Drought Indicators

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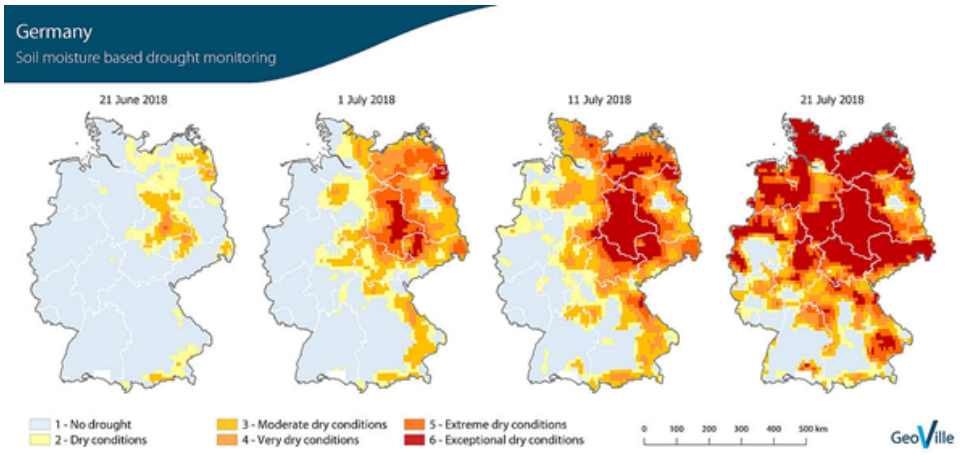

Soil moisture-based drought monitoring, June–July 2018, Germany (Source: GeoVille)

Category

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

PRODUCT DESCRIPTION

Drought may have several dimensions but for agro-insurances, agricultural drought is most relevant. This is considered when the soil moisture availability to crops has dropped to such a level that it adversely affects the crop yield.

In most cases drought is referred as a large-scale (systemic) risk, as it covers larger production areas affecting all farms and crops in the region. Although the early effects of droughts are hard to identify, the longer a drought persists the greater are the effects for crops, if they are irrigated or not.

Drought indicators are variables or parameters used to describe drought conditions. Examples include precipitation, temperature, streamflow, groundwater and reservoir levels, and soil moisture.

Drought indices are typically computed numerical representations of drought severity, assessed using climatic or hydrometeorological inputs including the indicators listed above. They aim to measure the qualitative state of droughts on the landscape for a given time period. Indices are technically indicators as well.
EO data correlation with the actual drought conditions for specific crops represents the major challenge for the industry. Different crop types (and their varieties) may react differently to drought effects, showing different yield capacity decrease, which requires additional calibration of drought datasets and parameters interpretation by algorithms for the needs of a specific crop (insurance) needs.

PRODUCT SPECIFICATIONS

Main processing steps

Drought indices are amongst others based on long time series of rainfall, soil moisture and vegetation data. Anomalies compared to the long-term average highlighting areas under drought conditions.

Input data sources

Optical: Sentinel-2, Landsat-8, MODIS, Geostationary satellites (IR/visible)

Radar: MetOp ASCAT, SMAP, TRMM, SSM/I

Supporting data: in-situ information of drought parameters

Spatial resolution and coverage

Spatial resolution: 10 m – 25 km

Coverage: National/regional/local level

Availability: globally available

Accuracy / constraints

Thematic accuracy: depending on observed variable.

Spatial accuracy: depending on observed variable.

Limitations

Depending on the drought indicator/index the limitations vary. A good overview on nearly 50 indicators/indices is provided in this WMO publication: https://www.droughtmanagement.info/literature/GWP_Handbook_of_Drought_Indicators_and_Indices_2016.pdf

Frequency / timeliness

Frequency: daily and more at regular intervals

Timeliness: near real-time

Delivery / output format

Data type: Raster formats

File format: GeoTIFF, NetCDF

Accessibility

Commercially available on demand from EO service providers.

Publicly available data can be obtained through the Copernicus European Drought Observatory (https://www.copernicus.eu/en/european-drought-observatory).

CHALLENGES ADDRESSED - USE CASE(S)

Product Development

Index insurance:

- Index insurance: Toolbox for indices
- Index insurance: Risk / Crop modelling (Correlation of EO data with in-situ data)
- Index insurance: Relation between weather events and impact on crop productivity
- Identification of specific stresses and vegetation problems and their underlying causes
- Risk exposure (product design and customer communication)
- Study relations between climatological events and crop production proxies at large scale
- Parametric insurance products

Product Sales:

- Pre-contractual Consulting (show-case risk exposure)
- Greater acceptance of index covers by farmers
- Risk alerts

Underwriting:

- Seasonal portfolio monitoring
- Risk / crop zoning
- Identification of vegetation stages (identify most sensitive stages when crop is the most vulnerable to a risk, e.g. flowering stage)
- Regular assessment of risk pricing and product rating

Loss Adjustment

- Workforce allocation and planning
- 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)

Claims Handling

- Quality control assessment of claims before pay-out
- Fraud detection
- Timely, reliable and consistent data to speed-up the indemnity pay-outs