Deploying MRV across Europe to grow impacts: Status, lessons learned, and opportunities.

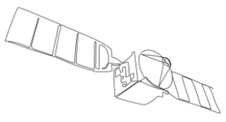
Blayne Lees, and Agreena science team

Agreena

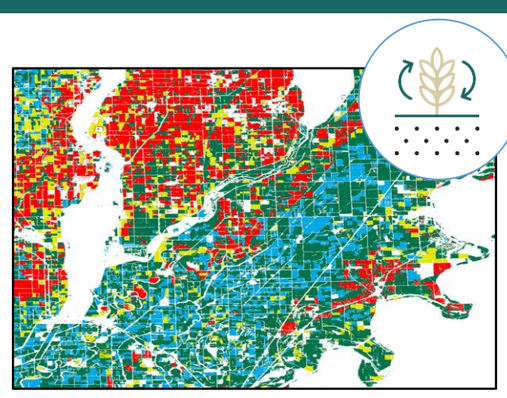
The adoption of regenerative agricultural practices is gaining traction as an approach to enhance soil health and sequester carbon to combat climate change. Different sustainability frameworks and programmes are now incentivizing producers to transition to regenerative farming. These initiatives need robust and transparent **M**easurement, **R**eporting and **V**erification (MRV) platforms to track cropland practices and outcomes. To help scale initiatives we use an automated approach currently quantifying rotations, tillage practices, cover crops, and soil carbon across European agri-landscapes.

Our approach leverages multi-source Earth Observations, process-based soil models, independent ground truth, and surveys. A current example is tracking tillage practices with tens of thousands of training data gathered across Europe. Independent training data is collected seasonally to ensure robust and transferability. Together, these multi-source data feed into machine learning models to classify features such as tillage practices and cover crops. Withheld independent observations and data science best practices are used to gauge model performance and accuracy depending on regional schemes and landscape practice variability. With this approach, the Community of Practice can robustly track field conditions over seasons and feed downstream applications, such as estimating Soil Organic Carbon (SOC) and impacts of practices. Combining these tools with open operational data streams such as Copernicus, we look forward to helping grow regenerative agriculture impacts and carbon farming initiatives across Europe.

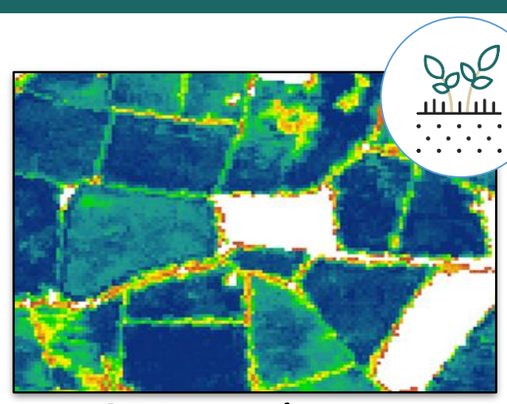
Satellite derived landscape metrics tuned to regenerative management practices. We largely use time series Sentinel-1 & Sentinel-2 combined with ground truth and machine learning architectures.



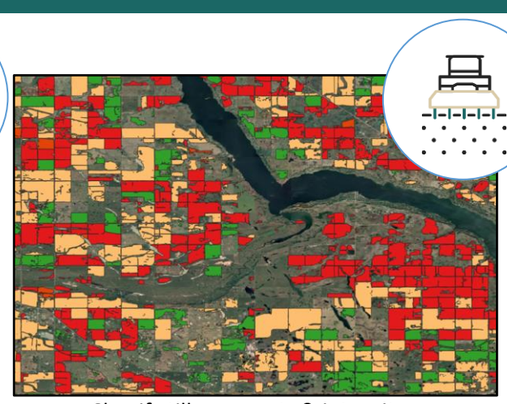
Delineate field boundaries and size



Classify crop types and historic rotations

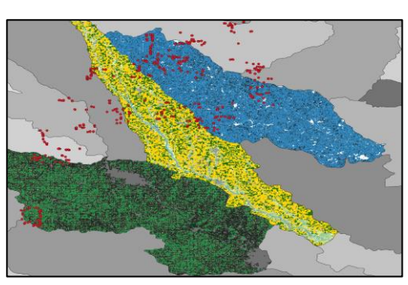


Detect presence of cover crops



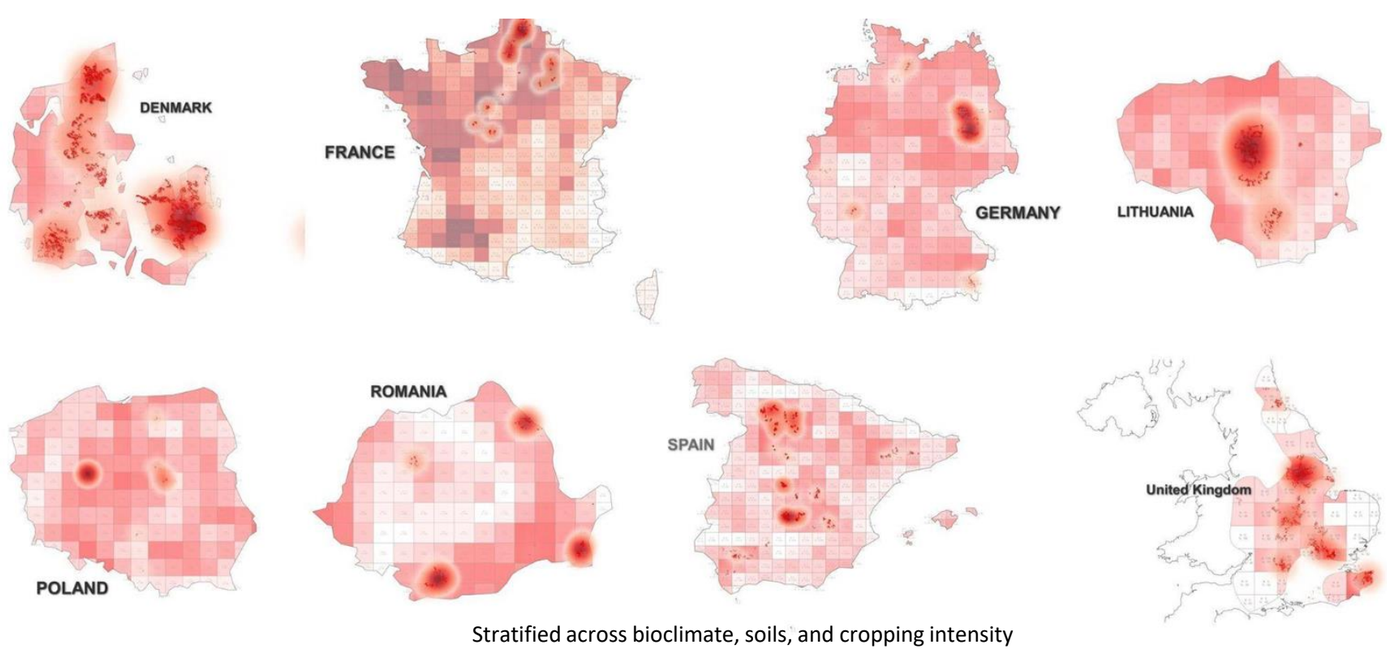
Classify tillage events & intensity

Independent dense ground truth is collected to build and validate satellite and crop models. Over the past two years we've collected >100,000 unique observations our data science team leverages.



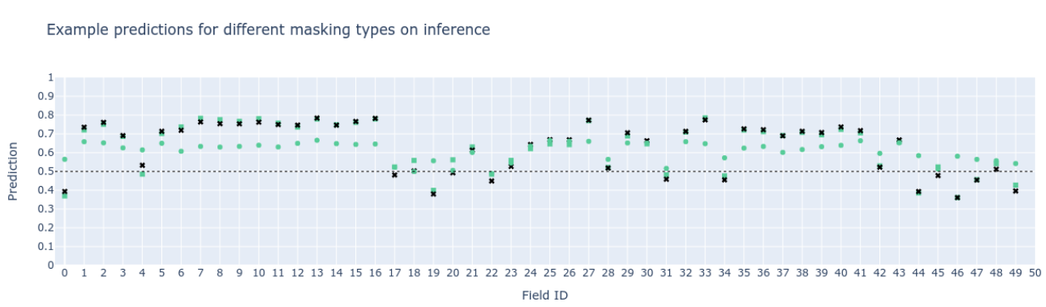
Wide array surveys help transferability

Infield measurements help tune models

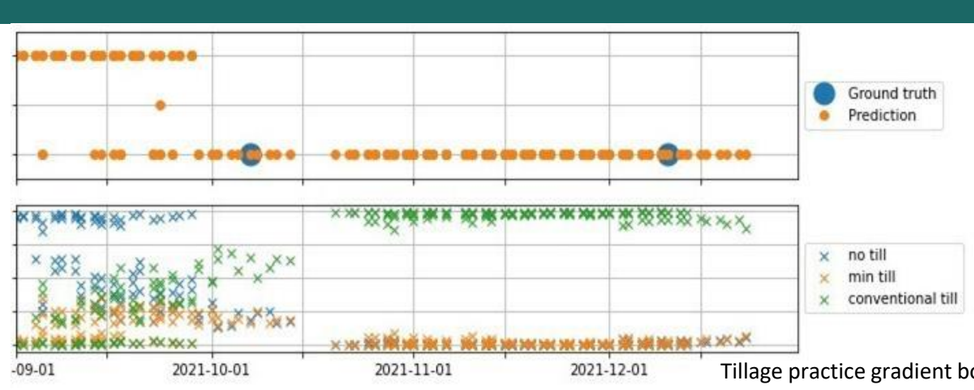


Stratified across bioclimate, soils, and cropping intensity

We define accuracy as comparing predictions vs truth. Important factors driving accuracy metrics include scale, geography, transferability, version, and sample design among others.



Cover crops LSTM illustration.



Tillage practice gradient boosting illustration.