

Sentinel Agro Labs (SAL)

EU Agricultural Monitoring — Descriptive Knowledge Notes (v1)

Date: 2025-12-25

Scope: Descriptive, citation-anchored reference material

Limitations: No modelling, forecasting, optimisation, benchmarking, or decision support.

Governance note (public-safe)

This document compiles descriptive notes and dataset references from EU and international public institutions and programmes. It does not provide recommendations, thresholds, alerts, or operational guidance.

Programme & Service Context

Statistical Agriculture — Programme & Service Context

Domain: Statistical Agriculture

Track: D — Knowledge Base Population

Status: ACTIVE (descriptive, reviewer-safe)

1. International and EU Context

Within SAL, **statistical agriculture** refers to the structured collection, harmonisation, and reporting of agricultural statistics as documented by international and European public institutions.

These statistics are used to: - Describe agricultural structures, production, and inputs - Support monitoring of agricultural trends - Provide official reference data for policy analysis and reporting

Statistical agriculture is treated as **descriptive and declarative**, not as an analytical or predictive system.

2. FAO Context

The **Food and Agriculture Organization of the United Nations (FAO)** provides global standards, classifications, and statistical frameworks for agricultural data.

FAO statistical outputs commonly include: - Crop and livestock production statistics - Land use and agricultural inputs - Food balance and supply indicators

FAO data is designed for **international comparability and consistency**, rather than local operational decision-making.

3. Eurostat Context

Eurostat is the statistical office of the European Union and provides harmonised agricultural statistics for EU Member States.

Within Eurostat, agricultural statistics support: - Monitoring of agricultural production and structures - Common Agricultural Policy (CAP) reporting - Cross-country comparison within the EU

Eurostat datasets follow defined statistical methodologies and legal frameworks.

4. Relationship to Environmental and EO Data

Statistical agriculture datasets are often referenced alongside: - Environmental indicators - Land and climate monitoring datasets - Earth observation-derived products

Within SAL, these relationships are recorded **descriptively**, without integrating or reconciling datasets.

5. Positioning Statement

Within SAL, statistical agriculture is positioned as: - Official, institutionally produced agricultural statistics - Reference data for understanding agricultural systems - Contextual information complementary to EO and environmental datasets

No modelling, forecasting, optimisation, or policy recommendation is implied.

References (descriptive sources)

- Food and Agriculture Organization of the United Nations (FAO) — Agricultural Statistics
- Eurostat — Agricultural statistics and methodologies
- United Nations Statistical Division — Agricultural statistics frameworks

Drought & Climate Indicators — Programme & Service Context

Domain: Drought & Climate Indicators

Track: D — Knowledge Base Population

Status: ACTIVE (descriptive, reviewer-safe)

1. Copernicus Programme Context

Within the **Copernicus Programme**, drought and climate indicators are treated as **environmental and climatic descriptors** used to characterise variability, anomalies, and long-term conditions affecting land, water, and ecosystems.

These indicators support: - Climate monitoring and assessment - Environmental and land condition context - Policy-relevant climate reporting

They are documented as **observational or derived indicators**, not as operational decision or response systems.

2. Copernicus Services Involved

Drought and climate indicators are primarily referenced through the following Copernicus services:

Copernicus Climate Change Service (C3S)

- Core service for climate variables and indicators
- Provides climate indicators related to temperature, precipitation, soil moisture, and drought conditions
- Focuses on consistency, comparability, and long-term climate records

Copernicus Land Monitoring Service (CLMS)

- References drought-related indicators in the context of land surface and vegetation condition
 - Supports monitoring of land and ecosystem responses to climatic variability
 - Indicators are contextual, not prescriptive
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3. Indicator Positioning

Within Copernicus documentation, drought and climate indicators are positioned as: - Measures of climatic state or anomaly - Descriptive indicators supporting monitoring and reporting - Inputs to climate assessment frameworks

They do not constitute forecasts, early-warning systems, or response mechanisms at this level.

4. Relationship to Environmental Monitoring

Drought and climate indicators are commonly linked with: - Precipitation and temperature records - Soil moisture and evapotranspiration variables - Vegetation condition indicators

SAL records these relationships **descriptively**, without combining indicators or inferring impacts.

5. Positioning Statement

Within SAL, drought and climate indicators are positioned as: - Climate-related descriptors referenced by EU programmes - Components of broader climate and environmental monitoring systems - Contextual information for understanding datasets and services

No prediction, risk assessment, or management interpretation is implied.

References (descriptive sources)

- Copernicus Climate Change Service (C3S) — Climate Indicators Overview
- Copernicus Land Monitoring Service (CLMS) — Land and vegetation condition context
- European Environment Agency (EEA) — Climate and drought indicator context

Soil Moisture — Programme & Service Context

Domain: Soil Moisture

Track: D — Knowledge Base Population

Status: ACTIVE (descriptive, reviewer-safe)

1. Copernicus Programme Context

Within the **Copernicus Programme**, soil moisture is treated as a **biophysical environmental variable** relevant to land surface monitoring, agriculture, hydrology, and climate assessment. It is referenced as an observed variable used to characterise surface and near-surface land conditions.

Soil moisture information supports: - Environmental and agricultural monitoring - Climate variability and drought context analysis - Long-term land surface condition records

At programme level, soil moisture products are **descriptive observational outputs** and do not constitute management guidance or forecasts.

2. Copernicus Services Involved

Soil moisture appears across Copernicus services in different roles:

Copernicus Climate Change Service (C3S)

- Soil moisture is included among land-related **Essential Climate Variables (ECVs)**
- Used within climate data records and reanalysis products
- Focus on temporal consistency and long-term comparability

Copernicus Land Monitoring Service (CLMS)

- Soil moisture referenced as contextual information for land surface condition
 - Supports interpretation of vegetation, drought, and land dynamics indicators
 - Not delivered as an operational decision-support product
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3. SMOS Mission Role

The **Soil Moisture and Ocean Salinity (SMOS)** mission, operated by the European Space Agency (ESA), is a primary European satellite mission dedicated to soil moisture observation.

Key characteristics: - Passive microwave radiometry (L-band) - Sensitivity to near-surface soil moisture - Global and systematic coverage - Emphasis on consistency rather than fine spatial detail

SMOS products are used by Copernicus services as **source datasets** and as inputs to climate records and land surface analyses.

4. In-situ Observation Context

In-situ soil moisture measurements are referenced within Copernicus workflows primarily for: - Calibration of satellite-derived products - Validation and quality assessment - Local-scale reference measurements

These observations are provided by national monitoring networks, research infrastructures, and standardised sensor deployments. Coverage is heterogeneous and complementary to satellite observations.

5. Positioning Statement

Within the EU Earth observation ecosystem, soil moisture is positioned as: - A measured environmental variable - One component within multi-variable land and climate monitoring frameworks - A descriptive indicator of surface and subsurface conditions

No forecasting, yield estimation, or management interpretation is implied at this level.

References (descriptive sources)

- European Space Agency (ESA) — SMOS Mission Documentation
- Copernicus Climate Change Service (C3S) — Land Essential Climate Variables
- Copernicus Land Monitoring Service (CLMS) — Land Surface Products Overview

CLMS HR-VPP — Vegetation Indicators (knowledge note)

Scope

This note lists vegetation indicators defined and distributed within the Copernicus Land Monitoring Service (CLMS) High Resolution Vegetation Phenology and Productivity (HR-VPP) product family. The content is descriptive only and reflects indicator definitions as stated in official CLMS documentation.

Vegetation indicators (as defined by CLMS HR-VPP)

- **NDVI (Normalized Difference Vegetation Index)**
 - Spectral index derived from Sentinel-2 multispectral observations.
 - Provided within HR-VPP as a core vegetation condition indicator.
- **LAI (Leaf Area Index)**
 - Biophysical variable representing leaf area per unit ground surface.
 - Distributed as part of HR-VPP vegetation parameter products.
- **FAPAR (Fraction of Absorbed Photosynthetically Active Radiation)**
 - Indicator describing the fraction of incoming solar radiation absorbed by vegetation.
 - Included in HR-VPP biophysical parameter products.
- **PPI (Plant Phenology Index)**
 - Index used within HR-VPP to support phenological state characterization.
 - Derived from Sentinel-2 time series observations.
- **Vegetation Phenology & Productivity Parameters (VPP suite)**
 - Set of seasonal and annual parameters derived from vegetation index trajectories.

- Includes phenology timing and productivity-related parameters as defined in CLMS documentation.

Source citations

- SAL_KB/citations/CLMS_HR-VPP_dataset.md
- SAL_KB/citations/CLMS_HR-VPP_Product_User_Manual.md

Notes (governance)

- Knowledge note derived exclusively from cited CLMS sources.
- Descriptive definitions only; no interpretation, evaluation, or application claims.
- No AI, modelling, or performance-related framing.

Dataset References (Citation Backbone)

Statistical Agriculture — Dataset References (Citation Backbone)

Domain: Statistical Agriculture

Track: C → D (metadata-only references supporting Track D notes)

Status: ACTIVE (reviewer-safe)

A) FAO — FAOSTAT

Entity: FAOSTAT (FAO Statistical Database)

Role in SAL:

Primary global reference database for agricultural, forestry, fisheries, and food statistics, maintained by the Food and Agriculture Organization of the United Nations.

Primary authoritative source: - FAO — *FAOSTAT Database*

<https://www.fao.org/faostat>

B) FAO — Methodologies and Classifications

Entity: FAO statistical standards and methodologies

Role in SAL:

Provides internationally recognised classifications, definitions, and methodological guidance for agricultural statistics.

Primary authoritative sources: - FAO — *FAOSTAT Methodology*

<https://www.fao.org/faostat/en/#definitions> - FAO — *Statistical Standards and Classifications*

<https://www.fao.org/statistics/standards>

C) Eurostat — Agricultural Statistics

Entity: Eurostat Agricultural Statistics

Role in SAL:

Harmonised agricultural statistics for EU Member States, produced under EU legal and methodological frameworks.

Primary authoritative source: - Eurostat — *Agricultural Statistics*

<https://ec.europa.eu/eurostat/web/agriculture/data>

D) Eurostat — Methodology and Metadata

Entity: Eurostat statistical methodology and metadata

Role in SAL:

Documentation of statistical concepts, survey design, and data quality for EU agricultural statistics.

Primary authoritative sources: - Eurostat — *Statistics Explained: Agriculture*

<https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agriculture>

- Eurostat — *Metadata and Quality Reports*

<https://ec.europa.eu/eurostat/web/quality>

SAL Governance Notes

- This file provides **descriptive, metadata-only references**.
- No data harmonisation, modelling, or comparison is performed within SAL.
- Track D knowledge notes may cite these sources where relevant.

Drought & Climate Indicators — Dataset References (Citation Backbone)

Domain: Drought & Climate Indicators

Track: C → D (metadata-only references supporting Track D notes)

Status: ACTIVE (reviewer-safe)

A) Copernicus Climate Change Service (C3S) — Climate Indicators

Entity: Copernicus Climate Change Service (C3S)

Role in SAL:

Primary Copernicus service providing authoritative climate indicators and climate variable products used for monitoring long-term climate conditions and variability.

Primary authoritative source: - Copernicus C3S — *Climate Indicators*

<https://climate.copernicus.eu/climate-indicators>

B) Drought Indicators — C3S and EEA Context

Entity: Drought-related indicators within Copernicus and EEA reporting

Role in SAL:

Documentation of drought indicators used for climate assessment, environmental reporting, and policy-relevant climate context.

Primary authoritative sources: - Copernicus C3S — *Drought Indicators and Indices*

<https://climate.copernicus.eu/drought> - European Environment Agency (EEA) — *Drought and Water Scarcity Indicators*

<https://www.eea.europa.eu/themes/water/europes-water/droughts-and-water-scarcity>

C) Precipitation and Temperature — Core Climate Variables

Entity: Climate variables (precipitation, temperature)

Role in SAL:

Foundational climate variables referenced in drought and climate indicator frameworks.

Primary authoritative sources: - Copernicus C3S — *Essential Climate Variables*

<https://climate.copernicus.eu/essential-climate-variables> - Copernicus C3S — *Climate Data Store*

<https://cds.climate.copernicus.eu>

D) Land and Vegetation Context — CLMS

Entity: Copernicus Land Monitoring Service (CLMS)

Role in SAL:

Provides land and vegetation-related products referenced in the context of drought and climate variability.

Primary authoritative source: - Copernicus Land Monitoring Service — *Global and European Products*

<https://land.copernicus.eu>

SAL Governance Notes

- This file provides **descriptive, metadata-only references**.

- No forecasting, early-warning, or risk assessment functionality is implied.
- Track D knowledge notes may cite these sources where relevant.

Soil Moisture — Dataset References (Citation Backbone)

Domain: Soil Moisture

Track: C → D (metadata-only references supporting Track D notes)

Status: ACTIVE (reviewer-safe)

A) Satellite Mission Source — ESA SMOS (Soil Moisture & Ocean Salinity)

Entity: SMOS mission (ESA Earth Explorer / Living Planet Programme)

Role in SAL:

Primary European satellite mission dedicated to global observations of soil moisture over land (and ocean salinity).

Primary authoritative sources: - European Space Agency (ESA) — *SMOS Mission Overview*

<https://earth.esa.int/eogateway/missions/smos> - ESA Earth Online — *SMOS: Soil Moisture and Ocean Salinity*

<https://earth.esa.int/eogateway/missions/smos/description>

B) SMOS Science Products — Level 1 / Level 2

Entity: SMOS Science Products Catalogue (L1 / L2)

Role in SAL:

Reference for the official SMOS soil moisture product family and retrieval documentation.

Primary authoritative source: - ESA Earth Online — *SMOS Products and Algorithms*

<https://earth.esa.int/eogateway/catalog/smos-products>

C) Copernicus Climate Change Service (C3S) — Soil Moisture

Entity: Copernicus Climate Change Service (C3S)

Role in SAL:

Service-level documentation describing soil moisture as a land Essential Climate Variable derived from observations.

Primary authoritative source: - Copernicus C3S — *Soil Moisture (Land Hydrology & Cryosphere)*

<https://climate.copernicus.eu/soil-moisture>

D) Copernicus Land Monitoring Service (CLMS) — Soil Moisture

Entity: Copernicus Land Monitoring Service (CLMS)

Role in SAL:

Product-group description for soil moisture products within the land monitoring portfolio.

Primary authoritative source: - CLMS — *Soil Moisture Products Overview*

<https://land.copernicus.eu/global/products/soil-moisture>

E) In-situ Reference Class — International Soil Moisture Network (ISMN)

Entity: International Soil Moisture Network (ISMN)

Role in SAL:

Example in-situ soil moisture reference network used for calibration and validation in Copernicus and ESA contexts.

Primary authoritative source: - ISMN — *International Soil Moisture Network*

<https://ismn.earth>

SAL Governance Notes

- This file contains **descriptive references only**.
- No modeling, forecasting, yield inference, or decision support is implied.
- Track D knowledge notes may cite these sources where relevant.

CLMS HR-VPP — Dataset Citation (metadata only)

Dataset

- Name: High Resolution Vegetation Phenology and Productivity (HR-VPP)
- Service: Copernicus Land Monitoring Service (CLMS)
- Source satellites: Sentinel-2A / Sentinel-2B (Copernicus)

Responsible institutions (as stated in CLMS documentation)

- Copernicus Land Monitoring Service (CLMS)
- European Environment Agency (EEA) project officer referenced in user manual

Coverage

- Geographic: Pan-European coverage (EEA region; HR-VPP pan-European component)
- Temporal: From ~2017 onwards for pan-European high-resolution products (per service descriptions)

Spatial / temporal characteristics (as stated in HR-VPP documentation / catalogues)

- Spatial resolution: 10 m × 10 m (high-resolution product suite)
- Repeat frequency basis: Sentinel-2 revisit ~5 days (constellation)
- Product family includes:
 - Vegetation Indices (VI): NDVI, LAI, FAPAR, PPI (near real-time; daily product in public collections)
 - Seasonal Trajectories (ST): filtered time series (commonly 10-daily)
 - Vegetation Phenology & Productivity Parameters (VPP): yearly/seasonal parameters (annual updates)

Primary variables / indicators (named in CLMS / HR-VPP materials)

- NDVI (Normalized Difference Vegetation Index)
- LAI (Leaf Area Index)
- FAPAR (Fraction of Absorbed Photosynthetically Active Radiation)
- PPI (Plant Phenology Index)
- VPP phenology/productivity parameters (suite parameters as documented by CLMS)

Access modality

- Public Copernicus/CLMS distribution channels; HR-VPP Data Access Manual describes catalogue/search/job/download access paths.

Official documentation / catalogue references

- Copernicus services catalogue entry (HR-VPP / PPI metadata example)
- CLMS Technical Library: HR-VPP Data Access Manual (download)
- CLMS Technical Library: Product User Manual (Seasonal Trajectories & VPP parameters)
- CLMS News: Annual product update notices (HR-VPP parameters updates)

Notes (governance)

- Metadata-only citation record. No performance claims, no methodological claims, no use-case framing.

CLMS HR-VPP — Product User Manual (policy / technical citation)

Document

- Title: High Resolution Vegetation Phenology and Productivity (HR-VPP) — Product User Manual
- Document type: Product User Manual (technical / operational)
- Service: Copernicus Land Monitoring Service (CLMS)

Issuing institutions

- Copernicus Land Monitoring Service (CLMS)
- Joint Research Centre (JRC), European Commission
- European Environment Agency (EEA)

Scope (as defined in the manual)

- Governs the definition, structure, and delivery of HR-VPP products
- Covers vegetation indices, seasonal trajectories, and phenology/productivity parameters
- Describes product characteristics, formats, and update logic

Relation to datasets

- Authoritative technical reference for the HR-VPP dataset family

- Directly applicable to the pan-European HR-VPP products distributed via CLMS

Versioning and publication

- Version: As specified in the official CLMS Technical Library release
- Publication year: As specified in the official document metadata
- Maintenance: Updates issued by CLMS/JRC as products evolve

Access modality

- Public technical documentation available via the CLMS Technical Library

Official access / reference

- CLMS Technical Library: HR-VPP Product User Manual (official download page)

Notes (governance)

- Policy/technical citation only.
- No evaluation of performance, accuracy, or scientific outcomes.
- No use-case or AI-related framing.

Scope and Boundaries

Statistical Agriculture — Scope and Boundaries

Domain: Statistical Agriculture

Track: D — Knowledge Base Population

Status: ACTIVE (descriptive, reviewer-safe)

1. Thematic Scope

Within SAL, **statistical agriculture** covers officially produced agricultural statistics as documented by international and European public institutions.

This scope includes: - Agricultural production, structure, and input statistics - Livestock, crop, and land-use statistics - Aggregated indicators used for monitoring and reporting

Statistical agriculture is treated as **descriptive and declarative**, not as an analytical or predictive domain.

2. Spatial Scope

The spatial scope reflects the characteristics of referenced statistical systems: - Global coverage (FAO statistics) - European and national coverage (Eurostat and Member State reporting) - Spatial granularity defined by reporting units (country, region, holding class)

SAL does not disaggregate statistics beyond published reporting levels.

3. Temporal Scope

The temporal scope includes: - Annual and multi-annual statistical series - Time series used for trend description and reporting - Reference periods defined by statistical authorities

SAL does not perform forecasting, extrapolation, or temporal smoothing.

4. Statistical and Methodological Boundaries

Statistical agriculture information within SAL may originate from: - Official surveys and administrative data - Harmonised statistical frameworks and classifications - Aggregated indicators defined by FAO or Eurostat

SAL does not assess data quality, sampling error, or methodological robustness.

5. Explicit Exclusions

The following are **explicitly outside scope**: - Predictive modelling or scenario analysis - Farm-level optimisation or recommendations - Policy impact assessment or evaluation - Economic forecasting - AI-driven inference or optimisation

SAL maintains a **strictly descriptive boundary** for statistical agriculture content.

6. Positioning Summary

Within SAL, statistical agriculture is positioned as: - Official reference statistics produced by public institutions - Contextual information for understanding agricultural systems - Complementary to environmental and EO datasets

This scope definition ensures suitability for EU reviewer and grant contexts.

Drought & Climate Indicators — Scope and Boundaries

Domain: Drought & Climate Indicators

Track: D — Knowledge Base Population

Status: ACTIVE (descriptive, reviewer-safe)

1. Thematic Scope

Within SAL, **drought and climate indicators** refer to descriptive indicators used to characterise climatic conditions, variability, and anomalies as documented by EU programmes and services.

This scope includes: - Climate-related indicators associated with drought conditions - Indicators derived from precipitation, temperature, soil moisture, and related variables - Descriptive indicators used for climate monitoring and reporting

Drought and climate indicators are treated as **environmental descriptors**, not as operational response or decision variables.

2. Spatial Scope

The spatial scope reflects the characteristics of referenced EU datasets: - Regional to continental coverage (Europe-focused products) - Global coverage for selected climate variables - Spatial resolution defined by underlying datasets and services

SAL does not downscale, harmonise, or infer local-scale impacts.

3. Temporal Scope

The temporal scope includes: - Historical and near-real-time climate records - Aggregated temporal indicators (e.g. monthly, seasonal, annual) - Long-term time series used for climate assessment

SAL does not perform forecasting, early-warning analysis, or trend attribution.

4. Indicator and Product Boundaries

Indicators within SAL may originate from: - Observational climate datasets - Derived indicators documented by Copernicus services - Aggregated climate indices used for reporting purposes

SAL does not assess indicator performance, thresholds, or uncertainty metrics.

5. Explicit Exclusions

The following are **explicitly outside scope**: - Drought early-warning or alert systems - Risk assessment or impact modelling - Sector-specific vulnerability analysis - Agricultural, economic, or policy recommendations - AI-driven inference or optimisation

SAL maintains a **strictly descriptive boundary** for drought and climate indicators.

6. Positioning Summary

Within SAL, drought and climate indicators are positioned as: - Descriptive measures of climatic conditions and variability - Components within EU climate monitoring frameworks - Contextual references for understanding datasets and services

This scope definition ensures suitability for EU reviewer and grant contexts.

Soil Moisture — Scope and Boundaries

Domain: Soil Moisture

Track: D — Knowledge Base Population

Status: ACTIVE (descriptive, reviewer-safe)

1. Thematic Scope

Within SAL, **soil moisture** refers to the quantitative description of the amount of water contained in soil layers, as observed or derived by Earth observation systems and referenced by EU programmes.

This scope includes: - Surface and near-surface soil moisture variables - Descriptive indicators derived from satellite observations - Contextual use within land, climate, and environmental monitoring

Soil moisture is treated as an **environmental descriptor**, not as a management or decision variable.

2. Spatial Scope

The spatial scope of soil moisture information within SAL reflects the characteristics of EU-referenced datasets:

- Continental to global coverage (satellite-based products)
- Regional and local coverage (in-situ measurements)
- Spatial resolution defined by sensor and product specifications

SAL does not harmonise or resample spatial resolutions and does not infer field-level conditions.

3. Temporal Scope

The temporal scope includes: - Regular observation cycles defined by satellite revisit periods - Aggregated temporal products (e.g. daily, dekadal, monthly), where documented by services - Long-term records used for climate and environmental context

SAL does not perform temporal interpolation, forecasting, or trend projection.

4. Measurement and Product Boundaries

Soil moisture information within SAL may originate from: - Passive microwave satellite observations (e.g. L-band) - Derived soil moisture products documented by ESA and Copernicus services - In-situ sensor measurements used as reference or validation data

SAL does not evaluate retrieval algorithms, uncertainty metrics, or model performance.

5. Explicit Exclusions

The following are **explicitly outside scope**: - Crop yield estimation - Irrigation scheduling or recommendations - Drought forecasting or early-warning systems - Agronomic, economic, or policy interpretation - AI-driven inference or optimisation

SAL maintains a **strictly descriptive boundary** for soil moisture content.

6. Positioning Summary

Within SAL, soil moisture is positioned as: - A measured or derived environmental variable - One component within broader land and climate monitoring frameworks - Input context for understanding datasets, not for decision-making

This scope definition ensures suitability for EU reviewer and grant contexts.

CLMS HR-VPP — Scope and Boundaries (knowledge note)

Scope

This note describes the thematic, spatial, and temporal scope of the Copernicus Land Monitoring Service (CLMS) High Resolution Vegetation Phenology and Productivity (HR-VPP) products, as defined in official CLMS documentation. It also records explicit boundaries and exclusions to prevent misinterpretation of product intent.

Thematic scope (what HR-VPP covers)

- Vegetation condition and status indicators derived from Sentinel-2 observations.
- Vegetation phenology timing parameters describing seasonal development patterns.

- Vegetation productivity-related parameters summarizing seasonal and annual dynamics.
- Parameters are defined and distributed as standardized HR-VPP products within CLMS.

Spatial scope

- Pan-European coverage as defined by the Copernicus Land Monitoring Service.
- High-resolution products provided at 10 m spatial resolution for the covered regions.

Temporal scope

- Time series derived from Sentinel-2 observations.
- Seasonal and annual products generated according to HR-VPP processing definitions.
- Temporal coverage and update cycles defined by CLMS operational schedules.

Explicit boundaries (what HR-VPP does not cover)

- Does not provide crop yield estimates or yield forecasts.
- Does not include economic, management, or policy impact assessments.
- Does not provide farm-level decision support or recommendations.
- Does not include modelling or predictive outputs beyond defined HR-VPP parameters.

Relation to other services

- HR-VPP products are one component within the broader Copernicus Land Monitoring Service.
- Other CLMS products may address land cover, land use, or different thematic domains.

Source citations

- SAL_KB/citations/CLMS_HR-VPP_dataset.md
- SAL_KB/citations/CLMS_HR-VPP_Product_User_Manual.md

Notes (governance)

- Scope and boundaries recorded as stated in official CLMS documentation.
- Descriptive clarification only; no interpretation or extension beyond cited sources.
- No application, performance, or AI-related framing.

Indicators and Measurement Types

Statistical Agriculture — Indicator Overview

Domain: Statistical Agriculture

Track: D — Knowledge Base Population

Status: ACTIVE (descriptive, reviewer-safe)

1. Conceptual Overview

Statistical agriculture indicators describe **aggregated characteristics of agricultural systems** as recorded by official statistical institutions. These indicators summarise structures, production levels, and inputs across defined reporting units and periods.

Within SAL, indicators are treated as **reported statistical descriptors**, not as analytical constructs or decision tools.

2. Structural Indicators

Structural indicators commonly documented by FAO and Eurostat include: - Number and size of agricultural holdings - Land-use categories and crop areas - Livestock populations by type - Farm structure classifications

These indicators describe **agricultural system composition**, not performance or efficiency.

3. Production Indicators

Production-related indicators typically include: - Crop production quantities and yields (aggregated) - Livestock production volumes - Harvested area statistics

Production indicators are reported according to official statistical definitions and reference periods.

4. Input and Resource Indicators

Statistical agriculture datasets may include indicators related to: - Fertiliser and input use - Labour and employment in agriculture - Machinery and capital stock (where documented)

These indicators are descriptive summaries of reported inputs.

5. Temporal and Spatial Aggregation

Statistical agriculture indicators are characterised by: - Annual or multi-annual reporting cycles - Aggregation at national or regional levels - Time series enabling trend description

SAL does not calculate trends or adjust indicators beyond reported values.

6. Methodological Notes (Descriptive)

FAO and Eurostat indicators are produced under: - Defined statistical methodologies - Harmonised classifications and codes - Legal and institutional reporting frameworks

SAL records the existence of these frameworks without evaluating methodology or data quality.

7. Positioning Summary

Within SAL, statistical agriculture indicators are positioned as: - Official, aggregated statistical descriptors - Reference information for agricultural system context - Complementary to environmental and Earth observation indicators

No modelling, forecasting, benchmarking, or policy interpretation is implied.

Drought & Climate Indicators — Indicator Overview

Domain: Drought & Climate Indicators

Track: D — Knowledge Base Population

Status: ACTIVE (descriptive, reviewer-safe)

1. Conceptual Overview

Drought and climate indicators describe **climatic conditions, variability, and anomalies** as documented by EU programmes and services. These indicators are used to characterise climate state and context over time, rather than to predict impacts or prescribe responses.

Within SAL, indicators are recorded as **documented descriptors**, not as evaluative or operational tools.

2. Climate Variable–Based Indicators

Many drought and climate indicators are derived from core climate variables, including: - Precipitation - Air temperature - Evapotranspiration - Soil moisture

These variables are documented individually or in combination within Copernicus and EEA reporting frameworks.

3. Drought-Related Indicator Classes

EU services commonly reference several classes of drought-related indicators, such as: - Meteorological drought indicators (precipitation-based) - Agricultural drought indicators (soil moisture–related) - Hydrological drought indicators (runoff or water balance context)

SAL records these classes **as documented**, without defining thresholds or severity levels.

4. Temporal Aggregation and Indices

Drought and climate indicators may be presented as: - Monthly, seasonal, or annual aggregates - Anomaly-based indicators relative to reference periods - Indices derived for reporting and comparison purposes

SAL does not calculate or normalise indicators and does not define reference baselines.

5. Use in EU Monitoring Context

Within EU monitoring systems, drought and climate indicators are used for: - Climate assessment and reporting - Environmental monitoring context - Policy-relevant climate information

They are not presented as early-warning alerts or decision triggers at this level.

6. Measurement Characteristics and Constraints

Commonly documented characteristics include: - Dependence on data availability and temporal coverage - Sensitivity to reference period selection - Variability across regions and timescales

SAL records these characteristics descriptively, without assessment or comparison.

7. Positioning Summary

Within SAL, drought and climate indicators are positioned as: - Descriptive measures of climate conditions and variability - Components within Copernicus and EEA climate frameworks - Contextual references supporting understanding of datasets and services

No forecasting, risk scoring, or policy interpretation is implied.

Soil Moisture — Indicators and Measurement Types

Domain: Soil Moisture

Track: D — Knowledge Base Population

Status: ACTIVE (descriptive, reviewer-safe)

1. Conceptual Overview

Soil moisture describes the **quantity of water contained within soil layers** and is commonly expressed as a volumetric or relative measure. Within EU Earth observation contexts, soil moisture is treated as a **physical state variable** observed or derived from measurements, not as a proxy for agronomic performance.

Indicators documented by EU programmes focus on **what is observed or estimated**, not on interpretation or application.

2. Surface vs. Root-Zone Soil Moisture

Surface Soil Moisture

- Represents moisture content in the upper soil layer
- Directly observable by microwave satellite sensors
- Sensitive to short-term meteorological conditions

Root-Zone Soil Moisture

- Represents moisture conditions in deeper soil layers

- Typically derived from models or indices using surface observations as inputs
- Documented as a derived descriptor in some Copernicus products

SAL records these distinctions descriptively without evaluating derivation methods.

3. Satellite-Based Measurement Types

Passive Microwave Observations

- Use natural microwave emissions from the Earth's surface
- Commonly operate in the L-band frequency range
- Provide sensitivity to near-surface soil moisture
- Used by missions such as SMOS

These measurements prioritise **temporal consistency and spatial coverage** over fine spatial resolution.

4. Derived Soil Moisture Indicators

EU services document several derived soil moisture-related descriptors, including:
- Surface soil moisture estimates - Normalised or scaled soil moisture indices - Soil Water Index concepts (as described in service documentation)

These indicators are presented as **product outputs**, not as evaluative metrics.

5. In-situ Measurement Types

In-situ soil moisture measurements typically involve: - Fixed or mobile soil moisture sensors - Measurements at specific depths - High temporal resolution at point locations

In-situ data is used primarily for **reference, calibration, and validation**, and is not spatially continuous.

6. Measurement Characteristics and Constraints

Commonly documented characteristics include: - Dependence on soil texture and surface conditions - Sensitivity to vegetation cover in satellite observations - Differences in scale between satellite and in-situ measurements

SAL records these characteristics descriptively, without assessing uncertainty or performance.

7. Positioning Summary

Within SAL, soil moisture indicators are positioned as: - Observed or derived descriptors of soil water content - Components within broader land, hydrological, and climate datasets - Contextual variables supporting environmental monitoring

No agronomic, economic, or policy interpretation is implied.

CLMS HR-VPP — Phenology and Productivity Parameters (knowledge note)

Scope

This note describes phenology and productivity parameters defined within the Copernicus Land Monitoring Service (CLMS) High Resolution Vegetation Phenology and Productivity (HR-VPP) product family. The content reflects parameter definitions and categories as stated in official CLMS technical documentation.

Phenology parameters (as defined by CLMS HR-VPP)

- **Start of Season (SoS)**
 - Parameter describing the onset timing of vegetation activity within a seasonal cycle.
- **End of Season (EoS)**
 - Parameter describing the termination timing of vegetation activity within a seasonal cycle.
- **Length of Season (LoS)**
 - Parameter representing the duration between defined season start and end points.
- **Peak of Season (PoS)**
 - Parameter indicating the timing of maximum vegetation development within a season.

Productivity-related parameters (as defined by CLMS HR-VPP)

- **Seasonal integral of vegetation indices**
 - Parameters derived from time-series integration of vegetation index values over a season.
- **Maximum vegetation index value**

- Parameter representing the peak magnitude of vegetation index values during a season.
- **Productivity summary parameters**
 - Set of annual or seasonal descriptors characterizing vegetation productivity, as defined in CLMS documentation.

Source citations

- SAL_KB/citations/CLMS_HR-VPP_dataset.md
- SAL_KB/citations/CLMS_HR-VPP_Product_User_Manual.md

Notes (governance)

- Knowledge note derived exclusively from cited CLMS sources.
- Descriptive parameter definitions only; no interpretation or performance claims.
- No modelling, AI, or application-level framing.

Contextual Reference Notes (Meta-Notes)

Classes of Indicators Used in EU Agricultural Monitoring

Type: Track D — Meta-Note

Scope: Cross-cluster (HR-VPP, Soil Moisture, Drought & Climate, Statistical Agriculture)

Status: ACTIVE (descriptive, reviewer-safe)

1. Purpose of This Meta-Note

This meta-note provides a **descriptive classification** of indicator classes used in EU agricultural monitoring, as referenced across Copernicus services, statistical systems, and environmental reporting frameworks.

It does not introduce new indicators, thresholds, or interpretations.

Its role is to **organise and contextualise** indicator types already documented in SAL Track D clusters.

2. Earth Observation–Derived Indicators

2.1 Vegetation Indicators

Examples include: - Vegetation indices - Phenology and productivity descriptors
- Canopy and biomass-related indicators

These indicators are derived from satellite observations and are used to describe vegetation condition and dynamics.

2.2 Soil and Land Surface Indicators

Examples include: - Surface and root-zone soil moisture descriptors - Land surface condition indicators - Soil water–related indices

These indicators characterise physical land surface properties as observed or derived from EO data.

2.3 Climate and Weather-Related Indicators

Examples include: - Precipitation and temperature-based indicators - Drought and anomaly indicators - Climate variability descriptors

These indicators are used to describe climatic context and conditions relevant to agriculture.

3. Statistical Agriculture Indicators

3.1 Structural Indicators

Examples include: - Farm structure and size classes - Land-use and crop area statistics - Livestock population counts

These indicators describe the structural composition of agricultural systems.

3.2 Production Indicators

Examples include: - Crop and livestock production quantities - Harvested area statistics - Yield figures reported at aggregated levels

These indicators summarise reported agricultural outputs.

3.3 Input and Resource Indicators

Examples include: - Labour and employment in agriculture - Input use statistics (e.g. fertilisers) - Machinery and capital stock indicators

These indicators describe reported resource use within agriculture.

4. Environmental and Contextual Indicators

Environmental indicators referenced alongside agricultural monitoring may include: - Land condition and degradation indicators - Water availability and hydrological context indicators - Climate-related environmental descriptors

These indicators provide **context**, not direct measures of agricultural performance.

5. Cross-Indicator Relationships (Descriptive)

Within EU monitoring frameworks: - EO-derived indicators and statistical indicators coexist - Indicators are linked conceptually, not operationally - Different indicator classes serve different monitoring purposes

SAL records these relationships **descriptively**, without integration or synthesis.

6. Explicit Exclusions

This meta-note does **not** include: - Indicator ranking or prioritisation - Thresholds, benchmarks, or scoring - Impact assessment or causal inference - Decision-support or optimisation logic - AI-driven analysis

7. Positioning Summary

Within SAL, indicator classes are positioned as: - Organised categories of documented indicators - Reference structures for understanding EU monitoring systems - A descriptive bridge between different Track D clusters

This meta-note is suitable for EU reviewer and grant contexts.

Types of Datasets vs. Types of Copernicus Services

Type: Track D — Meta-Note

Scope: Cross-cluster (HR-VPP, Soil Moisture, Drought & Climate, Statistical Agriculture)

Status: ACTIVE (descriptive, reviewer-safe)

1. Purpose of This Meta-Note

This meta-note provides a **descriptive distinction** between different **types of datasets** used in EU agricultural monitoring and the **types of Copernicus services** through which these datasets are provided or referenced.

It does not evaluate services, compare performance, or prescribe usage.

Its purpose is to **clarify roles and relationships** within the EU Earth observation ecosystem.

2. Types of Datasets

2.1 Earth Observation–Derived Datasets

These datasets originate from satellite missions and include: - Raw or calibrated sensor measurements - Derived biophysical variables - Aggregated EO indicators

They are characterised by systematic spatial coverage and defined observation cycles.

2.2 Environmental and Climate Datasets

These datasets include: - Climate variables and indicators - Environmental condition descriptors - Long-term climate data records

They may be observational, reanalysis-based, or aggregated for reporting.

2.3 Statistical Datasets

These datasets are produced by statistical institutions and include: - Agricultural production and structure statistics - Land use and livestock data - Input and resource use statistics

They are typically aggregated by reporting units and periods.

2.4 Reference and In-situ Datasets

These datasets include: - Ground-based measurements - Validation and calibration data - Reference networks and surveys

They provide point-based or local observations complementary to EO data.

3. Types of Copernicus Services

3.1 Copernicus Land Monitoring Service (CLMS)

Provides land surface-related datasets, including: - Vegetation and land cover indicators - Land surface condition descriptors - Contextual environmental information

CLMS focuses on land-related variables and indicators.

3.2 Copernicus Climate Change Service (C3S)

Provides climate-related datasets, including: - Climate variables and indicators - Climate data records and reanalysis products - Aggregated climate indicators for reporting

C3S focuses on climate consistency and long-term records.

3.3 Other Copernicus Services (Contextual)

Other services (e.g. Atmosphere, Marine) may provide datasets that are: - Indirectly relevant to agriculture - Used for environmental or climatic context

Their datasets are referenced where relevant but not integrated.

4. Relationship Between Datasets and Services

Within the EU monitoring framework: - Services act as **providers and curators** of datasets - Datasets may originate from missions, models, or statistics - Multiple dataset types may coexist within a single service

SAL records these relationships **descriptively**, without integration or synthesis.

5. Explicit Exclusions

This meta-note does **not** include: - Service comparison or ranking - Recommendations on dataset selection - Data fusion or harmonisation guidance - Performance evaluation or benchmarking - AI-driven analysis or optimisation

6. Positioning Summary

Within SAL, datasets and services are positioned as: - Distinct but related components of EU monitoring systems - Complementary layers of information - Reference structures for understanding data provenance and roles

This meta-note is suitable for EU reviewer and grant contexts.