIES CONTROL

*CAPCON is a Copernicus downstream service of farmland monitoring and CAP subsidies control, provided to the National Paying Agency of Lithuania since 2017.*

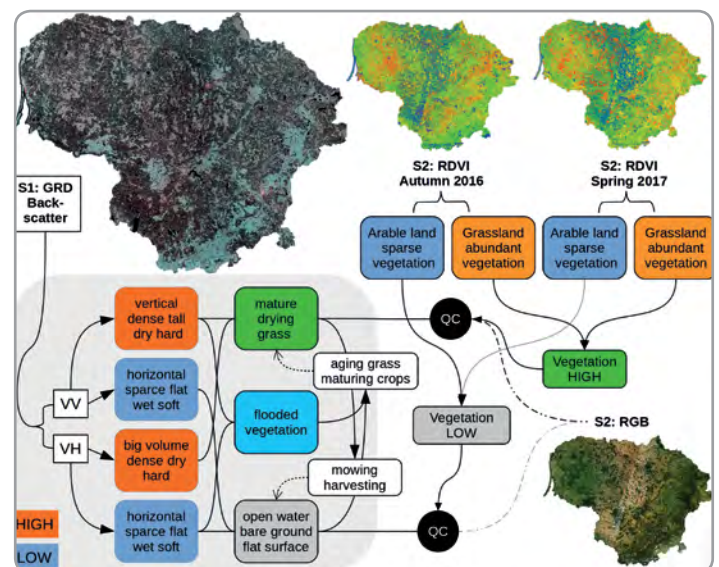
### The challenge

The Lithuanian Paying Agency (NPA) has set a strategic target to implement a CAP subsidies control system based on operational monitoring of farming activities in all declared parcels, integration of information available in several institutional registers, active use of technologically most relevant and cost-efficient remote sensing services and proactive cooperation with rural communities and farmers. Limited availability of multi-spectral satellite data, variability of natural conditions and farming practices is very high in the countries dominated by small households, therefore reliable detection of certain farming activities and major crops can only be achieved with iterative machine learning algorithms and reliable reference data samples. Artificial intelligence algorithms have to be sensitive to seasonal variation of crops and climatic conditions.

### The space based solution

In 2017 NPA signed a service contract with GEOMATRIX UAB for a Sentinels-based CAP subsidies control service with per-parcel monitoring and assessment of farming activities. The service elements were (1) separation of arable land from grassland to confirm the arable land status and (2) operational monitoring of farming activities on grassland to detect grass mowing period(-s) and/or confirm the fact of livestock grazing. The operational monitoring service was carried out on ~1 mln. parcels larger than 0.25 ha during the entire farming season (May – September) and processed a full stack of up to 100 Sentinel images per parcel. The Lithuanian CAPCON service developed and successfully implemented a series of innovative solutions adapted to unstable climate, environmental conditions and farming practices typical for the northern and eastern

European countries. The CAPCON service is primarily based on pol-SAR data. Sentinel-1 active sensor provided a continuous supply of pol-SAR data despite clouded or even rainy weather conditions, whilst multispectral Sentinel-2 imagery whenever available was used for validation of SAR-based parcel status detection. The service developed automated software components for building satellite data cubes and temporal analysis of large image stacks, production of dynamic composite SAR maps and extraction of per-parcel pol-SAR signal statistics and trends. The CAPCON Big data analytic engine is based on automated machine learning algorithms, which were developed and tested using thousands of confirmed field data samples, reaching 90% accuracy. Satellite data used operationally? Any solution described here must be fully operational or pre-operational. No research results, only applications should be presented. Use plain language, aim at the general public. Avoid acronyms or technical jargon.



CAPCON service concept, based on per-parcel statistical analysis of polarimetric SAR data and validation with multi-spectral imagery.

Thematic Area



AGRICULTURE, FOOD, FORESTRY AND FISHERIES

Region of Application



LITHUANIA

Sentinel mission used



S1  
S2

Copernicus Service used



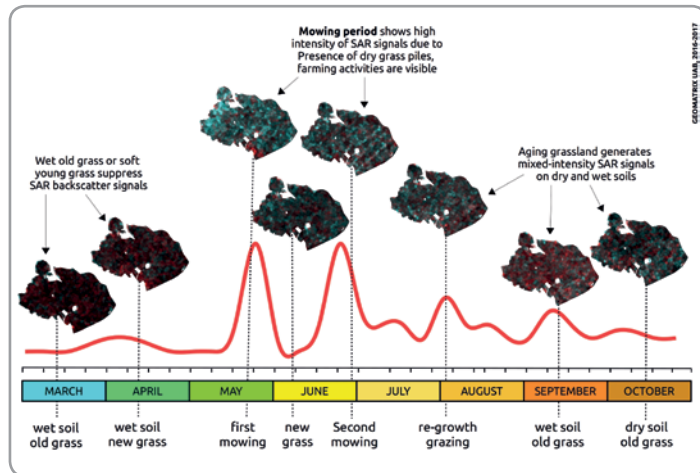
Usage Maturity Level



3

## Benefits to Citizens

The CAPCON service would reveal the actual farming practices and enable operational assessments of the overall farming success under challenging climatic conditions, minimize the risks of false claims for subsidies, streamline the operational control and prevention process and reduce the overall cost of CAP control considerably by switching from the manual on-site checks to automated and continuous per-parcel monitoring of farming activities. It will increase publicity and transparency of the whole process, exposing most of the cases of inappropriate farming and fraud.



Seasonal dynamics of grassland parcel farming status with detected 2 mowing periods in 2017, as seen on Sentinel-1 time series.

“ With Copernicus satellite data, farmers will no longer spend time on declarations, but will receive fair payments for their hard work.”

*Erikas Bėrnatas,  
Lithuanian Paying Agency Director*

## Outlook to the future

The CAPCON service is focused on automated detection of the dominating crops using customised machine learning algorithms, adjustments of classification algorithms and training samples corresponding to seasonal changes in climatic conditions, automated reporting on parcels not complying to their declared farming activities, as well as web application with thematic satellite maps and ancillary information made available for the personnel involved in field checks. Operational set-up of the system will enable a complete reprocessing of the entire parcels database and updating the current status records for all parcels over 10 days intervals, based on aggregated backscatter signal statistics retrieved from all Sentinel-1 products and calibrated with cloud-free Sentinel-2 images. Regular parcel status updates will enable automated detection of parcels possibly not complying with their declarations and trigger standard follow-up procedures implemented by the controlling authority.

Dr. Gediminas Vaitkus  
GEOMATRIX uab, Lithuania  
Email: [gedas.vaitkus@gmail.com](mailto:gedas.vaitkus@gmail.com)

## ABOUT COPERNICUS4REGIONS

This Copernicus User Story is extracted from the publication “**The Ever Growing use of Copernicus across Europe's Regions: a selection of 99 user stories by local and regional authorities**”, 2018, Edited by NEREUS, the European Space Agency and the European Commission.

The model cases focus on local and regional authorities who successfully applied Copernicus data in 8 major public policy domains. The views expressed in the Copernicus User Stories are those of the Authors and can in no way be taken to reflect the official opinion of the European Space Agency or of the European Commission.

Funded by the European Union, in collaboration with NEREUS. Paging, printing and distribution funded by the European Space Agency. IPR Provisions apply. Copernicus4Regions material may be used exclusively for non commercial purposes and provided that suitable acknowledgment is given.