Automated Extraction of Vegetated Features and Agricultural Land

Photo Credits: Isabelle Defroidmont

## eCognition Automates Vegetation Mapping for EU compliance

As geospatial data becomes increasingly available – via a greater range of sensor and higher temporal resolution – the need for automated data analysis grows. Using available aerial imagery and digital surface models, a small RLP AgroScience team, together with local authorities, created an operational system that completely automates the process of mapping vegetation to quickly produce precise, standardized classification datasets.

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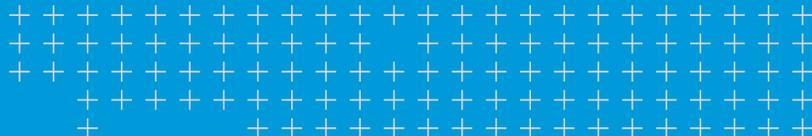
overview

When the European Union (EU) established the Integrated Administration and Control System (IACS), a spatial-based, technological system to improve the application process for agriculture subsidy payments, it presented a significant challenge for member states.

Location
NEUSTADT AN DER
WEINSTRASSE,
GERMANY

Having used predominantly manual methods for mapping and classifying landscapes with IACS, states would now have to create a digital Land Parcel Information System (LPIS) to accurately map their agricultural land at a very high resolution, as well as classify all vegetative features on each parcel by type and height. Without an LPIS, States cannot apply for aid payments; and without a way to effectively archive and update the information to ensure claims can be validated, farmers and States risk financial penalties.

Germany's RLP AgroScience saw the opportunity to use advanced spatial technology to automate this monumental task in order to help its local authorities meet the EU's requirements. Using spatial data and technology, RLP AgroScience, together with local authorities, created an operational system that completely automates the process of mapping and classifying vegetation, and quickly produces precise, standardized classification datasets——the root layer of the vegetative features in the LPIS.

The first of its kind in Germany, RLP AgroScience has not only proven that large-scale, automated and repeatable landscape-feature classification is possible, it has the operational seeds to possibly grow this system beyond its regional borders.

CHALLENGE

State authorities need to map their landscapes well enough that they can prove——from their computer screen——that any farmer's aid claim is accurate. This requires that every bush and tree on the ground has its geospatial counterpart in the LPIS.

For RLP AgroScience that meant inventorying and classifying individual vegetative features across the Rhineland-Palatinate's 19,000 square kilometers (7,336 square miles). It estimated it would need 15 full-time staff and a full year to manually digitize that volume of vegetation, a timeline that would jeopardize meeting the application deadline.

RLP AgroScience needed an intelligent, flexible and efficient image analysis tool that could objectively and automatically identify and classify vegetation. And since the claims application deadline is yearly, the solution for the landscape-feature classification needed to offer repeatable and adaptable workflows that could quickly integrate new data, run new classifications and allow for any unexpected compliance rules issued by the EU.

To fully meet the EU classification requirements, the system also needed to produce vector datasets that could seamlessly integrate with the Open Geospatial Consortium, and Inspire-compliant geodata infrastructure in Rhineland-Palatinate.

SOLUTION

RLP AgroScience identified simplicity, reliability and flexibility as the three critical elements it needed to develop their automated vegetation-mapping solution. The company chose Trimble's eCognition® technology to provide them with the image-analysis tools to identify, delineate and classify landscape features as well as the adaptable framework to integrate regular data updates and deliver standardized results.

Called "ALEK," (Automatic Landscape Feature Classification), RLP AgroScience's automated classification system combines customized eCognition and ESRI workflows to classify and map the entire region. Using existing 20-cm-resolution, orthorectified aerial images and digital surface models, eCognition methodically and automatically analyzes the imagery to identify and separate vegetation from non-vegetation. Based on physical properties and pre-defined, region-specific rules, it then determines each vegetation type such as trees or hedgerows. And finally, it delineates each vegetative object and produces georeferenced vector datasets of all classified vegetation. Those vector classifications are then ingested into ESRI ArcGIS to create EU-compliant data for the local ministry of agriculture's LPIS.

With the ALEK system, RLP AgroScience was able to precisely classify and map the entire 19,000-sq-km Rhineland-Palatinate region in three months, significantly reducing the time, resources and costs that would be needed to manually produce the required datasets.

"Manual digitization is not only incredibly tedious, it's subjective–15 people can interpret the same object 15 different ways–and prone to error," said Dr. Matthias Trapp, RLP AgroScience's head of environmental systems. "With eCognition's objective image analysis, we created standardized, reproducible results in a fraction of the time. Its speed, accuracy and data flexibility allowed our small team of image analysts to develop a fully automated, repeatable large-scale vegetation mapping system at no additional data cost to the ministry."

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RESULT

By transforming months of manual classification work into an automated exercise in keystrokes, RLP AgroScience is enabling the local authorities to build their landscape feature layers of the EU-required LPIS, verify farmers' claims and submit accurate applications for agriculture subsidies on time. And with ALEK's repeatable platform, it has the ability to continually and reliably classify the changing landscape of Rhineland-Palatinate.

With the batch and parallel processing features of eCognition Server technology, the ALEK system can handle significant volumes of data as well as automatically repeat the classification workflows each time a new dataset is introduced. In addition, should the EU issue new IACS data specifications, RLP AgroScience can adjust the system to meet those requirements with one simple change in the eCognition workflow.

Without the aid of eCognition, RLP AgroScience would have had to more than triple the size of its team to produce the same amount of output—— at potentially lesser quality. The increased productivity and improved efficiency and quality enables the organization to continue to innovate and expand ALEK applications. Anchored by eCognition's automation and its building-block nature of repeatable workflows, ALEK is helping to ensure RLP AgroScience can continue to efficiently and reliably deliver a crop of classifications for Rhineland-Palatinate, and possibly for other EU regions as well.

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Dr. Matthias Trapp,
Head of Environmental Systems,
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