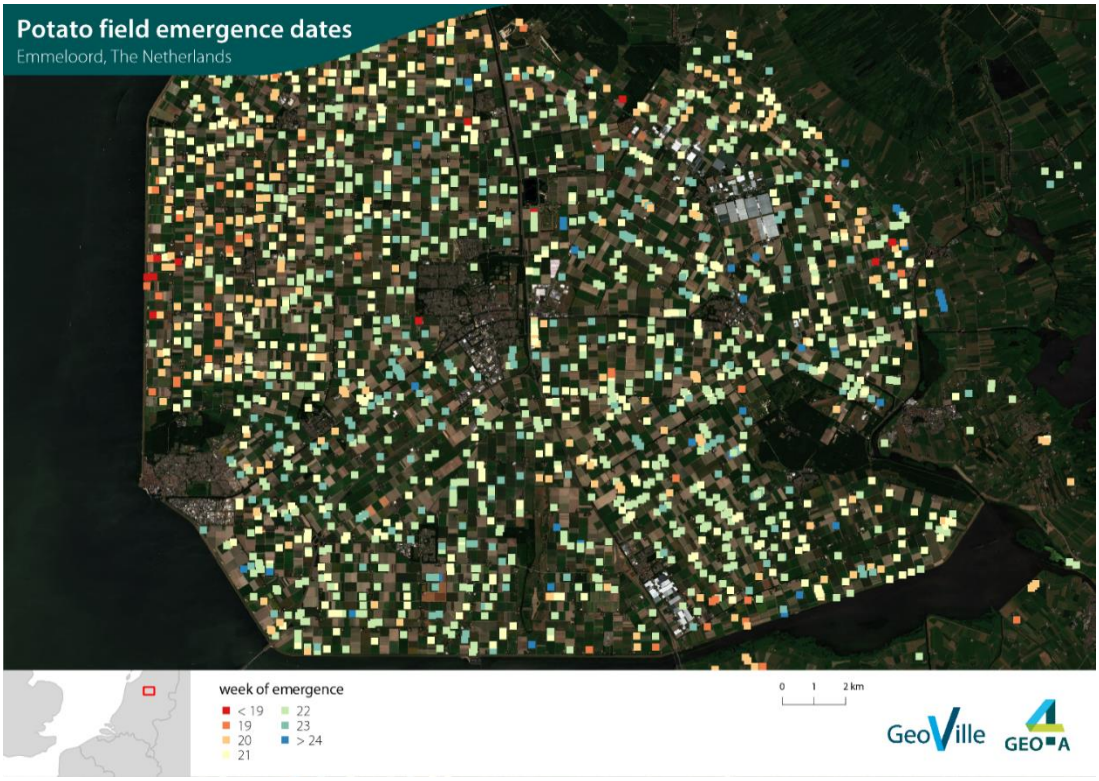
CROP PHENOLOGY



Week of emergence for potato crops (Source: GeoVille)

CATEGORY

☒ Product Development ☒ Product Sales ☒ Underwriting ☒ Loss Adjustment ☐ Claims Handling

DESCRIPTION

The date of emergence of plants is important to determine the vegetation period and in understanding of the crop's development. This service provides information on the emergence of a specified crop type, indicating in which week the plants emerge above the ground on a certain field.

Date of emergence provides underwriters with a monitoring tool for the portfolio to observe possible losses due to insured/non-insured risks (e.g. wrong sowing dates, improper inputs/technology application, etc.). Early or late planting dates may be rated higher (e.g. +10-20%).

While assessing the damage, the information on crop's emergence may assist the surveyor in determining the actual vegetation stage at time of risk event. This will assist in better precision for assessment of the actual loss.

Furthermore, the data serves as input for other services such as crop growth monitoring and crop growth models.

Similar to crop emergence, crop harvests can be detected from time series of high resolution imagery.

PRODUCT SPECIFICATIONS

Main processing steps	The product is based on the processing of multi-spectral optical and radar satellite imagery. Consistent time series over the starting of the vegetation period is essential. The comparison of different time steps allows to differentiate between agricultural fields with emerged crop from other land cover such as bare soil. The identification of the week of emergence or harvest is based on the analysis of vegetation indices such as the NDVI or LAI.

Input data sources	Optical: Sentinel-2, Landsat 8 Radar: Sentinel-1 Supporting data: meteorological data, field boundaries
Spatial resolution and coverage	Spatial resolution: 10 m Coverage: Local/Regional level Availability: globally available
Accuracy / constraints	Thematic accuracy: > 85 % depending on in-situ availability Spatial accuracy: field level
Limitations	Emergence/Harvest date can only be confirmed if a sufficient amount of satellite observations is available. Optical data can be limited by cloud coverage, thus a hybrid approach using also radar data as well as additional modelling supports the timely detection.
Frequency / timeliness	Frequency: various time steps Timeliness: around six weeks after start of growing season
Delivery / output format	Data type: GIS-ready data formats; Vector; Raster; API (depending on customer needs) File format: GeoTIFF; Shapefile (depending on customer needs)
Accessibility	Commercially available on demand from EO service providers.

CHALLENGES ADDRESSED – USE CASE(S)

Product Development:

- Index insurance: Toolbox for indices
- Index insurance: Risk / crop modelling (Correlation of EO data with in-situ data)
- Index insurance: Relation between weather and impact on crop productivity
- Index insurance: Functionalities of plants, chemical reactions, early stress detection
- Index insurance: Platform for crop health products
- Elaboration of crop profile: Field crops, vegetables, horticulture, greenhouses
- Information on crop (seasonal) calendar
- High accuracy of crop-specific yield for smaller crop parcels
- Radar data (eliminated cloud cover effects)
- Risk exposure (product design and customer communication)

Product Sales:

- Client outreach
- High accuracy of crop-specific yield for smaller crop parcels (penetration)
- Pre-contractual consulting (show-case risk exposure)
- Greater acceptance of index covers by farmers
- Regular market penetration review
- Risk alerts

Underwriting:

- Seasonal portfolio monitoring
- Online platforms or easy-to-use interfaces integrating various data sources (vegetation stress, field boundary changes, comparison, etc.)
- Risk / crop zoning
- Actual crop health (vegetation)
- Global/Regional production trends (e.g. monitoring specific crop acreages of surrounding regions/countries)

- Identification 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/visualization 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