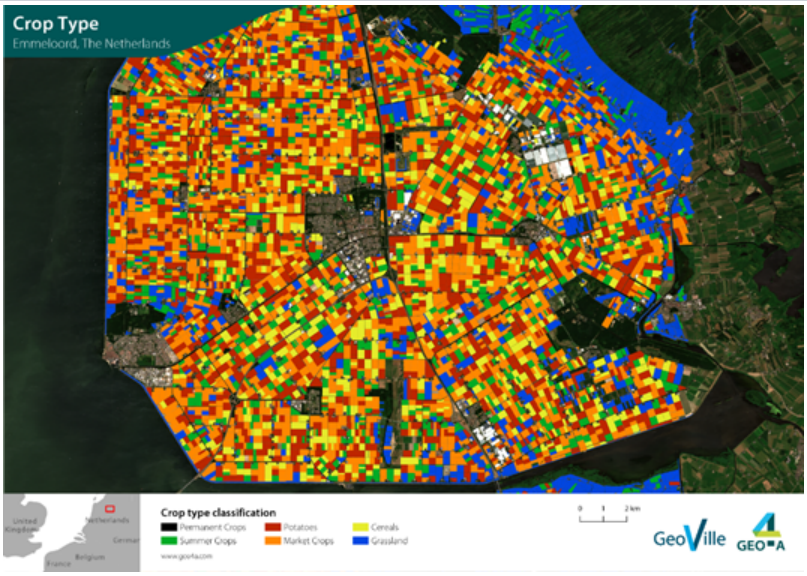
Crop Type Detection

Download Product Sheet



Crop types in a selected area of interest (Emmeloord, The Netherlands) (Source: GeoVille/Geo4A)

Category

☑ Product Development	☑ Product Sales	☑ Underwriting	☑ Loss Adjustment	☑ Claims Handling

PRODUCT DESCRIPTION

The crop type detection service provides information on types and location of crops grown with different levels of detail. Besides summer and winter crops, various types such as potatoes, maize, cereals, and others field crops can be detected using Earth observation techniques.

The classification of crop types is performed by using spectral information and temporal information about crop development. With this information it is possible to separate accurately different crop classes over large areas. To identify the different crop types a long and consistent time series of satellite imagery is needed. Taking a close look on the fields over a growing season is important as the differences between the crops become apparent based on their phenological development over the season. The later in the season, the more accurate the identification of crops gets, as there is more information available and the vegetation differences are more clearly recognisable. Typically, crop type mapping starts providing reasonable accuracies about 2-3 months after sowing.

Optical as well as radar satellites are used for this service. Radar imagery such as Sentinel-1 provide information on structural properties of crops and therefore optimise the results. Furthermore, the limitation of optical data due to cloud coverage can be overcome using radar data. Different levels of detail are possible: analysis may be performed on pixel or parcel level; also, generic grouped classes as well as specific crop types are feasible.
The service is applied within a specified area of interest. Analysis is possible in different regions with some region-specific adjustments. To distinguish the different crop types more accurately, training data from regions and within the season is needed.

PRODUCT SPECIFICATIONS

Main processing steps

Satellite Data -> Pan-sharpening / resolution merge -> Indices calculation -> Statistics Calculation -> machine learning algorithms

Input data sources

Optical: Sentinel-2, Landsat-7, Landsat-8, or commercial VHR / HHR satellite data

Radar: Sentinel-1

Supporting data: Field parcel delineation; in-situ crop type information such as LPIS

Spatial resolution and coverage

Spatial resolution: 10m

Coverage: Regional/national level

Availability: Globally available

Accuracy / constraints

Thematic accuracy: variable, >90% for major crops and crop groupings (end of season)

Spatial accuracy: 1.5 - 2 pixels of input data

Limitations

Machine learning datasets are highly dependent on their input datasets. The crop type classification can be improved with available in-situ data.

Frequency / timeliness

Frequency: various time steps

Timeliness: from the beginning of the respective growing season

Delivery / output format

Data type: GIS-ready data formats; Raster; API (depending on customer needs)

File format: GeoTIFF

Accessibility

Commercially available on demand from EO service providers.

CHALLENGES ADDRESSED - USE CASE(S)

Product Development

- Market analysis
- Index insurance: Risk / Crop modelling (Correlation of EO data with in-situ data)
- Index insurance: Functionalities of plants, chemical reactions, early stress detection
- Index insurance: Parcel/Field and regional yield statistics
- Index insurance: Platform for crop health products
- Elaboration of crop profile: Field crops, vegetables, horticulture, greenhouses
- Information on crop rotation
- Information on crop (seasonal) calendar
- High accuracy of crop-specific yield for smaller crop parcels
- Risk exposure (product design and customer communication)
- Radar data (eliminated cloud over effects)

Product Sales:

- Client Outreach
- Pre-contractual Consulting (show-case risk exposure)
- Farm Structure / Management Practice (linking to Cadaster)
- Regular market penetration review

Underwriting

- Seasonal portfolio mapping
- Online platforms or easy-to-use interfaces integrating various data sources (vegetation stress, field boundary changes, comparison)
- Risk / crop zoning
- Global/Regional production trends (e.g. monitoring specific crop acreages of surrounding regions/countries)
- Procure better reinsurance terms/capacity from enhanced insurance practice
- Identification of productive units
- Identification of crops grown
- Information of vegetation stages (identify most sensitive stages when crop is the most vulnerable to a risk, e.g. flowering stage)
- Crop calendar and crop practices
- Regular assessment of risk pricing and product rating

Loss Adjustment

- Workforce allocation and planning
- High accuracy of crop-specific yield for smaller crop / land parcels
- Regularly updated consistent long time series of reliable data for index insurance
- Benchmark physical field observations against yield loss detection (e.g. product calibration
- Risk mapping against crop's vegetation stages
- Increase credibility of loss adjustment (e.g. show EO data/visualizations to support loss adjustment communication to farmer)
- Enhance field survey (better precision with EO data support)
- Detect crop damage at field level
- Assess crop damage at field level
- Distinct field heterogeneity with crop damage

Claims Handling

- Identification of actual damage size (tones (volume) / ha (area) / price (yield value)
- Quality control assessment of claims before pay-out
- Fraud detection