Annex 1: Requirements and Specifications

Content

By submitting a tender, you, as Tenderer, explicitly agree to all requirements and conditions specified in this document and declare that you will continue to comply with them throughout the entirety of the contract period. You also confirm that you will comply with all of the specified prices and rates, including any agreed indexation. Failure to comply with one or more requirements will disqualify your tender from the assessment process and therefore exclude it from the tendering process.

The purpose of the Area Monitoring System (AMS) is to exploit the time series of Sentinel data or other satellite imagery in order to continuously monitor all the FOIs associated with agricultural parcels within the LPIS and the GSAA that relate to CAP area-based schemes. The system will be required to generate information enabling NEA to confirm or reject area-based eligibility conditions. This information will be communicated to the scheme applicants by NEA near real time, so that they can be amended by the applicant, if required. The communication will be facilitated through the RVO.nl platform hosted and provided by NEA.

The tender should contain a proposal for supplying, implementing and supporting the AMS solution. The AMS solution must be highly automated and able to handle the large volume of data. The Tenderer is required to provide an AMS solution that addresses all of NEA's key requirements. The AMS proposal should define in detail all components that will be used in the solution and its architecture.

The successful vendor must be able to demonstrate ongoing historical improvements and developments in line with broader developments and technology advancements in the area. The proposed solution should also define the support requirements and timeframe for implementing such a plan.

We have split the key requirements into a number of parts. First, there is a general introduction. This is followed by a part dealing with requirements for the infrastructure, data processing and data

exchange (chapter 1). The third part of this document will go into more detail about the actual monitoring task (chapter 2), and the final part will discuss requirements for process control and management (chapter 3), prices, taxes, invoicing and social return will be discussed in chapter 4.

General introduction

The new Common Agricultural Policy (CAP2023), which will come into force in January 2023, requires all Member States of the European Union (EU) to integrate satellite monitoring into their Integrated Administration and Control System (IACS). The AMS signifies a paradigm shift in agricultural control as it will become mandatory to have in place land cover AMS using at least satellite data. The AMS is a procedure for systematically gathering and analysing data on activities and practices on agricultural parcels. The results are used to assess whether or not the eligibility criteria for one or more EU interventions have been met. Furthermore, a key element of the AMS is that the beneficiary must be able to respond to the monitoring results. This also means that the results will be presented by NEA to the beneficiary.

The AMS must be capable of reporting the basic income support for sustainability (BISS) results by 2023 and fully functional for all monitorable area-based interventions by 2024. These include but are not limited to the ECO scheme, the AECM and the Conditionalities. In 2025 the European Commission (EC) expects additional data (such as geotagged photos and GPS tracks) to supplement satellite data and ensure that the impact targets for all area-based interventions are met. More information about the CAP reforms can be found at https://marswiki.jrc.ec.europa.eu. It is important to note that in the AMS context we are mainly looking for a contractor to support us with the technical aspects of monitoring and the delivery of monitoring results (e.g. markers, signals and processed images). The impact on the subsidy application and the communication with the beneficiaries will fall under NEA's responsibility and does not come within the scope of this tender. Nor does generating a traffic light system come within the scope of this tender.

The main aim of the AMS is to reduce the control burden for the Member States and use warning alerts for the beneficiaries in order to minimise any non-compliance with their applied schemes. The European Commission (EC) has introduced various concepts defining the process of transforming raw satellite data into data capable of being used for decisions on eligibility, as described in the Regulations: Regulation (EU) 2022/1173 and Regulation (EU) 2022/1172. The regulations define a system based on data from ESA's Sentinel satellites; however, we also envisage using data from other sources (including Landsat, PlanetFusion and data provided by the NSO through https://www.satellietdataportaal.nl/). As regards commercial satellite data, the supplier is expected to purchase such data on behalf of NEA.

The regulations include a model of how to handle data from different sources and relate them to the agricultural parcels within the framework of a traffic light system. NEA takes this document as its basis for implementing the Dutch AMS from 2023 and onwards. NEA has formulated the fundamental monitoring tasks described in chapter 2, which must be operational from 2023 and developed continuously thereafter. It is therefore important for the contractor to be capable of working with NEA to adjust the defined tasks and accommodate changes in the years ahead. Please note that NEA will continuously consolidate the adjustments and methodological improvements, thereby building up in-house knowledge and experience.

NEA is required to carry out an annual Quality Assurance (QA) of the AMS in order to evaluate the setup and ensure that the data used for reporting the output and performance indicators in the Annual Performance Report (APR) are correct. The QA is based on a population of cases selected by the European Commission and carried out by NEA itself. The QA must cover all eligibility criteria (monitorable and non-monitorable) for the area-based interventions. The QA is conducted on the basis of high-resolution satellite data and must identify error rates at intervention level.

If significant discrepancies are found between the QA and the monitoring results, the European Commission will request an action plan to improve the setup: deviations detected in the QA and insufficient quality of the AMS may mean that it is necessary to adapt the AMS to improve the detection of activities, i.e. to develop better marker algorithms. However, deviations can also have other causes (e.g. errors in the Geo Spatial Application (GSA) or errors in the land parcel identification system (LPIS)). In the event of insufficient quality, it will always be necessary to draw up a remedial action plan. Any failure to improve the quality of the AMS may mean that payments cannot be

financed with EU funding. We therefore expect the Contractor to play an active role in improving the quality of the monitoring results, for example by making specific suggestions for improvements both during the season and at the end of the season in preparation for the next season.

1. Requirements relating to infrastructure, data processing and data exchange

The following sections provide a detailed overview of the more technical issues in relation to the Dutch AMS. This part covers requirements relating to architecture, data exchange and data processing.

1.1 Requirements relating to input data

This section describes the input data used by the AMS.

- The monitoring tasks must be based on freely available satellite data as well as commercial data. The tasks must at least be based on data from ESA's satellites Sentinel-1 and Sentinel-2, NASA/USGS's Landsat 8 and 9, PlanetFusion and data provided by the Netherlands Space Office (NSO) through https://www.satellietdataportaal.nl/. The data for all tasks must be collected and analysed up until 24 hours before each delivery deadline.
- We also ask the Contractor to actively monitor the processing of all input data, for example by taking into account the data footprint and coverage frequency and comparing this with the processed images.
- The Contractor may also be asked by NEA to work with commercial satellite data, e.g. PlanetFusion, and very high-resolution aerial photography. Please bear in mind that the use of PlanetFusion data should be part of the proposal and that we have budgeted for the purchase of these data.
- Dutch beneficiaries apply for EU support by drawing their parcel polygons together with parcel data (e.g. main crop type) in a web-based GIS system called GO (*Gecombineerde Opgave*). In IACS terms this is the same as the Geo Spatial Aid Application (GSAA). The polygons include parcel information and constitute the initial parcel layer (referred to below as declaration data). These must be used as the basis for all monitoring tasks.
- The Contractor must perform a critical assessment of the data before analysis and, if the quality is worse than expected, inform NEA about this immediately. This has to be done within one working day after the discovery.

1.2 Requirements relating to data processing

- All satellite data used in the monitoring tasks must be pre-processed before analysis using the methods most suited to Dutch conditions. All pre-processing for optical and radar data must be justified and described comprehensively in the tender and in reports during the contract period.
- Optical data must be corrected for atmospheric, radiometric and geometric errors as well as orthorectified and checked for cloud and cloud shadow masking. Given the Dutch weather conditions, an efficient system of detecting cloud and cloud shadow masking is very important.
- Processed imagery is expected to be delivered continuously, within 48 hours of acquisition. The processing steps mentioned above (including masking) are an integral part of these deliveries.
- The Contractor must use spatially aligned and cross-sensor calibrated data, and indices must be optimised for Dutch conditions. Required projection: UTM31N.
- Radar data must be multilooked, and noise and thermally calibrated as well as speckle-filtered. The data used must also be terrain corrected and orthorectified. Proper account must be taken of weather disturbance to radar when analysing the data.
- The pre-processing steps described above do not necessarily constitute all the requirements needed to achieve a sufficient analysis quality. The Tenderer is therefore obliged to employ a pre-processing method that ensures quality at least equal to the generic analysis-ready products available from ESA or NASA/USGS.
- Quality control of all input data is an essential part of this task.
- The Contractor must keep track of the satellite data provider (i.e. ESA, NASA) to monitor changes and data unavailability that may affect the monitoring tasks. If unforeseen changes occur, the Contractor must inform NEA immediately, i.e. within two working days.
- Furthermore, the Contractor must have in place a robust system for coping with changes in data formats and availability. It must therefore describe a procedure for ensuring adequate

supervision of data input and a fast problem-solving system for minimising any impact on the monitoring tasks. Examples of the type of changes that took place in the last period can be found on the following webpage: https://sentinels.copernicus.eu/web/sentinel/-/copernicus-sentinel-2-major-products-upgrade-upcoming.

1.3 Requirements relating to data access and storage

- All processed images must be made available as a web service (WM(T)S) and as COG (Cloud Optimised GeoTIFFs).
- All data must be stored in the EU.
- At the end of each month a report must be created listing all processed images. The list must be based on the footprints and expected dates (frequency) compared with the actual processed data. This has to be delivered in an Excel file. This document has to be shared via sFTP site.
- To ensure transparency and traceability of the satellite analysis results and the future development of the AMS, the Contractor must provide access to all pre-processed data and extracted information used in the monitoring tasks throughout the contract period.
- The Tenderer must propose a setup that ensures that NEA can gain easy access to data and that supports easy handling of the data for the purposes of ad hoc analysis and possible QA (Quality Assurance). In this case, 'easy' means being available through web services such as APIs and OGC-compliant web services.
- As regards the APIs and analytics platform, NEA would like to see at least the following functions and methods supported:
    - Spatial modelling
        - Spatially enabled data frames – spatial overlays, joins, tessellations, merging layers, data extractions
        - Analysing patterns – density, outliers, interpolation, clusters
        - Prediction – regression, random forests
        - Summarisation – describe data, aggregations, summarise nearby and within
    - Imagery analysis
        - Data management – raster collections, raster stats
        - Information extraction – raster functions, raster algebra
        - Ortho mapping – generate mosaics
    - Spatial machine learning
        - Imagery – classification, segmentation
        - Deep learning – detecting objects, classifying pixels, classifying object, instance segmentation, NLP, managing models
    - Visualisation
        - Mapping – map widget
        - Renderers – Matplotlib style renders
- Results should be either downloadable directly to the personal environment of the user or made available through SFTP. Here we make a distinction between the running of regular processes and ad hoc requests initiated through the web-based GUI (see below). The regular process should generate results which will be uploaded to the SFTP environment. Data generated by ad hoc requests generated through the web-based GUI should be downloadable to the user's personal environment.
- All functionality must be well documented and preferably contain examples. NEA requires a minimum of 5 notebook examples illustrating the functionality of the analytics platform. The content of these examples will be discussed with the Contractor.
- The Contractor is required to provide consulting on how to best implement a solution that enables NEA to access data for analysis and development purposes. Given the current restrictions posed by NEA's own IT infrastructure, a web-based analysis platform is required. The diagram below shows a possible setup for the analysis platform. The diagram is based on the current setup of Sentinel Hub, but another solution is of course also possible.
- The costs of hosting the AMS Cloud environment should also include the running of production approved markers and data transfer.

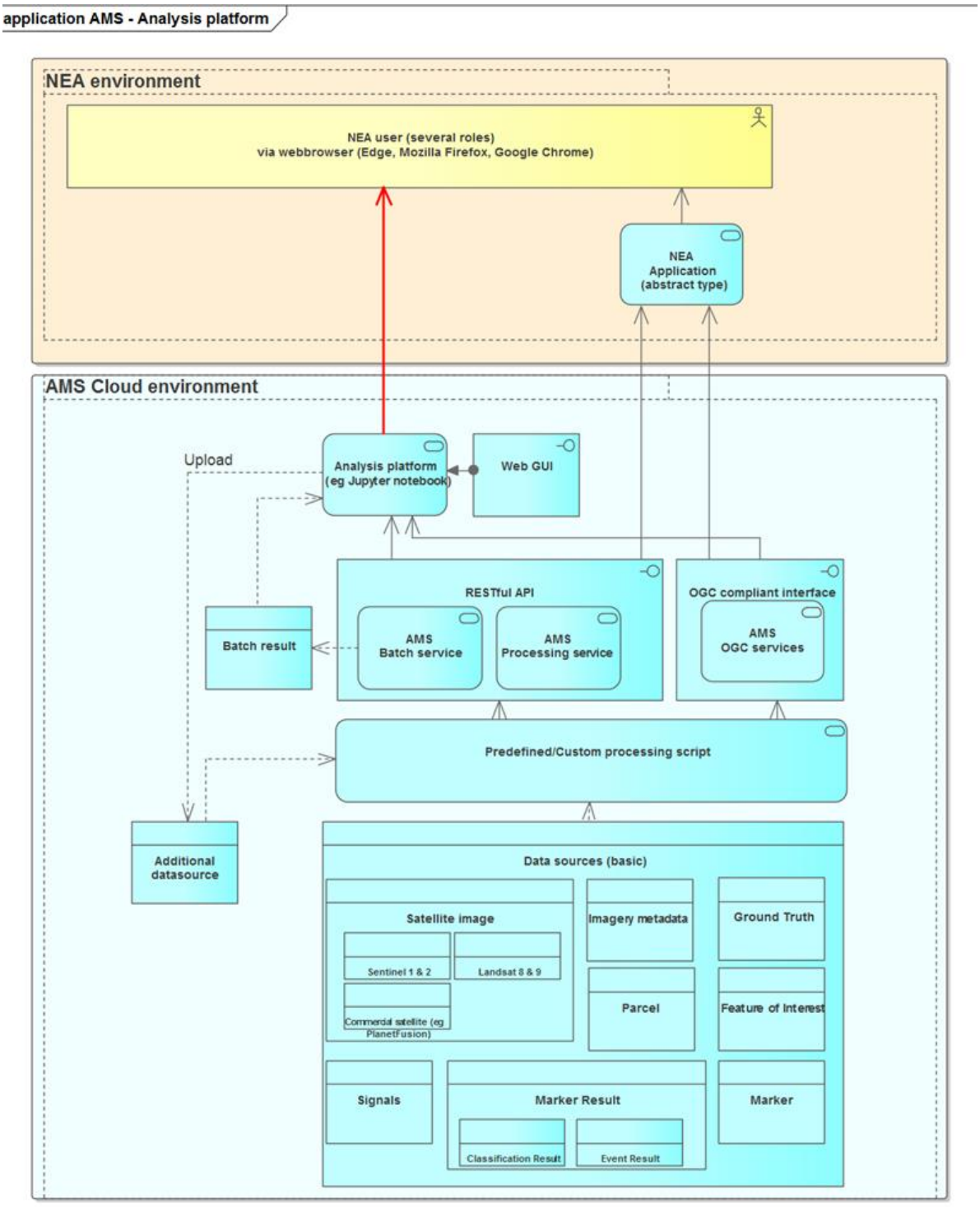


Figure 1 – Services and data abstraction diagram.

1.4 Requirements relating to the delivery of results

- As all operational tasks have to be coordinated with NEA's fixed annual workflow, timely delivery of the monitoring tasks is essential. Each year, the Contractor and NEA must agree on a fixed delivery plan that specifies the exact dates for all tasks and the scope of all deliverables.
- The results of the monitoring tasks must be delivered in GPKG or Shapefile and CSV formats with predefined structures. All deliveries must use the file description described in Annex A. All the datasets are visualised in the diagram below.

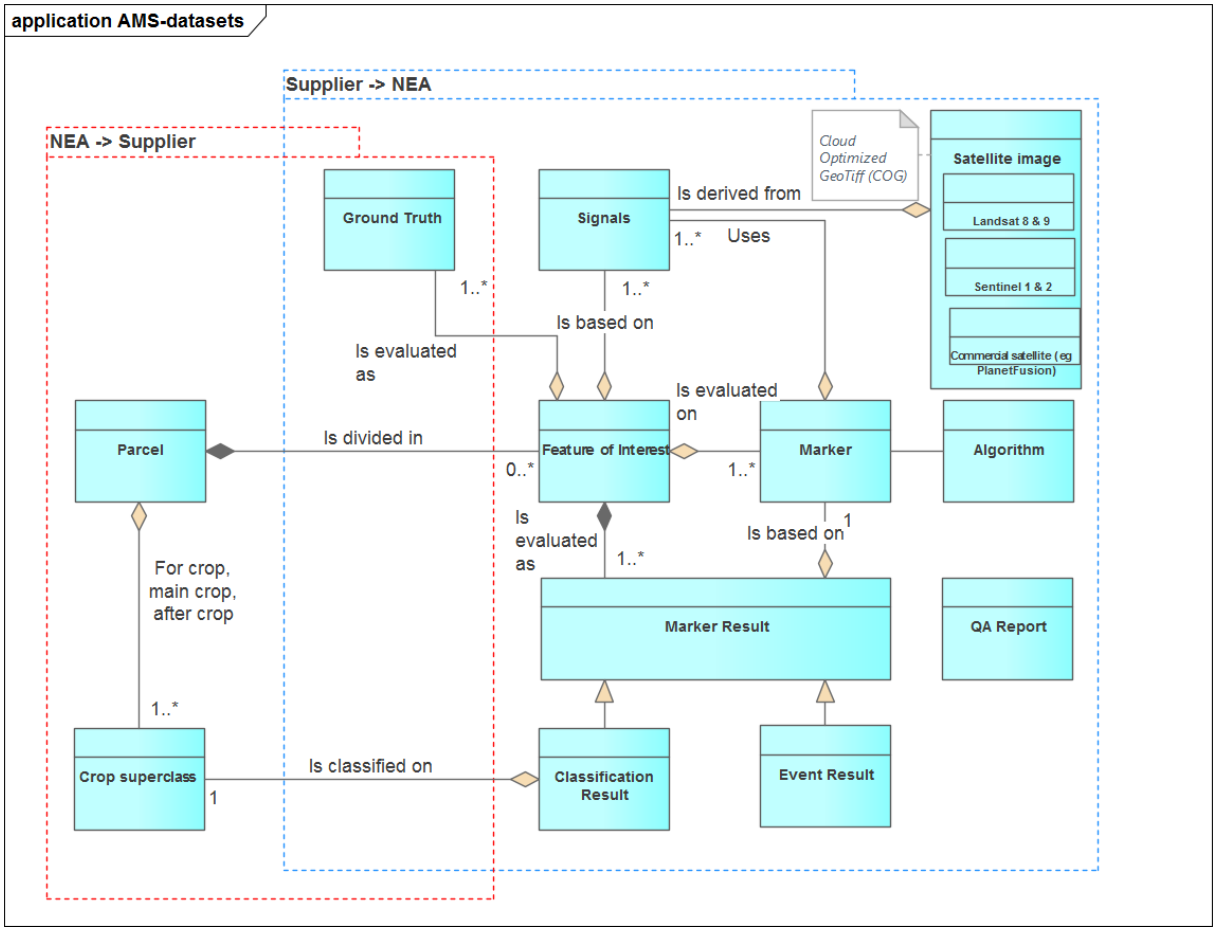


Figure 2 – Visualisation of the different datasets

- The delivery of results must be easy and secure. NEA will provide an SFTP site for the exchange of production-related monitoring results.
- With regard to the COGs, we will expect 4 COGs for each image:
  - Fully processed optical image, raw band values (ARD)
  - Fully processed optical image, 3 bands stretched True Colour
  - Fully processed optical image, 3 bands stretched False Colour
  - Corresponding mask, 1 band in 4 categories: clear, haze, cloud, shadow.

All products should be delivered with acquisition and processing meta data and footprint vector. All data should also be made available using APIs and OGC-compliant web services (e.g. WM(T)S and WFS).

1.5 Requirements relating to the technical infrastructure

The technical infrastructure plays an important part in the AMS. The Contractor is required to set up a cloud-based infrastructure which is scalable and accessible to NEA. Given the limitations posed by NEA's own infrastructure, the Contractor's environment setup has to be accessible via web-based interfaces.

- The Contractor is required to set up three different environments:
  - Production – this environment will be used to run production-approved procedures and markers.
  - Development – this environment will be used to create and develop new procedures and markers, mainly by the Contractor.
  - Test – the test environment will be mainly used for data analysis tasks. But we also anticipate that we will develop new markers or ask specialists to develop new procedures and markers. Based on the outcome of these tests, we will ask the Tenderer to add these new products to the production environment.
- The technical infrastructure should provide for the following processes:
  - Image collecting and processing

    - Signal and indices processing
    - Marker processing
    - Web-based user interface for running markers
    - Data exchange (both web services and files)
    - Analytics platform
    - Web interface to run markers
    - Web interface for user management and functional management (configuration).
- We expect the Contractor to run the markers for all production-related activities and upload the results to the SFTP environment. However, as already mentioned, we also expect the Tenderer to provide a web-based user interface which will allow NEA to run specific markers on an ad hoc basis. NEA has to be able to indicate the period, type of marker and FOI (Area or Feature of Interest) and upload a dataset containing parcels. This should be similar to the interface provided by Sen4CAP (see also esa-sen4cap.org).

1.6 Requirements relating to the architecture

Based on the previous sections, we expect a setup similar to the one presented in the diagram below (see figure 3). The diagram shows the different components mentioned in the previous sections. A full description of the different components can be found in Annex B to this document.

It is important to note that we distinguish between three different environments: a production environment, a development environment and a test environment. Some of the main characteristics and differences are described below.

Production environment:	The production environment is dedicated to all production-related activities. That means that NEA has no direct access to this environment other than through the web-based GUI used for running markers on an ad hoc basis.
Development environment:	The development environment is solely accessible to the contractor for the purpose of developing new features, functionality and markers.
Test environment:	The test environment is accessible to both NEA and the contractor. What separates this environment from the other two is that the analysis platform forms part of it. It is important that a copy of the data sent from the production environment to the test environment is made on a regular basis.

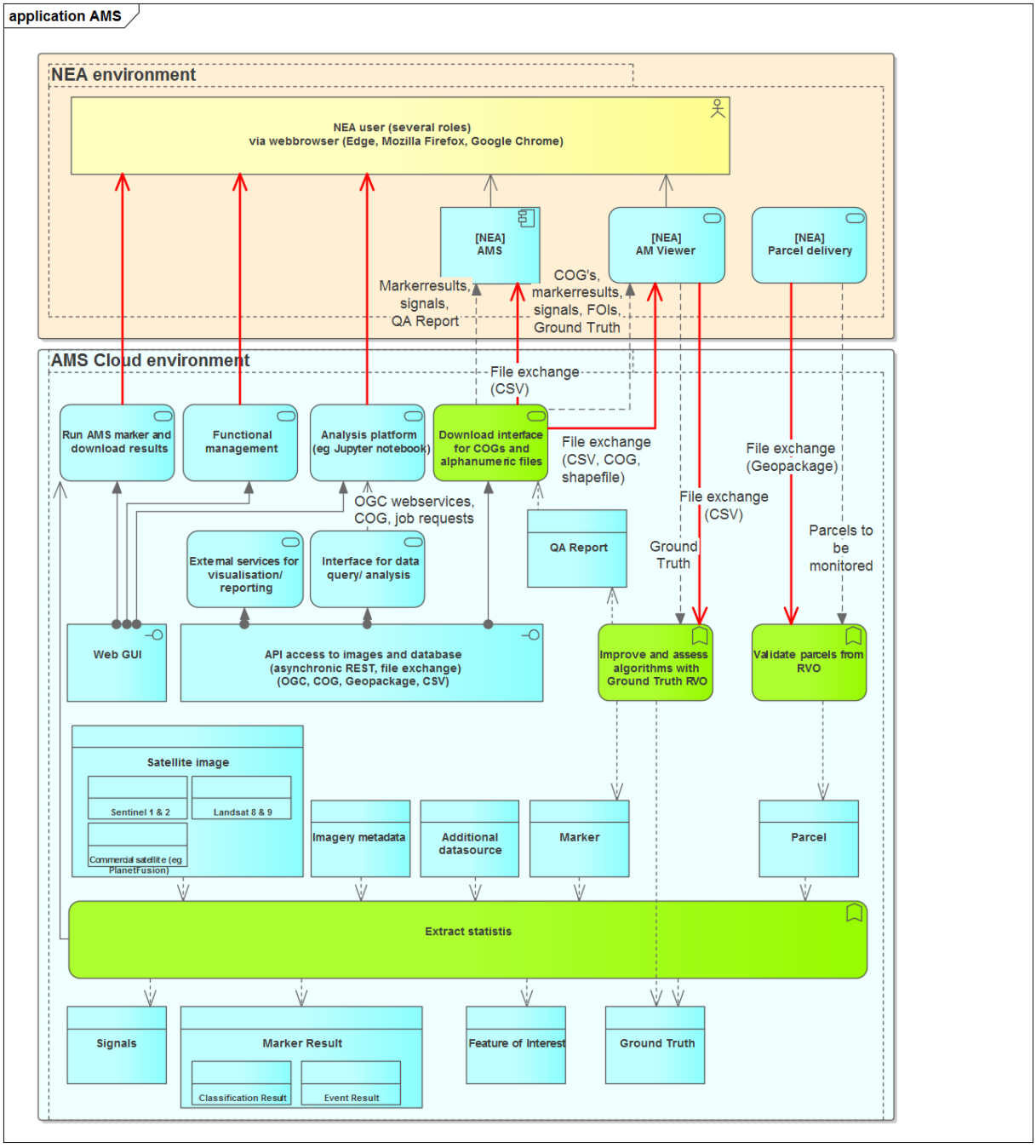


Figure 3 – Generic architecture of the AMS

1.7 Requirements relating to security

Although the data which will be provided to the contractor and used by the provider are mainly open data, we do impose a number of requirements regarding the security of the cloud-based infrastructure. The most important elements are depicted in the diagram below. It is crucial that only authorised NEA personnel have access to the cloud environment.

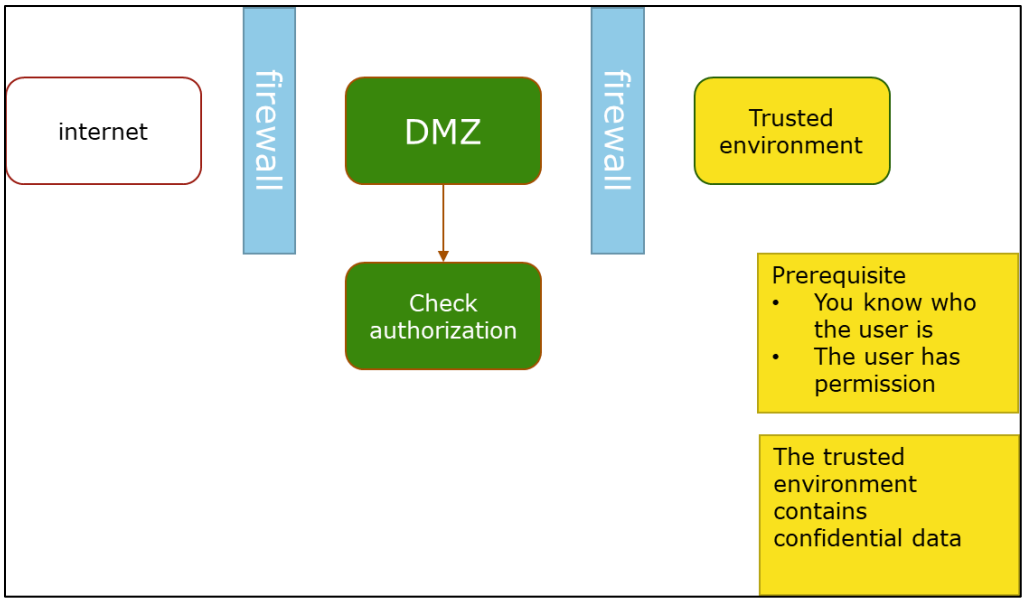


Figure 4 – Security setup of the cloud environment.

1.8 Requirements relating to the transfer of the AMS environment

NEA attaches great importance to continuity. Once the contract ends, a new contractor may win the tender for the AMS. In the past, the transfer of developed software and tooling sometimes proved to be cumbersome or very difficult. We therefore request the Tenderer to deal with this issue in the proposal and come up with suggestions as to how the transfer can be facilitated even during the project period. Another important aspect is that we require the contractor to work on an open-source basis.

2. Monitoring tasks

This part of the tender documentation discusses the different markers we intend to use for the AMS.

2.1 Requirements relating to task specification

The following sections describe the fundamental monitoring tasks that must be performed in order to implement the AMS in the Netherlands. The tasks are divided into categories of operational task, namely tasks that must be delivered continuously within a specified time in the Dutch monitoring period and development tasks – i.e. those that are for research and development purposes and are not yet bound by the constraints of the operational workflow in NEA's monitoring setup.

Not all specific development tasks have yet been defined. However, we do have some ideas about the markers we would like to see developed. NEA expects that certain tasks will need to be developed in the coming years and will discuss them with the Contractor at a later stage of implementation. The tasks mentioned below are tasks which the Contractor should already have developed. Naturally, we understand that most of them will have to be calibrated and adjusted specifically to Dutch agricultural conditions.

All tasks are defined as either **classification** or **event** tasks. A classification task is a remote sensing analysis that aims to classify or detect a land cover, e.g. the classification of crop types or the detection of specific catch crops. An event task is a remote sensing analysis task that aims to detect a temporal land use change, e.g. the detection of a harvesting or ploughing event.

Before going into more detail about specific classification or event tasks, we will first list a number of general requirements. For a general overview of the concept of markers, see Annex C.

- The Contractor must be able to handle a dynamic parcel layer in terms of newly defined parcel boundaries (e.g. from the invalid parcel detection task) or relevance in terms of different markers/classifications.
- The beneficiary has the opportunity to respond to AMS results, i.e. by redrawing its parcel, submitting geotagged photo documentation or changing certain attributes such as the crop code. Changing the parcel data will be done with the existing tooling and interfaces used by NEA to communicate with the beneficiary (e.g. the geospatial aid application). The Contractor has to be able to work with mutations in parcel data.
- New or changed parcels can emerge when the hearing period for the individual tasks ends. This means that NEA can ask for new pixel statistics or reactivation of a classification and marker task for the parcel.
- A geotagged photo can also reject a satellite result, e.g. classified crop, which can mean that monitoring scenario (expected activity markers / allowed activity) of the parcel in question changes. This will be used as input to improve the quality of the algorithms used. If the area or crop changes, this will lead to a new delivery of parcels.
- Furthermore, the increased focus on crop rotation and cultivation practices from year to year in the new CAP2023 means that there will be a need to monitor overlapping areas from one year to the next (for example, catch crops which sometimes need to be monitored from October in year n until April in year n + 1) .
- The terms for calculating new pixel statistics or reactivating a classification and marker task for the parcel will be agreed at the beginning of each contract year. As all operational tasks have to be coordinated with NEA's fixed annual workflow, timely delivery of the monitoring tasks is essential.
- A simplified diagram of the operational tasks and their dependencies is presented along with a preliminary timeframe in Annex D.
- The exact dates for the operational tasks and the scope of their delivery will be agreed at the beginning of each contract year. The first deliverable list and payment plan must be agreed before the 1st of June 2023. The exact date in 2023 will depend on the finalisation of the tender procedure. In subsequent years, 1 January will be considered as the final deadline.
- The deliverable list and payment plans may need to be continuously updated in accordance with any potential task agreed upon later during the contract period.
- If NEA cannot approve the deliverables for any given task, the contractor must make the necessary changes and redeliver within an agreed timeframe without extra payment. NEA reserves the right to reject a deliverable if it does not meet the quality requirements described in the tender or given in the AMS rules.
- If the results do not comply with the quality criteria (i.e. the thresholds mentioned for each marker), we expect a written statement detailing the reasons why the thresholds are not met as well as a plan of action on how to improve the quality.

2.1.1 Test delivery

The overall aim of the test deliveries is to ensure that the Contractor is capable of delivering all monitoring results in line with the technical requirements. NEA has developed a special format for all deliveries to which the Contractor needs to adhere (see also Annex A).

- Prior to the first operational deliveries of the monitoring tasks in June 2023, the Contractor must make test deliveries for all tasks based on monitoring data from 2022 or 2023, depending on the exact start of the contract.
- The Contractor is fully responsible for developing reliable solutions for all monitoring tasks from the start of the contract period in April 2023. The Contractor must generate test files for all tasks as soon as possible in 2023. A preliminary timetable is presented in Annex D.

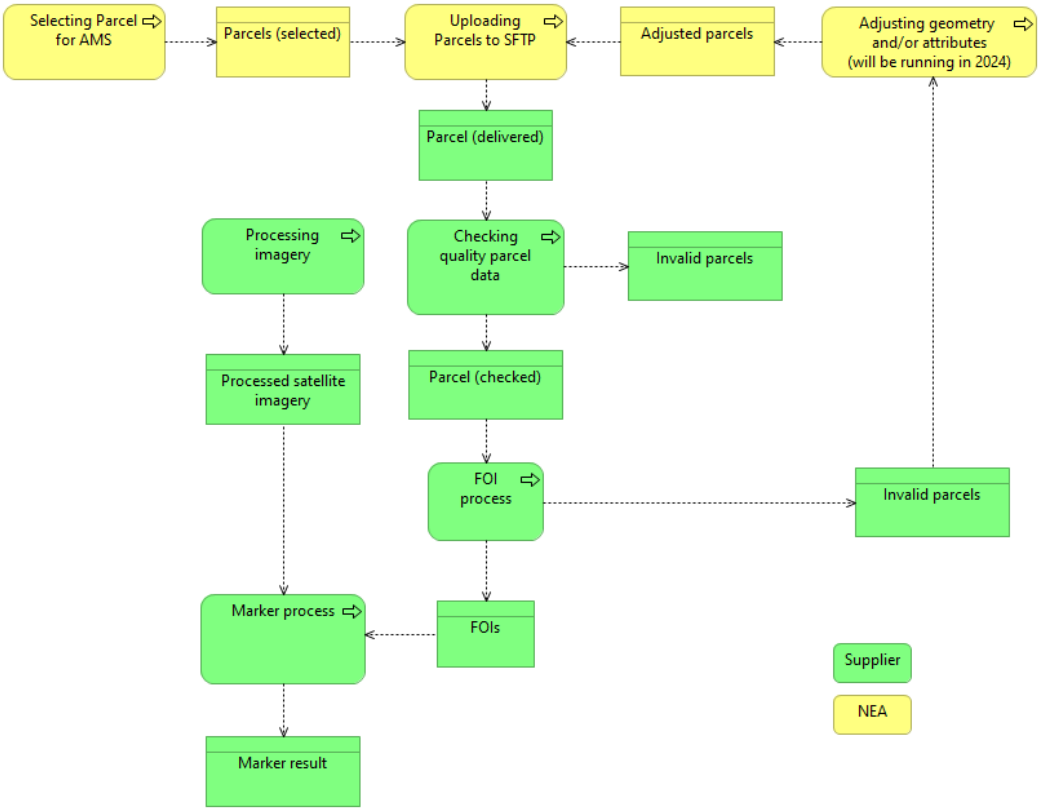


Figure 5 – Workflow describing non-monitorable and invalid parcels

2.1.2 Feature of Interest

The Feature of Interest (FOI) is an important aspect of the monitoring process. The FOI is in fact the 'space' occupied by the observable physical object on the ground, i.e. its spatial footprint. In the EU CAP context, it often coincides with the single unit of agricultural management (single crop field or particular land use, located on homogeneous agricultural land cover).

There are roughly three types of FOI. The most common is a FOI that matches the declared parcel boundaries. Usually, the original parcel boundaries are buffered inwards (between 5 and 10 metres). The second type is an FOI where adjoining parcels with the same crop and cultivated by the same farmer are merged. The third type is an FOI where the original parcel is split into smaller units because more than one crop is detected.

- The exact requirements regarding the FOI data that have to be delivered are described in Annex A.
- The FOI creation and use process has to be designed in such a way that we can track the FOI throughout the process. An example of what is meant by this is presented in Annex E.
- The third type of FOI involves a close link with invalid parcel detection (see below).
- As certain FOIs cannot be monitored, they have to be marked in the FOI delivery (see Annex A).

2.1.3 Algorithms

Algorithms play an important role in the AMS. In order to keep track of which version is used for which marker, the Contractor is requested to supply for each delivery a file containing the version used, plus a number of other attributes of the algorithm. This will not only help NEA to keep track of any changes but also make it possible to reproduce results for different versions of the algorithms used. A more detailed description of what this particular file should look like is given in Annex A.

2.1.4 Signals

The signals derived from the raster data form the basis for all markers. The signal data are mainly used in our viewer to display some of the parcel characteristics (see figure 6). This can sometimes help the interpreter to get a better understanding of why certain markers have yielded a specific result. For more details regarding the delivery of signal related data, see Annex A.

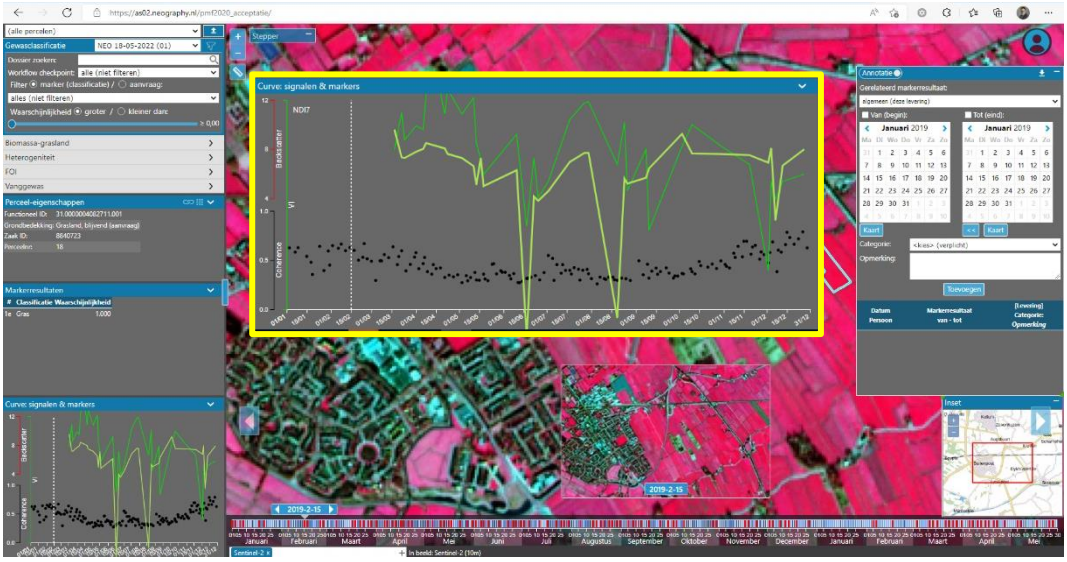


Figure 6 – Screenshot of the AM Viewer

2.1.5 Non-monitorable parcels

The overall aim of this task is to identify monitorable and non-monitorable parcels for all monitoring tasks. It might not be meaningful or possible to analyse some parcels using optical and radar satellite data due to their size, geometry or other reasons.

- Suitable criteria for monitoring (e.g. minimum number of pixels or area) must be defined by the Tenderer before proceeding with the subsequent analytical tasks.
- Parcels that do not fulfil the criteria are called non-monitorable parcels. The non-monitorable parcels must be defined before the classification process takes places and delivered before the start of the subsequent analytical tasks. This means that we are expecting from the Contractor a list of rules for 2023 which indicate what types of parcel can and cannot be monitored.
- When the FOI is delivered, the reason why it cannot be further analysed should be indicated. The delivery format structure for this task can be seen in Annex A.
- A technical delivery note containing the non-monitorable criteria and the reasons for this must be delivered before delivery of the results. The note must include the number of parcels affected by the non-monitorable definition. NEA must accept the technical delivery note before the delivery of non-monitorable parcels.

2.2 Requirements relating to the markers

In table 1 you will find an overview of the markers which are described in the following sections. Combinations of markers are marked blue and green; these markers are expected to be combined by the contractor. The markers which will be subject of the test of competence (ToC) are marked as well.

ToC	Year	Marker	Grassland activity	Arable land activity
	2023	FOI	Detection of different uses of the same parcel, parcels that can be merged	
	2023	Invalid parcel detection	Detection of eligible and non-eligible elements, different crops, different activities	
X	2023	Crop classification	Detection of grass	Detection of crops
X	2023	Mowing events	Mowing and grazing	
X	2023	Homogeneity of grassland	Mowing and grazing	
X	2024	Ploughing	Ploughing of grassland	Ploughing of arable land
X	2024	Harvesting of main crop		Harvesting
X	2024	Catch crop		Sowing, planting, emergence, harvesting (sowing and planting always by calculating later, e.g. from main crop harvesting)
	2023	Completeness of grassland marker = crop classification + mowing + homogeneity of grassland	End stage of combined markers: crop classification, mowing, homogeneity	
	2024	Completeness of catch crop marker detection = harvesting marker + catch crop marker		End stage of combined markers: harvesting of main crop, catch crop
	2024	Water	Pond / swamp / pool / water in ditch	
innovation	2024	Tillage /spraying tracks[1]		Use of fixed driving tracks
	2024	Roughness / neglect of grassland and permanent cultivation	Lack of any activity that causes parcels to grow rough, grassland and permanent cultivation	
	2024	Detection of cattle	Grazing	

Table 1: Overview of markers to be used starting in different years

2.2.1 Invalid parcel detection

The overall aim of this task is to detect parcels containing one or more different crop categories or non-agricultural elements/ineligible features. The declaration data is derived from the beneficiary's application for support. Hence, inconsistency between the declaration data and actual parcel boundaries can occur.

- The Contractor must identify sub-parcels or ineligible features (e.g. built-up areas) within the declaration data (see also Annex F).
- For more information about ineligible features and IACS, the Tenderer must consult the rules set out in Regulation (EU) 2021/2116. This regulation will come into force on 1 January 2023. The relevant requirements are described in Article 68. Regulation (EU) 2022/1173), Regulation (EU) 2022/1172) and especially the National Implementation Regulations (*Uitvoeringsregeling*) GLB 2023 (Annex F) contain additional requirements and focus on the connection to the satellite-based control.
- The results of this task will enable NEA to validate the beneficiary's declaration by checking whether it is correct in terms of the digitised parcel boundaries. If this is not the case, the parcels may need to be adjusted.
- In 2023 the Contractor will be required to automatically create new parcel boundaries and use them as input for further processing.
- From 2024 onwards, NEA will share the results with the beneficiary. And from the same year onwards the beneficiary will be asked by NEA to change his application. This means that after a certain period the original parcels must be replaced by a new set of parcels with sub-parcel

[1] Fixed driving tracks can often be seen using HR imagery. They point to a cultivation method using fixed tracks. They do not directly indicate spraying activity, because these traces are also used by other farm equipment, for example weeding equipment.

detections in the future monitoring tasks. The revalidated parcels will be provided to the Contractor as soon as possible for a follow-up classification.
- The Contractor must identify all parcels that contain two or more crop types or ineligible features within a parcel boundary.
- The Contractor must suggest selection criteria and thresholds for confident parcel delineation of sub-parcels. The criteria and thresholds must be disclosed in a technical delivery note provided to NEA before delivery of the results. New parcel boundaries of confident sub-parcels must be delivered in an additional layer.

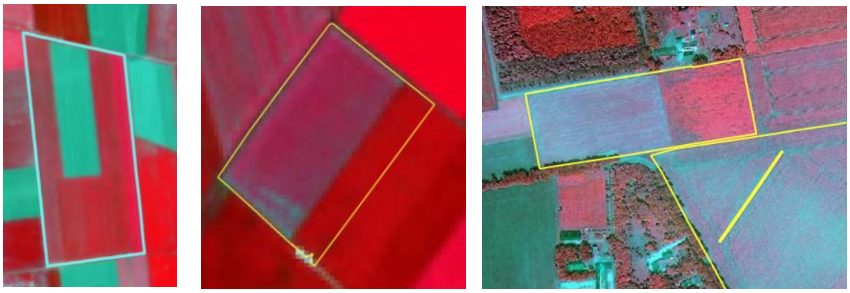


Figure 7 – A couple of examples of invalid parcels.

2.2.2 Crop classification

The overall aim of this task is to identify the correct crop on all parcels. The crop classification is an essential task in the AMS as it is used directly to check whether requirements are met and to define relevant monitoring scenarios at the start of each season. Hence, the crop classification can secure a more correct monitoring setup with crop-specific event markers within certain periods. The crop classification results may also be used directly to define eligibility conditions for applying for certain ECO schemes in the future.

- The Contractor must classify all declared parcels with reference to all possible crops. NEA will provide a list of crops prior to the start of the monitoring campaign each year. An overview of Dutch crops is also given in Annex G. Please be aware that this list is subject to change on an annual basis.
- In addition to the crop classification of all normal parcels, the sub-parcels must also be classified separately. See figure 5 for the entire workflow prior to the marker analyses. Furthermore, the Contractor must be able to make a new crop classification for selected parcels that may change their monitoring scenario throughout the season.
- All classification results must include a probability value between 0 and 1 and the date of the last optical satellite image used in the classification. The crop classification method must be optimised to take account of Dutch conditions and be based on well-founded scientific references.
- A probability value should be provided for the crop group to which each parcel belongs.
- See also Annex A for the delivery format.
- The Contractor must suggest one probability threshold for confident crop classification. The threshold must be disclosed in a technical delivery note to NEA.
- For 2023 the primary focus should be on checking the distinction between grassland, arable land and permanent crops. The list will be extended for 2024 to include a number of specific crops.

2.2.3 Harvesting events

The overall aim of this task is to detect harvesting events on all arable crops. The harvesting of a crop can be an indicator of a fulfilled agricultural activity. The existence of harvesting indicates that the parcel contains an arable crop, and the timing of the harvesting can confirm both the main crop type and that the agricultural activity is compliant with the BISS. As catch crops are usually grown after a main crop is harvested, the date on which a rotational crop is harvested may serve as important information when checking whether the catch crops are sown within the required periods.

- The Contractor must deliver a marker that detects all arable crop harvesting events.

- The data to be delivered for a detected harvesting event are a time window (start and end date) and a probability value between 0 and 1.
- When delivering this data, the Contractor must also indicate what algorithm was used, the version of the algorithm, the monitoring period and the date of the last signal used.
- The Contractor must be able to deliver crop-specific harvesting markers if deemed necessary by NEA.

2.2.4 Mowing events

As a significant part of agricultural land consists of rotational and permanent grasslands and natural grasslands, a mowing detection marker is of great relevance to the AMS. Each year NEA needs to monitor all mowing events on grassland from 1 January to 1 October. On certain types of grassland mowing is prohibited before a certain time period. Grazing can also resemble a mowing event and is therefore considered equivalent.

- The Contractor must deliver a mowing marker indicating mowing events within the described activity period. The data that must be delivered for each detected event are a time window (start and end date) and a probability value between 0 and 1.
- When delivering this data, the Contractor most also indicate what algorithm was used, the version of the algorithm, the monitoring period and the date of the last signal used.
- The time window must be realistic according to agricultural management practices in the Netherlands. Although the monitoring period covers the period from January to October, the first mowing events are expected to start from the 15th of March (also see the note below).
- It is up to the Tenderer to choose the best method to detect the mowing or grazing activities (as grazing can resemble mowing) during the period.
- Certain grassland parcels are mowed in stages. The Contractor should deliver a marker that detects partial mowing and should be able to monitor this parcel over time to ascertain whether the majority of the parcel has been mowed. The moment the parcel was completely mown should be included in the delivery data.

Note: It is important that the mowing marker should record only realistic events! This means that mowing periods longer than 30 days, mowing that starts before 15th of March and more than five mowing events are considered non-compliant and such data should not be delivered to NEA.

2.2.5 Ploughing marker/bare soil

The overall aim of this task is to detect ploughing events on grassland, permanent crops, and arable crops. For some schemes, ploughing on grassland is prohibited and may result in a reduction of EU support. Where ploughing is detected in a certain period (i.e. a period in which a crop or catch crop should be present), this will be equivalent to detecting that a crop is missing in that period. For other schemes, ploughing over rotational crops indicates that the beneficiary has fulfilled the activity requirement. The identification of an agricultural practice can be used to fulfil the activity requirement for rotational crops, but for some other schemes ploughing over rotational crops is prohibited and may result in a reduction of EU support. The Tenderer must therefore be able to detect whether or not one or more ploughing events occurred throughout the year for all rotational crops.

- The Contractor must therefore be able to detect whether or not one or more ploughing events occurred throughout the year (sometimes only in specific areas).
- The data to be delivered for each detected event are a time window (start and end date), and a probability value between 0 and 1.
- When delivering this data, the Contractor must also indicate what algorithm was used, the version of the algorithm, the monitoring period and the date of the last signal used.
- For some schemes, ploughing over multi-annual permanent crops is prohibited and may result in a reduction of the EU support. The Contractor must therefore be able to detect whether or not one or more ploughing events occurred throughout the year for all multi-annual permanent crop parcels.
- A ploughing event on a rotational crop is a fairly distinct event and more common than over grasslands and multiannual permanent crops. However, the markers are at the same time highly dependent on the land cover before ploughing. The Contractor must be able to deliver crop-specific ploughing markers or a marker which is sensitive enough for the entire population (both arable land and grassland). The data to be delivered for each detected event are a time window (start and end date) and a probability value between 0 and 1.

2.2.6 Catch crop detection/marker

One of the measures used to protect biodiversity and maintain environmental balance is the establishment of catch crops. NEA needs one or more precise detections/markers for the emergence and presence of catch crops. In the Netherlands, the practice of establishing catch crops is fairly flexible and depends on both the type and obligations of each beneficiary.

An overview of Dutch catch crops and main crops compatible with catch crops is given in Annex H.

Ploughing or destruction is prohibited within a particular period on parcels containing catch crops. Non-compliance can lead to reduction of the EU support. The exact period depends on the use of the catch crop and the reason for using it.

- The Contractor must deliver one or more detections/markers of catch crops for all potential catch crop parcels. It is up to the Tenderer to choose the best method for monitoring both the presence and absence of a catch crop during the period.
- The data to be delivered by the Contractor for each detection include a probability value between 0 and 1 and, if relevant, a time window (start and end date).
- When delivering this data, the Contractor must also indicate what algorithm was used, the version of the algorithm, the monitoring period and the date of the last signal used.
- This particular marker will probably consist of a number of markers:
    - Harvesting of the main crop
    - Increase in catch crop biomass
    - Decrease biomass/harvesting catch crop
    - Ploughing or mechanical incorporation of the catch crop

2.2.7 Homogeneity of grassland marker

The vast majority of grassland in the Netherlands is either mowed or grazed at least once a year. According to national and European legislation, permanent grassland has to be actively used by the farmer. One way to prove this is by monitoring mowing activity. Unfortunately, it is not always possible to detect mowing or grazing on grassland, for example because a parcel is grazed continuously. NEA assumes that parcels which have the appearance of being homogeneously managed or grazed meet the minimum standard for agricultural activity.

Unlike the roughness/neglect marker, this marker can generally be used within one year. This marker only has to be run on grassland. For example, spatial autocorrelation can be used. This is the extent to which the proximity or distance between measurements explains the difference (or similarity) of the measured value. Noise or a heterogeneous surface has low autocorrelation and a parcel with clustering of equal values has high autocorrelation. This concerns the pattern/trend in the difference between all pixel values within a parcel as a function of the distance between those pixels. Mowing in stages must be classified as a mowed or partially mowed field (see mowing events marker).

- The Contractor must deliver a marker indicating the homogeneity of the use of grassland. It is up to the Contractor to develop and/or choose a method for calculating the homogeneity of the use of the grassland. There are several data sources which can be used as input, ranging from high-resolution satellite data to aerial photography. One of the things to consider is that it might be necessary to use a multiannual approach in order to determine homogeneous use, although this need not be the case.
- The Contractor must deliver a result, including a probability value between 0 and 1 for each grassland parcel.
- When delivering the data, the Contractor must also indicate what algorithm was used, the version of the algorithm, the monitoring period and the date of the last signal used.

2.2.8 Completeness marker grassland = crop classification + mowing + homogeneity of grassland

Grassland must first be detected using the crop classification marker before it is possible to determine whether a parcel of grassland meets the minimum agricultural activity. It must also be established for each parcel of grassland whether the minimum agricultural activity is met, either by determining one or more mowing moments or by determining a homogeneous managed field of grassland.

It is possible that mowing moments may be observed after a crop was initially detected as other than grass. In such cases, the correct crop may still be grassland and the result of the mowing marker

must be displayed. This is to prevent such a plot from being classified as grassland only later in the year and thus not being checked for mowing.

- The Contractor must deliver a combined marker crop classification + mowing/grazing + homogeneity of grassland. The result of homogeneity of grassland only matters when no mowing activity is detected.
- The combination of the mowing marker, crop classification and the homogeneously managed grassland marker should provide a result. This yields a supply of marker results in addition to the single marker results.
- The Contractor must deliver a total result, including a probability value between 0 and 1 for each grassland parcel.
- When delivering the data, the Contractor most also indicate what algorithm was used, the version of the algorithm, the monitoring period and the date of the last signal used.

2.2.9 Completeness of catch crop detection marker = harvest marker + catch crop marker

The harvesting of a main crop is an important factor in detecting the start of a catch crop. That is why NEA requests the combination of harvesting marker and catch crop marker.

- The Contractor must deliver one or more detections/markers of catch crops on all potential catch crop parcels, including detection of the harvesting of the main crop. It is up to the Contractor to choose the best method for monitoring both the presence and absence of a catch crop during the period.
- The combination of the catch crop marker and the main crop harvesting marker should provide a result. This will yield a supply of marker results in addition to the single marker results.
- The Contractor must deliver a result, including a probability value between 0 and 1 and, if relevant, a time window (start and end date) for each detection.
- When delivering the data, the Contractor most also indicate what algorithm was used, the version of the algorithm, the monitoring period and the date of the last signal used.

2.3 Requirements relating to new developments

In this part we give one example of a possible new marker. During the term of the contract, we intend to develop more markers together with the contractor. An important aspect of this is the use of artificial intelligence (AI) techniques to create new services involving monitoring the CAP and agricultural practices in the Netherlands. Together with the contractor, we will draw up an annual development calendar setting out our development goals and the resources needed to achieve them.

2.3.1 Roughness/neglect marker for grassland and permanent cultivation

Permanent grassland in the Netherlands can be divided into three main groups: intensively used grassland, extensively used grassland and natural grassland. Grassland which is left unattended or is considered natural grassland has particular characteristics which set it aside from grassland which is used for pasture or mowing. One of the characteristics is the emergence of shrubs and rushes.

Also, permanent crops such as fields with fruit trees or other trees can be left unattended for several years. One of the characteristics is the emergence of shrubs, tall grass, and young (wild) trees that are not in rows.

- The Contractor must deliver a marker indicating the roughness of grassland and neglect of permanent crops. It is up to the Tenderer to develop and/or choose a method for calculating the roughness or neglect. There are several data sources which can be used as input, ranging from high-resolution satellite data to aerial photography. One of the things to consider is that a multiannual approach will probably be necessary to determine an increase in roughness/neglect.
- The Contractor must deliver a result, including a probability value between 0 and 1 for each grassland parcel / permanent crops parcel.
- When delivering the data, the Contractor must also indicate what algorithm was used, the version of the algorithm, the monitoring period and the date of the last signal used.

3. Process control and management

3.1 Requirements relating to marker quality

Monitoring quality is an important aspect of the AMS. This entails maintaining and improving quality and includes identification and use of indicators for detection of deviations from standards and specifications. Measuring the quality of the data generated by the AMS is based on a number of concepts and steps and involves calculating various statistics. This section provides a general overview. Much of what will be discussed below is based on documentation provided by the European Commission's Joint Research Centre (JRC).

The most important concepts are presented in the table below.

Concept	Explanation	Example of Minimal Activity
Lane – What is relevant?	This is the support scheme you want to assess.	A minimal activity is carried out on a crop parcel between 1 January and 1 October: either an eligible crop is present or, in the case of grassland, the parcel was mown at least once during this period.
Scenario – What to expect?	Indicate what agricultural practices are expected for a particular support scheme. These agricultural practices encompass a whole range of activities: method of cultivation, phenological stages, activities such as harvesting, mowing, sowing and ploughing, as well as events such as dry and wet periods. By learning more about the quality of specific markers you should be able to extend the different scenarios. This can in turn lead to fine-tuning existing markers or even adding new markers.	In the case of a minimal activity, the main crop has to be detected during the period from 15 May to 15 July on a declared crop parcel. If this is the case, the application is compliant with regard to the minimal activity requirement. In the case of grassland, the minimal activity requirement has to be proved in a different way, namely by showing that the farmer has mowed the parcel or used it for grazing. Usually these are short events lasting only one or two days. What makes detection more difficult is that in some cases the farmer mows the parcel in stages (partial mowing) or carries out extensive grazing.
Rule (Switch) – What to look for?	Each rule uses one or more markers as input and generates a traffic light (green, yellow or red) as output. Usually, this rule will be run a number of times and will eventually lead to a final decision. *Note: the traffic lights are generated by NEA.*	Example: mowing can be detected several times a year.
Markers – What to look at?	Algorithm-based observation of a particular physical state or change of state. Examples of marker results are crop, phenological stage, activity or event.	Example: crop classification, mowing and homogeneity markers are used to detect minimal activity on a parcel.

The next step is to validate the marker results. The basic premise of validation is the null hypothesis that a particular irregularity or phenomenon is not present. The following are possible examples of the null hypothesis: 'a suspect is innocent until proven guilty', 'a new cure is not effective' and 'a passenger's luggage does not contain an illegal substance'. In the context of complying with the

requirements of a particular support scheme the hypothesis could be: 'the farmer complies with the requirements of a particular support scheme'.

By collecting information, you try to reject the null hypothesis in favour of an alternative hypothesis (e.g. 'the suspect is guilty'). You can only do this if you are sure about it. That means you want to minimise the chance that you are wrongfully rejecting the null hypothesis (also known as 'type I error'). At the same time, you want to be sure that you are not wrongfully failing to reject an incorrect null hypothesis (e.g. 'the suspect is guilty'). This is called a type II error.

The evidence that is used to prove or disprove the null hypothesis that a farmer is compliant with the requirements of a particular support scheme consists of markers. Such a marker can indicate the presence of a crop, a mowing event, the presence of cattle in a particular field or other activities taking place in the field. In some cases, compliance may be shown by the absence of a particular activity. For example, some schemes provide that farmers are not allowed to mow grassland before a certain date.

General workflow	Minimal activity	Resting period
1. What is the scheme/measure?	A minimal activity is carried out on a crop parcel between 1 January and 1 October: either an eligible crop is present or in the case of grassland the parcel was mown at least once during this period.	No mowing activity is allowed to take place during the resting period.
2. Null hypothesis: the farmer complies with the rules of a particular scheme/measure	The farmer complies with the requirements for a minimal activity.	The farmer has not mowed during the resting period.
3. Alternative hypothesis: the farmer does not comply with the rules of a particular scheme/measure	The farmer does not comply with the requirements for a minimal activity.	The farmer has mowed during the resting period.
4. Type I error (angry farmer): rejecting the null hypothesis and accepting the alternative hypothesis. Also known as a false positive.	The monitoring results show that the farmer is not complying with the requirements for a minimal activity, but in reality the farmer is compliant.	The monitoring results show that the farmer has mowed during the resting period, but in reality the farmer has not mowed the grassland.
5. Type 2 error (happy farmer): wrongfully accepting the null hypothesis. Also known as a false negative.	The monitoring results show that the farmer is complying with the requirements for a minimal activity, but in reality the farmer is non-compliant	The monitoring results show that the farmer has not mowed during the resting period, but in reality the farmer has mowed the grassland too early.
6. False positive: positive outcome in that the monitoring results show that the application is non-compliant, but these results are shown to be incorrect after validation.	The monitoring results show that the farmer does not comply with the requirements for a minimal activity, but in reality the farmer is compliant.	The monitoring results show that the farmer has mowed during the resting period, but in reality the farmer has not mowed the grassland.

7. False negative: the monitoring results show that the farmer is compliant, but these results are shown to be incorrect after validation.	The monitoring results show that the farmer is complying with the requirements for a minimal activity, but in reality the farmer is non-compliant	The monitoring results show that the farmer has not mowed during the resting period, but in reality the farmer has mowed the grassland too early.

The next step is the validation of the marker. The validation process usually consists of a number of steps. This is described in more detail in the diagram below.

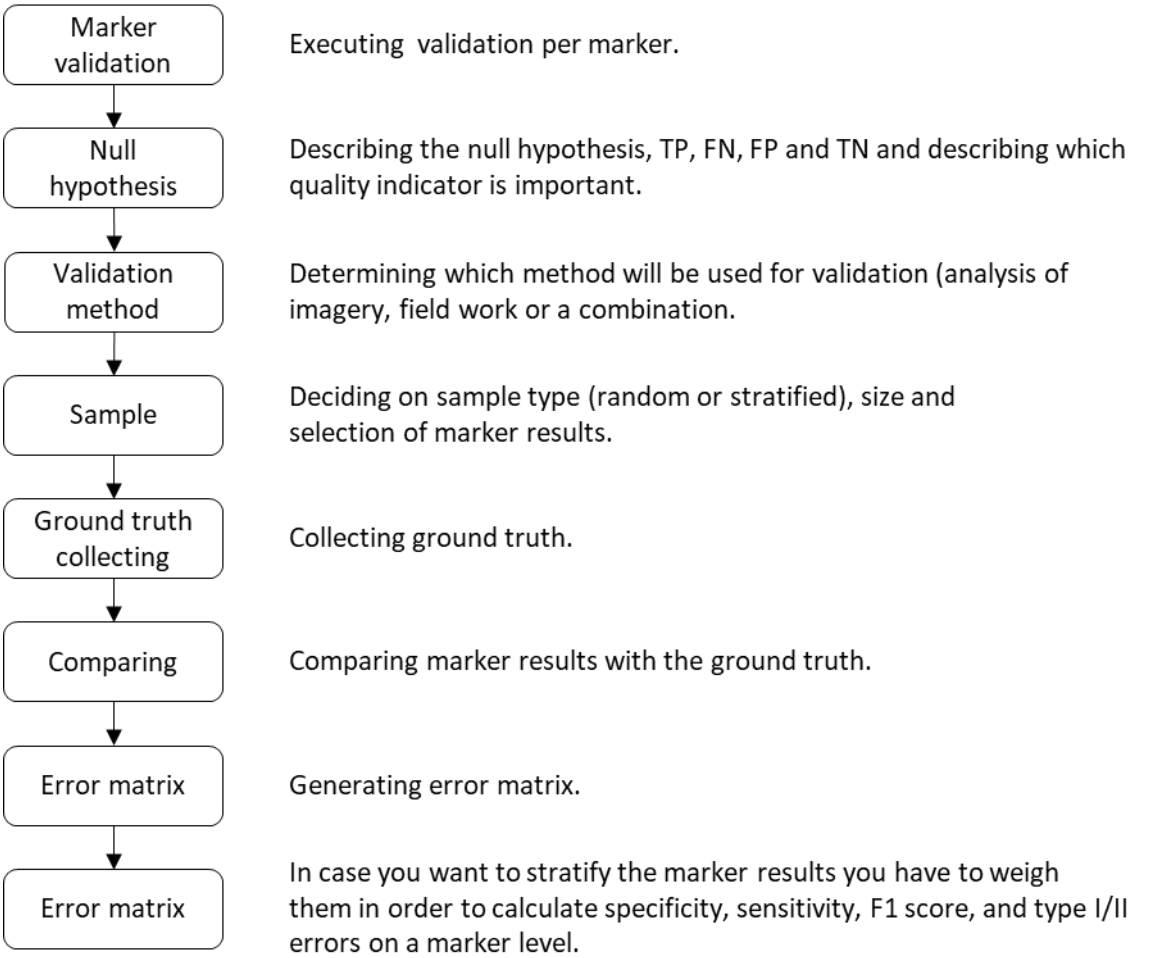


Figure 8 – Steps of the validation process

The majority of these steps are more or less self-explanatory. The actual calculation of the statistics requires rather more clarification. We will do this by giving a number of examples of statistics generally used in the context of the AMS, but of course also other fields such as Machine Learning (ML).

The first step is to define the null hypothesis. Usually, the null hypothesis is a statement of 'no effect' or 'no difference'. When applied to the mowing detection marker, the null hypothesis is therefore that no mowing activity has taken place. The confusion matrix below shows what information goes where.

[2] Please note that the collection of ground truth data will be the primary responsibility of NEA.

		real situation / reference set		
		activity present (R+)	no activity present (R-)	Total
Monitoring (algorithm)	activity present (M+)	TP	FP	TP+FP
	no activity present (M-)	FN	TN	FN+TN
	Total	TP+FN	FP+TN	

Figure 9 – Example of a confusion matrix

Using the data in this table we can calculate a number of other ratios which can help to better understand the quality of the marker used. The most common ones are sensitivity, specificity, precision and the F1-score.

Sensitivity The percentage of correctly identified positive marker results compared with a real situation or a reference set. Calculation: TP/ (TP+FN).

This says something about the ability of a marker to correctly identify parcels where an activity has taken place. This particular ratio is also known as TPR (True Positive Rate) and Recall.

Specificity The percentage of true negative marker results compared with a real situation or a reference set. Calculation: TN/(TN+FP).

This says something about the ability of a marker to correctly identify parcels where no activity has taken place.

Precision The percentage or proportion of positive identifications that were actually correct. Calculation: TP/(TP+FP).

F1-score The F1 score is the harmonic mean of the precision and recall. The highest possible value of an F-score is 1.0, indicating perfect precision and recall, and the lowest possible value is 0, if both precision and recall are zero. Calculation: F1-score= 2*((Precision*Sensitivity)/(Precision+Sensitivity))

Please be aware that this is by no means a complete overview of all statistics relevant to the AMS. There are many others such as ROC curve (receiver operating characteristic curve) and AUC (area under the ROC Curve). We expect the Tenderer to be familiar with statistics of this kind and be able to produce them on a regular basis, for example as part of the marker results delivery.

3.2 Requirements relating to delivery notes

Before delivering the first results for each monitoring task, the contractor must deliver a technical delivery note documenting the method and summarising key features (see annex I for example). The content of the note will depend on each marker, but it must at least include:

- A short description of the monitoring task
- The marker used
- The algorithm used (including version)
- A short and comprehensible overview of the results produced
- An overview of available and analysed satellite images and supplemental data
- Description of data pre-processing - Description of software and tools (based on open source)
- Accuracy assessment and error rates; systematic errors, if relevant
- Recommended probability threshold and use of results (The contractor must explain the reasoning behind the recommended use of results and the setting of threshold values for confident results before delivery of any task. For the crop classification and the sub-parcel detection, a probability rate indicating the certainty of each classified/detected crop is required. The marker events must be accompanied by a probability rate, indicating the certainty of an event. In the technical delivery notes, the contractor must recommend a threshold that defines at what probability rate NEA can use the marker event for a decision

within the AMS. Probability thresholds for the tasks and scenarios must be discussed with NEA at least one week before delivery of each task).

3.3 Requirements relating to communication

It is very important for the Contractor to work in a cooperative fashion with NEA. Some aspects of how this will be done will be formalised in the form of a Service Level Agreement (SLA), see annex 9b. However, other aspects of working together are more difficult to formalise. One way of cooperating will be to set short term goals and work to achieve them using Agile and Scrum techniques.

There is a distinction between production- and development-related activities. With regard to the production-related activities we expect a weekly progress update. More frequent meetings are expected during the period when the AMS is being set up. The exact number of meetings and interactions will be recorded in an SLA. The SLA will also contain metrics for service availability, defect rates, technical quality, security and business results.

3.4 Requirements relating to meetings

At start and end of each contract year and in the case of prior delivery of single (or several) monitoring tasks, the Contractor must facilitate physical or virtual meetings. A meeting agenda must be given by the Contractor at least three working days before the meeting. Subject to the same period of notice, the Contractor must prepare a PowerPoint presentation or a short written status report and present them at the meetings if NEA so requests. After each meeting, the Contractor must answer any questions raised in the meeting or follow up on action points within an agreed timeframe.

3.5 Requirements relating to processing red parcels

Using the marker results delivered by the Contractor, NEA will generate a traffic light for each crop parcel. Currently we are using four different traffic lights: green for parcels which comply with the requirements of a particular scheme, red for parcels which do not comply, yellow where the results are uncertain, and white for parcels which cannot be monitored (see also Figure 10). Parcels which are flagged red may possibly result in reduction of the support the farmer receives.

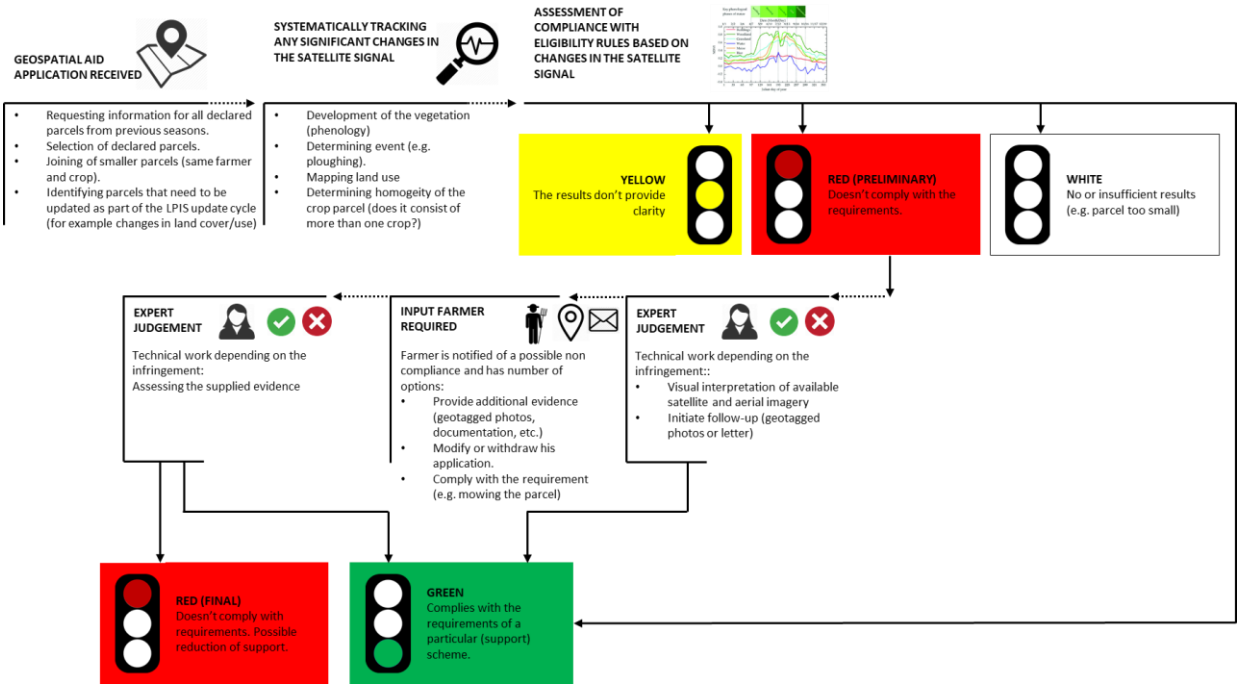


Figure 10 – Overview of traffic light generation.

As stated earlier, generating the traffic lights is something NEA will do. However, we do expect the Tenderer to respond to any particular issues arising from the traffic lights. In particular, when the number of red traffic lights is relatively high, we will expect the Tenderer to come up with possible solutions for reducing the number of red parcels.

3.6 Requirements relating to 'timeliness'

By submitting a proposal to this tender, the Tenderer declares that as of 7 April 2022 it will be able to carry out the preparatory part of the assignment and will have the basic functionality available for use on 1 June 2023.

This basic functionality is the functionality described in this document (see also section 1.6). The remaining functionality will be implemented at a later date in consultation with NEA, but in any case before 1 January 2024.

3.7 Requirements relating to data transfer

By submitting a proposal to this tender, the Tenderer declares that: the exchange of data traffic takes place via a procedure prescribed by NEA, which meets all requested information security requirements as stated in this document. Also see 1.7 Requirements relating to security and annex A and B. Furthermore the tenderer must meet the current the requirements of the guidance documents provided by the Joint Research Center of the EU but also subsequent amendments. These documents are referenced in Annex J.

3.8 Requirements relating to AI-based algorithms

Artificial Intelligence (AI) technologies are expected to bring a wide array of economic and societal benefits to a wide range of sectors, including environment and health, the public sector, finance, mobility, home affairs and agriculture. They are particularly useful for improving prediction accuracy, optimising operations and resource allocation and personalising services. However, the implications of AI systems for fundamental rights protected under the EU Charter of Fundamental Rights, as well as the safety risks for users when AI technologies are embedded in products and services, are raising concerns. Most notably, AI systems may jeopardise fundamental rights such as the right to non-discrimination, freedom of expression, human dignity, personal data protection and privacy.

Given the rapid pace at which these technologies are developing, AI regulation has become a central policy issue in the EU in recent years. Policy-makers have pledged to develop a 'human centric' approach to AI to ensure that Europeans can benefit from new technologies that have been developed and function in accordance with EU values and principles. Although the EU does not yet have a specific legal framework for AI, the European Commission has drawn up a White Paper on Artificial Intelligence highlighting the necessity for a regulatory and investment-oriented approach with the twin objectives of promoting the uptake of AI and addressing the risks associated with certain uses of this new technology.

AI and, in particular, algorithms based on AI play an important role in the AMS. They help us to detect patterns in large datasets which would otherwise remain undetected. Without the use of AI, it would not be possible to set up and run the AMS. As mentioned before, there is currently no legal framework detailing the rules contractors and government institutions must comply with. In view of the proposed term of the contract, however, it is very likely that legislation on AI will come into force during the contracting period. Once this happens, the contractor will have to comply with the rules set out in the new legislation.

Although the new AI Act will probably come into effect in 2026 there a number of requirements NEA want the contractor to take into account during the development of the AMS.

<u>Risk management system</u>

1) The Supplier ensures that, prior to the Delivery of the AI System, a risk management system shall be established, implemented and documented in relation to the AI System.
2) The risk management system shall at least comprise the following steps:
   a) identification and analysis of the known and foreseeable risks to health, safety and fundamental rights that are likely to arise in the light of the Intended Purpose of the AI System;
   b) estimation and evaluation of the risks that may emerge when the AI System is used in accordance with its Intended Purpose and under conditions of Reasonably Foreseeable Misuse;
   c) evaluation of other possibly arising risks;

d) adoption of suitable risk management measures in accordance with the provisions of the following paragraphs.
    i) The risk management measures referred to in bullet 2, point (d) shall take into account the generally acknowledged state of the art, including as reflected in relevant harmonised standards or common specifications.
    ii) In identifying the most appropriate risk management measures referred to in bullet 2, point (d), the following shall be ensured:
        (1) elimination or reduction of risks as far as possible through adequate design and development;
        (2) where appropriate, implementation of adequate mitigation and control measures in relation to risks that cannot be eliminated;
        (3) provision of adequate information, in particular as regards the risks referred to in bullet 2, point (b)

3) All risks identified, measures taken and tests performed in the context of compliance with the previous bullets will be documented by the Supplier. The documentation will be provided to NEA and updated when necessary.

Transparency

4) The contractor ensures that the AI System shall be designed and developed in such a way to ensure that the operation of the AI System is sufficiently transparent to enable NEA to interpret the system's output and use it appropriately.
5) During the term of the Agreement, the contractor is obliged to assist NEA's first request to explain on an individual level how the AI System arrived at a particular decision or outcome. In any event, this will include a clear indication of the key factors that led the AI System to arrive at a particular result and the changes to the input that must be made in order for it to arrive at a different outcome.

Other obligations

6) If the contractor considers or has reason to consider that the AI system is not in conformity with these Clauses it shall immediately take the necessary corrective actions to bring that system into conformity, to withdraw it or to recall it, as appropriate. The Supplier shall inform NEA accordingly.
7) The contractor shall keep the logs automatically generated by the AI System, to the extent such logs are under its control based on the Agreement. The logs shall be kept for a period that is appropriate in the light of the Intended Purpose and applicable law.

Note: The upcoming AI Act is new. That means that we are not able to rely on existing formats, procedures and examples. Addressing the requirements with regards to the use of AI is something that the Contractor will have to do in close cooperation with NEA.

3.9 Requirements relating to knowledge transfer

An important aspect of this project is the transfer of knowledge. Throughout the project we expect the contractor to play an active role with regard to training and knowledge transfer. We expect training or a presentation to be provided for every new feature (e.g. software, interface or algorithm). Also, everything has to be documented (manuals, source code, functional and technical documentation). As regards AMS-related documentation standards, see also *Zieliński R., Milenov P., Sima A., Devos W, 'Structured template for documenting agricultural land monitoring systems', Ispra, 2022, JRC130662*.

3.10 Requirements related to the audit trail

The contractor must have an audit system in place during the execution of the contract. Under this system, the contractor declares that during the contract:

- evidence (in paper or electronic form) of actions performed (including quality checks) will meet the requirements of an audit trail. This means that the following are recorded: who/what (person and/or system) performed the audit, what (e.g. second check) was done, when (date) was it done, why was something done and with what (based on/using what) was it done? These data are not subsequently mutable.

Or,

- all actions will be logged by means of a systematic method which excludes the possibility of entries being subsequently changed. These log files (including content processing) must be consultable and verifiable.

And,

- NEA or specified services such as Internal Audit Service RVO.nl, Audit Service Central Government, Netherlands Court of Audit, Audit Service DG Agri (EU) and the European Court of Auditors will able to access and retrieve the data directly for audit and other purposes.[3]

The information must be accessible and consultable, in accordance with Article 51 of Regulation (EU) 2021/116 and Article 34, paragraphs 4 and 5, of Regulation (EU) 2022/128.

4. Requirements relating to prices, taxes, invoicing, the team and social return

4.1 Requirements relating to prices/rates

4.1.1 The Tenderer will provide an overview of the prices and rates applicable to this assignment by completing Annex 6 entitled 'Prices/Rates'.

4.1.2 The price for the following activities must be all-inclusive:

Section 1: Fixed annual costs

1.1	Hosting production environment
1.2	Hosting test/acceptance environment
1.3	Hosting development environment
1.4	Data transfer
1.5	Collecting satellite data
1.6	Archive

Section 2: Fixed Development costs

2.1	Development of markers (a list of markers can be found in section 2.2)
2.2	Development of a data pipeline
2.3	Adjusting pipeline for the processing of planet fusion data
2.4	Development of a web interface for the different markers
2.5	Satellite data processing
2.6	Development of an analysis platform
2.7	Signal and indices processing

*Section 3: Variable development and production costs**

3.1	Hourly rate for junior developer/image analyst, for further development
3.2	Hourly rate for medior developer/image analyst, for further development
3.3	Hourly rate for senior developer/project manager, for further development

[3] Conservation periods information according to EU (Reg.) 2022/128

Article 34: Information must be kept for at least 3 years after the year in which the European Commission (Cion) has approved the accounts for the financial year concerned on the basis of 2021/2116.

- In the case of irregularities or negligence, the supporting documents will be kept at the disposal of the Cion for at least 3 years after the year in which the amounts concerned have been fully recovered from the beneficiary and credited to the funds.
- In conformity procedures, the documents are kept available for at least 1 year after the year in which that procedure is terminated, or if the subject of legal proceedings before the Court of Justice, at least one year after the year in which those legal proceedings are terminated.
- If supporting documents are kept in electronic form only, the system used for this purpose must comply with section 3, point B of Annex 3 to Delegated Regulation 2022/127

*The rates provided will be used to draw up further assignments. These services will be on call. How the services can be called upon is described in section 7.4 of the tender document.

All rates must in any event include the following: wage costs, overheads (e.g. accommodation and wage costs for support staff), costs for the use of equipment and machinery during the assignment, service costs (SLA), insurance costs, any applicable costs for eInvoicing, and local travel and accommodation expenses.

In 2023, the annual costs of hosting the production environment, the development environment and hosting the test/acceptance environment will only be paid for the months in which the contract is in force and the environments need to be live, i.e. from the 7th of April 2023. This means that the maximum annual costs in 2023 are 8/12*annual costs for these items. The costs of archiving can only be incurred from 1 January 2024.

4.1.3 The agreed hourly rates and annual costs are fixed at least until 1 January 2026. Requests for indexation can be submitted only once a year, exclusively in the month of October. Requests for indexation for the upcoming year that are submitted before or after this month will not be considered. Requests for indexation must be sent to the following email address: contractmanagement@RVO.nl.

Prices and rates may be adjusted in line with the price index published by Statistics Netherlands (https://opendata.cbs.nl/statline/#/CBS/nl/) for hourly rates of pay, excluding special remuneration established under collective labour agreements in the business services sector. The figure for the preceding October will be used for this purpose, with the index for the starting date of the contract, i.e. *April 2023,* being set at 100%.

The contractor must submit a specified request for indexation, together with a printout of the information form Statistics Netherlands, and refer to the contract with the Contracting Authority. The request should give both the old and the new prices/rates.

Upon receipt of the request, the Contracting Authority will send a confirmation to the contractor whether the request is granted.

4.1.4 The agreed rates for the fixed development costs are fixed and invariable for the duration of this Contract.

4.1.5 The total annual costs, including the costs for optional years, may not exceed €2,820,000, exclusive of VAT. These costs are exclusive of indexation costs.

4.1.6 The total fixed development costs may not exceed €1,700,000, exclusive of VAT.

4.1.7 The Tenderer should quote a fixed total price for the annual costs and the fixed development costs in the offer using Annex 6.

4.1.8 Hourly rates should be provided. These hourly rates must be used to determine the costs of further development during the contract. Further development of different markers can be requested by the Contracting Authority during the contract. In such a case, the contractor must then provide a quote for the development based on the hourly rates, with a fixed maximum price for the development. More information about this process can be found in section 7.4 of the tender document.

4.1.9 The maximum budget for the further development of markers, which can be called on at any given moment during the contract, is: €2,300,000, exclusive of VAT and exclusive of indexation. This budget covers the entire duration of the contract, including the optional years.

4.1.10 The Tenderer will not submit any zero or negative prices/rates.

4.2 Requirements relating to taxes

4.2.1 The Tenderer indemnifies the Contracting Authority against any claims from the Dutch Tax and Customs Administration (*Belastingdienst*) or other tax authorities.

4.2.2 The Tenderer will quote the prices in the following way:
- the amount exclusive of Dutch VAT and any VAT due outside the EU;
- the amount of Dutch VAT due (if applicable) and the amount of any VAT due outside the EU, and;
- the amount inclusive of Dutch VAT (if applicable) and any VAT due outside the EU.

4.2.3 If the Tenderer indicates that no VAT is applicable, it agrees to provide documentary proof of why this is so to the Contracting Authority within fifteen calendar days of being requested to do so.

4.2.4 You are liable for any extra costs for Dutch and/or foreign VAT due if you incorrectly charge no VAT or an incorrect amount of VAT to the Contracting Authority. If applicable, you are liable for accurate payment of VAT in the Netherlands and outside the EU, with the exception of the case stipulated in the following sentence. If the Contracting Authority procures a service from a foreign business and Dutch tax law considers the work to have been performed in the Netherlands, then the Contracting Authority is liable for the payment of VAT to the Dutch Tax and Customs Administration for this/these service(s) performed in the Netherlands.

4.2.5 You guarantee that the amounts specified in the quotation are inclusive of all taxes and levies (including amounts considered equivalent to taxes or levies), regardless of their description and wherever in the world they may have been levied.

4.2.6 You indemnify the Contracting Authority against any claims from any tax authority for any taxes, levies or contributions considered equivalent to taxes or levies, originating from either the Netherlands or outside the Netherlands.

4.3 Invoicing requirements

Delivery, payment and/or other general terms and conditions – by whatever name they are known – of the Tenderer or its branch organisation are expressly not accepted. The contract is subject to the General Government Terms and Conditions for IT Contracts (ARBIT), version 2022.

The applicable general conditions include a provision on electronic invoicing. This can be done in four different ways:

- Invoice portal of the central government
- Connection with Digipoort
- eInvoicing from your (accounting) software package via Simplerinvoicing
- eInvoicing via a service provider

Fixed annual costs are invoiced on a quarterly basis in advance.

The development costs for 2023 are fixed. The following invoicing schedule applies to each different component (marker or other) that needs to be developed:

- 15% at the start of the development
- 35% halfway through the development
- 50% after completion and acceptance of the results of the development

Variable costs, as in the variable development costs and other costs that are not annual or known in advance, will be invoiced according to the following schedule:

- 15% at the start of the assignment
- 35% halfway through the assignment
- 50% after completion and acceptance of the results of the assignment

We use an agile approach to development and it is possible that an assignment may be cancelled in the middle of the process. If the assignment is cancelled, only the costs actually incurred until then can be invoiced.

If applicable, you must include a summary of the actual hours/days worked in accordance with the applicable rates

For companies established in the Netherlands only

E-invoicing

The general terms and conditions that apply to this contract contain a provision that invoices must be sent electronically (not in PDF). This can be done in 3 different ways:

- The invoicing portal of the Dutch government
- eInvoicing with your own (accounting) software package through Peppol
- eInvoicing through a service provider.

For companies not established in the Netherlands:

The paragraph concerning eInvoicing does not apply to companies located outside the Netherlands.

4.4 Requirements relating to the team

4.4.1 The project manager nominated in the tender for delivery of the service must meet the following minimum criteria:

- a recognised qualification in project management or an equivalent;
- at least 3 years' project management experience of comparable projects of a similar size;
- at least 5 years' experience within the Earth Observation environment covering the following aspects:
- extensive experience of spatial analysis, data management and big data processing;
- experience of interpreting Sentinel and other satellite data for the identification of vegetation, land cover/land use and other purposes;
- experience of overseeing the automation of spatial analysis methods;
- experience of overseeing IT infrastructures, server components, database solutions etc.;
- in-depth understanding of database structure and RDBMS principles;
- fluency in English and Dutch (C1 level), both spoken and written.

The project manager will be responsible for delivery of this project. As such, the project manager must have the critical planning and organisational skills required to establish, implement and manage processes and procedures covering project management, including risk and issues management, documentation management and quality assurance.

4.4.2 All project team members nominated in the tender for delivery of the service must individually meet the following minimum criteria:

- have a recognised qualification in the Earth Observation (EO), GIS or Data Analytics fields or equivalent;
- have a minimum of 3 years' experience within the Earth Observation environment;
- fluency in English and/or Dutch (C1 level), both spoken and written.

Additionally, the project team members nominated in the tender for delivery of the service must collectively meet the following minimum criteria and have expertise and experience covering all of the following topics as a collective and at least one of the following topics as individuals:

- large-scale EO IT infrastructure experience;
- EO database solutions experience;
- EO knowledge and application to agriculture;
- satellite processing, extraction and analysis experience;

- experience of automating EO tasks;
- front-end service development experience;
- experience of quality assurance in relation to EO data;
- understanding of Dutch agriculture.

4.4.3 All project team members nominated in the tender for delivery of the service must individually meet the following minimum criteria:
- knowledge of developing earth observation algorithms;
- cloud expertise;
- software development skills;
- agile scrum.

4.4.4 All Project Team Members nominated in the tender for delivery of the service must be prepared to commit to this assignment for the duration of the contract. This is to prevent NEA from having to build up a new collaborative relationship on a regular basis. NEA expects the tenderer's project manager to supervise this. It stands to reason that people change jobs or for other pressing reasons no longer can take part in this project. If this is the case we expect the contractor to nominate a replacement and consult NEA for approval.

4.5 Requirements relating to social return

The contractor applies a standard social return of 1% of the total contracted amount for the execution of the contract. Three months after contracting, the contractor must submit an action plan describing how this requirement will be fulfilled. The specifics must be related to the contract, but need not be at the locations of the contractor in all cases. The action plan must also describe how displacement of personnel by employees from the social return target group is avoided.

The specifics of social return must be substantiated in the action plan by reference to the following factors:

- total number of SR employees to be deployed (persons – no names in view of the requirements of the General Data Protection Regulation (GDPR));
- period of deployment of SR employees;
- indication of the categories of employee to be deployed (e.g. Work and Social Assistance Act (WWB)), Sheltered Employment Act (WSW), Work and Income (Capacity for Work) Act (WIA), etc.);
- recruitment channel (e.g. municipality, Employee Insurance Agency (UWV), etc.);
- value of 1% of the total contract amount to be achieved during the contract.

Social return includes the following target groups:

a. people entitled under the Work and Social Assistance Act (WWB) who have been unemployed for longer than 12 months, are aged 50 or over and/or cannot find work independently without rehabilitation support or other guidance;
b. people entitled under the Unemployment Insurance Act (WW) who have been unemployed for longer than 12 months and/or are aged 50 or over;
c. people entitled under the Work and Income (Capacity for Work) Act (WIA);
d. people entitled under the Return to Work (Partially Disabled Persons) Regulations (WGA);
e. people entitled under the Incapacity Insurance (Self-Employed Persons) Act (WAZ);
f. people entitled under the Incapacity Insurance (Young Disabled Persons) Act (WAJONG);
g. people entitled under the Income Support (Older and Partially Disabled Unemployed Workers) Act (IOAW);
h. people entitled under the Income Support (Older and Partially Disabled Formerly Self-Employed Persons) Act (IOAZ);
i. people entitled under the Sheltered Employment Act (WSW);
j. practical training places/workplaces for jobseekers not entitled to benefits;

k. practical training places/workplaces for school dropouts and young people with insufficient qualifications;
l. practical training places/workplaces in the context of BOL/BBL training programmes, VSO and/or practical schools.

Annexes

Annex A: Data exchange

The annex describes all files and fields.

Functional Design data interchange Monitoring results Supplier-RVO Netherlands Enterprise Agency

Table of contents

Document management

Changes

Version	Date	Author	Reason for change

Document was issued to

Per person, the last issued version and data appear in this table.

Version	Date	Name	Department	Position

References to other documents

The domain values are included in the Excel file 'Domain list data interchange NEO-RVO' which is available in the collaborative space between RVO and NEO.

The data delivery parcels are described in FO geguitwis Percelen AM D1.1

1 Introduction

For the Monitoring project, data are exchanged to provide support for the monitoring of the BISS scheme and later also other schemes within the Common Agricultural Policy (CAP). The data relate to results of algorithms according to which a specific observation can be made.

This functional design (hereinafter FD) describes for each type of delivery the specifications as they can be read in in the MONA MOVE system.

1.1Purpose of this document

The purpose of this FD is to explain the agreed specifications, and to provide support in managing the agreed deliveries. This document can be used by the manager of MONA MOVE in communication with the delivering party, and vice versa.

1.2Reader's guide

This design consists of 3 chapters. The first chapter is an introduction and description of the purpose of the FD.

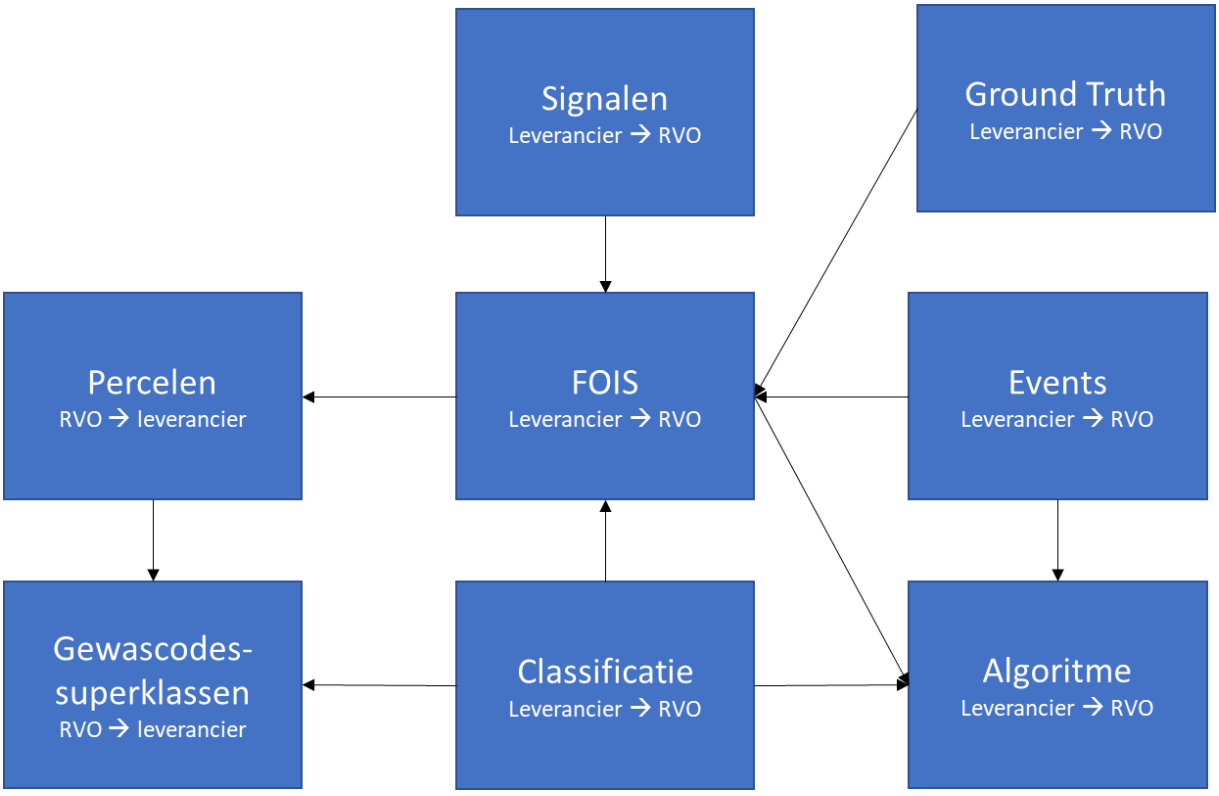
Chapter 2 then deals with the specifications of the delivery. Each type of delivery is described in an individual section. Each section discusses the background, purpose and use of the attributes per delivery. Finally, the output check is described if it must be carried out before a delivery is made.

1.3 Method of data interchange

The data is exchanged with the supplying party via an sFTP interface. This is a secure environment (with login and password) where various supplying parties and receiving parties can place and retrieve deliveries. The details of this interface are described in the Memo use of ftp by AMS and GEO v1.2.

1.4 Diagrammatic representation of the relationship between deliveries

At present, 8 different types of deliveries are recognised and described in this FD. All of these deliveries are interrelated. The table below shows the relationship between the different deliveries. The arrow that goes from to means that the input for that delivery comes from the delivery to which it refers. For example, an FOIs delivery cannot be made before a Plot delivery has taken place.



1.5 Collection and issue list

As a result of changes in registers at RVO, or changes in the MONA MOVE system, it is possible that items will change in the FD. These changes, together with any improvements proposed by the supplier, are described in a separate Excel list. The issues from this list are discussed periodically, so that they can be dealt with.

2 Specification of the deliveries

In this chapter, the data interchanges are specified for each delivery format.

2.1 Generic file structure

The formats are described in this FD. Each format contains a file name with an identical structure. Namely:

2.1.1 Description of file

Characteristic	Execution
Format	Csv and shape (for geometries)
File name	partij+"_"+soort_levering+"_"+datum_aangemaakt+"_"+jaar+"_"+nr_levering.csv NEO_10_20-02-2020_2020_01 1e record = header record with column names Exception: The deliveries GEWASCODES-SUPERKLASSEN and BBR PERCELEN that are delivered to the external supplier contain no numbers but instead the description "+soort_levering+". • RVO_gewascodes-superklassen_20-02-2020_2020_01 • RVO_Percelen_20-02-2020_2020_01
Field separator and decimal separator	Semicolon, field values never contain a ';' Decimal separation is applicable and indicated with a '.'
No value	Leave field empty, for example: waarde1;waarde2;waarde3;waarde4; waarde5; 1 full record waarde1;waarde2;waarde3;waarde4;; 1 record, last empty
Field types	Numerical, text, date and time stamp

NB. The plots delivery that is read in in the MONA MOVE application is designated with a soort_levering (delivery type) number.

2.1.2 Explanation of data in file name

The following data appear in the file name:

Data	Length and format	Explanation
Party	3 letters For example: NEO, RVO, ASB, etc.	A party refers to the party from which the delivery originates. The abbreviation must be known or created in the MONA MOVE application.

Data	Length and format	Explanation
Type of delivery	2 digits For example: 01, 05, 14 etc.	A type of delivery refers to the number of the delivery in which the specifications for the delivery are recorded. The number determines the read-in format.
Date created	DD-MM-YYYY For example: 01-01-2022, 03-11-2019 etc.	The date refers to the moment at which the delivery was created.
Year	4 digits (YYYY) For example: 2019, 2023 etc.	The year refers to the scheme year to which the data relate. A delivery may therefore have been created in 2022, but relate to data from the scheme year 2019.
Delivery no	2 digits For example: 01, 02, 03 etc.	The serial number or delivery number refers to the version number of the delivery. If a delivery has to be delivered for a second time, for example due to errors in the first version, this number will be raised.

2.1.3 Overview of delivery types

Format	Number	Description
BBR PLOTS	01	Plots for scheme years 2022 and earlier
BISS/ECO PLOTS	14	Plots for scheme years 2023 and later
FOIs	02	FOIs
CROP CLASSIFICATION	03	Crop classification winter (early)
CROP CLASSIFICATION	04	Crop classification summer early
CROP CLASSIFICATION	05	Crop classification summer late
EVENTS	06	Marker results mowing
EVENTS	15	Marker results Heterogeneity (part mowing)
EVENTS	16	Marker results Catch crop
SIGNALS	07	SIGNALS
GROUND TRUTH	08	Ground Truth crop classification
GROUND TRUTH	09	Ground Truth mowing
ALGORITHMS	10	Algorithm and signal type

2.2Timetable

In 2023, for the implementation of the BISS scheme, a number of deliveries are expected from the supplier. In date order these are:

Date	Number	Description
15 June	02	An FOIs delivery
15 June	10	An algorithms and signal types delivery, only if algorithms and signals are used here that are not yet known in MONA MOVE.
15 June	04	A crop classification summer early delivery
15 June	06	A marker result mowing delivery about picture material from 1 January to 1 June.
15 July	02	An FOIs delivery, only if new FOIs are created and/or old FOIs have ended.
15 July	04	A crop classification summer early delivery
15 July	06	A marker result mowing delivery for the period 15 May to 1 July.
15 August	02	An FOIs delivery, only if new FOIs are created and/or old FOIs have ended.

15 August	05	A crop classification summer late delivery
15 August	06	A marker result mowing delivery for the period 15 June to 1 August.
15 September	02	An FOIs delivery, only if new FOIs are created and/or old FOIs have ended.
15 September	06	A marker result mowing delivery for the period 15 July to 1 September.
15 November	10	An algorithm and signals delivery, if signals are supplied that are not yet known in MONA MOVE.
15 November	07	A signals delivery containing the signals used for the production of all deliveries in 2023.

The following will be delivered to the supplier by RVO:

- Each month a plot delivery. This is described in the document FO geguitwis Percelen AM. NB. In the year 2023, this will be reduced to an initial delivery around 14 May and 4 monthly update deliveries from the start of July through to the start of October.
- If changed, between February and May a delivery of:
    - Domain values
    - Crop codes – superclasses

2.3 Crop codes - superclasses

This section describes the specifications of the delivery with crop codes in combination with superclasses to NEO.

2.3.1 Background

The crop code list is drawn up each year by the GRG department of RVO and is updated each year. Within the Area monitoring project, this list is categorised according to a number of superclasses. Within the list, a breakdown has been made into early and late superclasses. The superclasses are a categorisation of crops that bear some relationship to each other, or are somewhat similar in terms of growth pattern/characteristics. This categorisation simplifies the crop classification.

The early superclasses comprise less than 10 and are intended for crop recognition in periods where little crop growth occurs in the Netherlands and is not yet sufficiently recognisable via monitoring. The late superclasses are used later in the year to be able to identify a greater diversity of crop growth.

2.3.2 Purpose and use

The crop codes with superclasses are sent by RVO to the external supplier. The external supplier uses the crop codes and superclasses in the deliveries to RVO.

2.3.3 Description of file attributes

Field name	Type	Length	Obligation	Description of function
GEWASCODE	Text	10	M	Identifying characteristic of a crop. Always a code with only digits
OMSCHRIJVING	Text	150	M	Description of the crop code
DATUM_GELDIG_VANAF_GEWASCODE	Date	19	M	First day of an administrative period in which the crop code is valid. Layout: 1-1-2018 01:00:00

DATUM_GELDIG_TM_GEWASCODE	Date	19	C.	Last day of an administrative period in which the crop code is valid. Layout: 1-1-2018 01:00:00
SUPERKLASSE_CODE_VROEG	Text	10	M	Identifying characteristic of an early superclass. Always a code with only digits
OMSCHRIJVING_VROEGE_SUPERKLASSE	Text	100	M	Description of early superclass
SUPERKLASSE_CODE_LAAT	Text	10	M	Identifying characteristic of a late superclass. Always a code with only digits
OMSCHRIJVING_LATE_SUPERKLASSE	Text	100	M	Description of late superclass
DATUM_GELDIG_VANAF_SUPERKLASSE	Date	19	M	First day of an administrative period in which a superclass is valid Layout: 1-1-2018 01:00:00
DATUM_GELDIG_TM_SUPERKLASSE	Date	19	C.	Last day of an administrative period in which a superclass is valid Layout: 1-1-2018 01:00:00

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.3.4 Detailed description

This section contains a generic explanation of the delivery and per attribute.

Generic explanation

The list is updated each year. Records that have been ended are given an end date, and new crop codes may be added. Each year, therefore, a number of records will be added and a number will be updated. Each year the entire list is redelivered and then only contains all crop codes and all superclasses known for that year.

GEWASCODE

No further explanation.

OMSCHRIJVING

No further explanation.

DATUM_GELDIG_VANAF_GEWASCODE

No further explanation.

DATUM_GELDIG_TM_GEWASCODE

Conditional field. Entered if crop code is ended.

SUPERKLASSE_CODE_VROEG

The early superclass refers to a very rough grouping of crop codes to carry out the winter classification at the start of May and the early summer classification at the start of July. In this period of the year, few distinctive crops grow on the land.

OMSCHRIJVING_VROEGE_SUPERKLASSE

No further explanation.

SUPERKLASSE_CODE_LAAT

Relates to a more detailed grouping of crop codes than the SUPERKLASSE_CODE_VROEG, to carry out crop classification July until the end of the growing season. In this period, the variety of crops is greater and more easily monitored.

OMSCHRIJVING_LATE_SUPERKLASSE

No further explanation.

DATUM_GELDIG_VANAF_SUPERKLASSE

No further explanation.

DATUM_GELDIG_TM_SUPERKLASSE

Conditional field. Entered if superclass is ended.

2.3.5 Output check

The output check is carried out manually and has no predetermined check.

2.4BBR plots

This section describes the specifications for the delivery with BPR plots to the external supplier. From 2023 onwards, a different plot delivery to the external supplier will be provided, which is described in the FO geguitwis Percelen AM. This delivery will only be used if plot information is required, for plots from before the scheme year 2023.

2.4.1 Background

The delivery of BPR plots contains information about the Basic Payment Right (BPR) subsidy applied for each plot by farmers. The application is annual whereby a plot is given a unique number, a functional ID. This ID is valid for a maximum of one subsidy year. In the interim changes may take place. Each change results in a new functional ID. The delivery includes the type of plot change, which indicates how the plot has changed compared with the previous version of the plot.

2.4.2 Purpose and use

The BPR plots are sent by RVO to the external supplier. The external supplier uses the BPR plots to calculate the Feature of Interest (FOI). The supplier calculates the marker results on the basis of the FOI.

2.4.3 Description of attributes shapefile BPR plots.

Field name	Type	Length	Obligation	Description of function
GRG_FID	Text	20	M	Unique identifying characteristic from RVO for a plot

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.4.4 Description of attributes csv file BPR plots

Field name	Type	Length	Obligation	Description of function
BBR_GEWASCODE	Text	10	M	Unique identifying characteristic from RVO for a crop from a BBR plot. Always a code with only digits
GRG_FUNCTIONEEL_ID	Text	20	M	Unique identifying characteristic from RVO for a plot
ZAAK_ID	Numerical	22	M	Unique identifying characteristic of the case for coupling with NEO viewer
GDB_FROM_DATE	Time stamp	25	M	Time at which the plot was entered in the registration. Layout: 24MAR2020:18:44:02.219000

GDB_TO_DATE	Time stamp	25	M	Time at which plot expired as truth in the registration. Layout: 4MAR2020:18:44:02.219000
BBR_VOLGNUMMER	Numerical	5	M	Identifying characteristic of BPR plot on the application for coupling with NEO viewer
VERG_GWC_ID_VANGGEWAS	Text	10	C.	Unique identifying characteristic from RVO for a catch crop from a BBR plot.
VERG_UITERSTE_ZAAIDAT_VANGGEW	Date	18	C.	The latest date on which the catch crop is sown Layout: 01AUG2020:00:00:00
TYPE_PERCEELMUTATIE	Numerical	2	M	Indication of why plot was changed (and hence ended)

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.4.5 Detailed description

This section contains a generic explanation of the delivery and per attribute.

Generic explanation

The delivery is currently broken down into 3 times a year. The initial delivery contains all BPR plots applied for in that year. The 2 follow-up deliveries contain all changes and any new BPR plots. It is therefore possible that a follow-up delivery includes a plot that was active but that has once again ended in the interim, at the moment of delivery.

BBR_GEWASCODE

No further explanation.

GRG_FUNCTIONEEL_ID

Every record relating to plots is uniquely identified with this ID. The layout is as follows:

- First 2 positions indicate the scheme (BBR=31; ANLB=35)
- Position 3 is a full stop
- Positions 4 to 16 form a unique ID (to each scheme)
- Position 17 is a full stop
- Positions 18 to 20 are the version number of the plot

ZAAK_ID

This is the application number of the scheme for the coupling in NEO viewer.

GDB_FROM_DATE

This attribute specifies the start of the (current) validity of a version of the plot.

This time stamp does not change from summer to wintertime and vice versa. Is also not concurrent with NL time: in winter 1 hour behind and in summer 2 hours behind.

GDB_TO_DATE

This attribute specifies the end date. Scheme plots applied for expire as a current truth as soon as a correction is implemented; the date of the plot applied for is then in the past.

This field is always entered. With a current plot, this is as standard 31DEC9999:23:59:59.000000.

BBR_VOLGNUMMER

This is the serial number for the plot specified by the relation on the BPR application.

VERG_GWC_ID_VANGGEWAS

The crop code for the catch crop specified by the relation in the application or the catch crop observed by RVO.

This is a conditional field. If the applicant specifies this content, it must also be entered in the delivery.

VERG_UITERSTE_ZAAIDAT_VANGGEW

The latest date on which the catch crop is sown. This is a planned date and is specified by the applicant.

This is a conditional field. If VERG_GWC_ID_VANGGEWAS is entered, this date must be entered.

TYPE_PERCEELMUTATIE

With each GRG_FUNCTIONEEL_ID, the reason for the change is also provided.

There are a number of reasons why a change occurs. It may be that a plot has undergone multiple changes over time. These are supplied in a delivery as separate records. Below is an overview showing the types of changes and the accompanying value in the delivery. The explanatory notes indicate what the change means for the monitoring of the plot.

Value in delivery	Type of change	Explanation
0	Initial selection	This type is not a change but indicates that the record is part of the initial selection.
1	Withdrawn plot	This plot is no longer an existing plot in the current situation and is therefore no longer relevant for the monitoring. The plot does remain stored in the history with a GDB_TO_DATE in the past. This plot can be removed from the set of plots to be monitored.
2	New plot	This plot has been added to the application or has arisen as a consequence of the splitting (off) of (part of) the plot. This plot must be added to the set of plots to be monitored.
3	Change to plot geometry	The surface area of this plot has changed. It may now be a larger or a smaller surface area. For this plot, when monitoring, use must be made of the plot data relating to the current version of the plot.
4	Change to crop code plot	For this plot, the crop code has been changed. For this plot, when monitoring, use must be made of the plot data relating to the current version of the plot.
5	Change to crop plot and plot geometry	For this plot, both the crop code and the surface area have been changed. For the surface area change, the area may be larger or smaller. For this plot, when monitoring, use must be made of the plot data relating to the current version of the plot.
6	Rejected plot	The plot has been rejected by RVO and may not be used by the relation for the application in question. This plot can be removed from the set of plots to be monitored.
7	Rise in Functional ID due to other change	For this plot, the version number has been raised due to a change that is not further specified for monitoring. NB: automatic changes to the surface area (so-called marking-in errors) are also submitted with this change type. In these plots, therefore, no changes can be made to geometry. For this plot, when monitoring, use must be made of the plot data relating to the current version of the plot.

2.4.6 Output check

No automated output checks are performed.

2.5Algorithms

This section describes the specifications for delivery with algorithms in connection with the signals used from the external supplier.

2.5.1 Background

The external supplier uses various algorithms to generate market results and FOIs. Algorithms can make use of various types of signals. By supplying the information about the algorithms (and versions) used for each marker, the external supplier enables RVO to time travel through the results. The data must also be known in the system.

2.5.2 Purpose and use

The algorithms with signals used are received by the RVO from the external supplier. RVO uses the algorithms in its analysis of the external supplier's marker results.

2.5.3 Description of file attributes

Frequency

At the start of the year, and every time there is a new marker or (version) algorithm.

Size

0 to 10 records per delivery.

Attributes

Field name	Type	Length	Obligation	Description of function
ALGORTIME_TYPE	Text	50	M	Type to which the algorithm belongs
NAAM_MARKER	Text	50	C.	Marker name
ALGORITME_NAAM	Text	200	M	Identifying characteristic of the algorithm
ALGORITME_VERSIE	Text	50	M	Version of the algorithm
SOORT_SIGNAAL	Text	50	M	Describes the type of signal used in the algorithm
EXPLANATION	Text	1000	O	Optional

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.5.4 Detailed description

This section contains a generic explanation of the delivery and per attribute.

Generic explanation

The delivery takes place at the start of the year with the first crop classification and again whenever there are changes in existing algorithms or new algorithms are developed. A subsequent delivery will probably be coupled to a specific PoC or other type of tender.

ALGORITME_TYPE

Indicates the marker for which the algorithm is used.

NAAM_MARKER

This attribute is conditional. If the ALGORITME_TYPE is ‘marker’ this attribute is mandatory. Indicates the marker to which the algorithm applies.

ALGORITME_NAAM

The name of the algorithm in combination with ALGORITME_VERSIE is a unique key for coupling the marker results or delivered FOIs to the algorithms used.

ALGORITME_VERSIE

See ALGORITME_NAAM.

SOORT_SIGNAAL

An algorithm often uses a combination of multiple signals for example coherence and backscatter. Multiple used signal types result in multiple records in the delivery for the same combination of ALGORITME_NAAM and ALGORITME_VERSIE.

EXPLANATION

No further explanation.

2.5.5 Output check

The output check by NEO consists of 6 levels. Up to and including level 5 are hard errors. If these occur, NEO is not permitted to deliver to RVO, unless decided otherwise by RVO. Errors that occur at level 6 checks need not necessarily be hard errors, but do require an explanation in the submission document for a delivery. The table below describes the checks.

Level/check	Result
LEVEL 1. Checks at file level (physical file)	
Corrupt file error	OK/NOT OK (number of errors if NOT/OK)
Empty file error	OK/NOT OK (number of errors if NOT/OK)
File name error	OK/NOT OK (number of errors if NOT/OK)
File format error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 2. Check of record type (file lines)	
Header error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 3. Check of line structure (format)	
ALGORITME_NAAM empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
ALGORITME_NAAM empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
SOORT_SIGNAAL empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
TOELICHTING not STRING	OK/NOT OK (number of errors if NOT/OK)
LEVEL 4. Check of line content (domains)	
SOORT_SIGNAAL not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
LEVEL 5. Check of relations between columns	
No level 5 checks applicable to this delivery.	
LEVEL 6. Check of completeness (numbers, cross checks, etc.)	
Double records (combination ALGORITME_NAAM, ALGORITME_VERSIE, SOORT_SIGNAAL, NAAM_MARKER)	OK/NOT OK (number of errors if NOT/OK)

2.6FOIS

This section describes the specifications for the delivery with a Feature of Interest (FOI) from the external supplier.

2.6.1 Background

The FOI is a calculated area based on plot information, on the basis of which the external supplier calculates marker results. It is a technique for identifying a crop unit. The FOI is coupled to the crop classification and to the mowing result. The calculated FOI can have the same geometry as a plot, but may also be different. Here you can distinguish between three situations, as described below. In addition, an FOI may be created because the plot is for example too narrow or too small.

An FOI matches the plot

In these cases, a section is often buffered inwards. In other words, the outer edges of a plot have been trimmed away. This situation is far and away the most common.

An FOI covers multiple plots (combined)

This situation can occur when 2 (very) small plots are located next to each other, with the same crop on the plot. These plots are combined in order to be able to identify the crop with greater certainty.

A plot contains multiple FOIs (split)

This situation can occur in the event of heterogeneity on a plot. For example, beetroots on one half and grass on the other.

2.6.2 Purpose and use

The ROV receives the FOIs from the external supplier. RVO uses the FOIs in its analysis of the external supplier's marker results.

2.6.3 Description of attributes in shapefile

Field name	Type	Length	Obligation	Description of function
PRODUCT_ID	Text	50	M	Unique identifying characteristic origin FOI from NEO
FOI_ID_LEV	Text	50	M	Unique identifying characteristic FOI from NEO

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.6.4 Description of attributes in csv file

Field name	Type	Length	Obligation	Description of function
PRODUCTIE_ID	Text	50	M	Unique identifying characteristic origin FOI from NEO
FOI_ID_LEVERANCIER	Text	50	M	Unique identifying characteristic FOI from NEO
GRG_FUNCTIONEEL_ID	Text	20	M	Unique identifying characteristic from RVO for a plot
KENMERK_FOI	Numerical	2	M	Indication of which characteristic relates to the FOI
FOUT_CODE_FOI	Text	50	C.	Indication of which error was observed in FOI analysis
FOI_BEOORDEELD	Numerical	1	M	Indication of whether an FOI analysis was conducted for each plot.

DATUM_GELDIG_VANAF	Date	10	M	First day of an administrative period on which FOI is valid. Layout: 20-05-2020
DATUM_GELDIG_TM	Date	10	C.	Last day of an administrative period on which FOI is valid. Layout: 20-05-2020
PERC_FOIS_TOV_PERCEEL	Numerical	4.3	C.	Percentage of surface area in relation to original plot if plot is split. Layout: 0.252 = 25.2%
NAAM_ALGORITME	Text	200	M	Name of the algorithm used
VERSIE_ALGORITME_LEVERANCIER	Text	50	M	Version of algorithm used
REDEN_BEEINDIGD	Numerical	2	C.	Reason why an FOI was ended

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.6.5 Detailed description

This section contains a generic explanation of the delivery and per attribute.

Generic explanation

To calculate an FOI, an algorithm is used. An FOIs delivery is therefore coupled to a delivery with algorithms. A delivery with algorithms must take place prior to or parallel with an FOIs delivery. If this is not the case, RVO cannot process the FOIs delivery.

All FOIs that have ever enjoyed the status active are delivered to RVO.

FOIs are given no standard end date. FOIs are never longer valid than the term of the plot on which they are based.

PRODUCTIE_ID

This attribute specifies from which database the FOI originates and is supplied to distinguish between double issued FOI_ID_LEVERANCIER. In the RVO database, this is an additional key, together with the FOI_ID_LEVERANCIER, that makes it possible to correctly couple signals and marker results and Ground Truth.

A delivery may not contain results from different environments of the external supplier. In other words, only 1 production ID may be delivered for each delivery. This restriction was added because it improves the user friendliness of the Viewer. As a result, in the Viewer, the choice for displaying a delivery always coincides with a single production environment, in other words a single set of FOIs.

FOI_ID_LEVERANCIER

Every change to an FOI results in a new FOI_ID_LEVERANCIER.

GRG_FUNCTIONEEL_ID

Every record relating to plots is uniquely identified with this ID. The layout is as follows:

- First 2 positions indicate the scheme (BBR=31; ANLB=35)
- Position 3 is a full stop
- Positions 4 to 16 form a unique ID (to each scheme)
- Position 17 is a full stop
- Positions 18 to 20 are the version number of the plot

KENMERK_FOI

This attribute contains the characteristic of the FOI. For the time being, this relates to the following characteristics:

- 0 An FOI that matches the plot 1 to 1
- 1 FOI that consists of 1 part of a split plot
- 2 FOI that consists of 2 combined plots

FOUT_CODE_FOI

If the FOI analysis reveals that errors have occurred, these are described here. More than 2 FOIs, or there are 2 FOIs but the boundary is incorrect.

FOI_BEOORDEELD

Each year, multiple deliveries can be carried out, and you wish to be certain whether the FOI analysis has been carried out for a plot.

DATUM_GELDIG_VANAF

No further explanation.

DATUM_GELDIG_TM

- This is an up to and including date.
- Standard empty
- If a change occurs, the FOI is ended and the end date entered

PERC_FOIS_TOV_PERCEEL

Percentage of surface area in relation to original plot if plot is split.

ALGORITME_NAAM

The name of the algorithm in combination with ALGORITME_VERSIE is a unique key for coupling the FOI to the algorithm used.

ALGORITME_VERSIE

See ALGORITME_NAAM.

REDEN_BEEINDIGD

No further explanation.

2.6.6 Output check

The output check by NEO consists of 6 levels. Up to and including level 5 are hard errors. If these occur, NEO is not permitted to deliver to RVO, unless decided otherwise. Errors that occur at level 6 checks need not necessarily be hard errors, but do require an explanation in the submission document for a delivery. The table below describes the checks.

Level/check	Result
LEVEL 1. Checks at file level (physical file)	
Corrupt file error	OK/NOT OK (number of errors if NOT/OK)
Empty file error	OK/NOT OK (number of errors if NOT/OK)

File name error	OK/NOT OK (number of errors if NOT/OK)
File format error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 2. Check of record type (file lines)	
Header error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 3. Check of line structure (format)	
FOI_ID_LEVERANCIER empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
GRG_FUNCTIONEEL_ID empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
PRODUCTIE_ID empty	OK/NOT OK (number of errors if NOT/OK)
KENMERK_FOI empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
FOUT_CODE_FOI not NUM	OK/NOT OK (number of errors if NOT/OK)
FOI_BEOORDEELD empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
DATUM_GELDIG_VANAF empty or not DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_GELDIG_TM not DATE	OK/NOT OK (number of errors if NOT/OK)
PERC_FOIS_TOV_PERCEEL not NUM	OK/NOT OK (number of errors if NOT/OK)
REDEN_BEEINDIGD not NUM	OK/NOT OK (number of errors if NOT/OK)
LEVEL 4. Check of line content (domains)	
KENMERK_FOI not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
REDEN_BEEINDIGD not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
FOUT_CODE_FOI not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
DATUM_GELDIG_TM not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_GELDIG_VANAF not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
LEVEL 5. Check of relations between columns	
REDEN_BEEINDIGD AND DATUM_GELDIG_TM wrong combination	OK/NOT OK (number of errors if NOT/OK)
DATUM_GELDIG_TM before DATUM_VANAF	OK/NOT OK (number of errors if NOT/OK)
LEVEL 6. Check of completeness (numbers, cross checks, etc.)	
Double records CSV (combination VERSIE_ALGORITME_LEVERANCIER FOI_ID_LEVERANCIER GRG_FUNCTIONEEL_ID DATUM_GELDIG_TM KENMERK_FOI PRODUCTIE_ID NAAM_ALGORITME)	OK/NOT OK (number of errors if NOT/OK)
Double records SHP (combination FOI_ID_LEV PRODUCT_ID)	OK/NOT OK (number of errors if NOT/OK)
All plots in delivery of BPR plots have at least 1 FOI_ID_LEVERANCIER	OK/NOT OK (number of errors if NOT/OK)
PERCEEL_SAMENGEVOEGD = 1 has at least 2 records with different GRG_FUNCTIONEEL_ID	OK/NOT OK (number of errors if NOT/OK)
PERCEEL_GESPLITST = 1 has at least 2 records with different FOI_ID_LEVERANCIER	OK/NOT OK (number of errors if NOT/OK)
Check numbers CSV and SHP match	OK/NOT OK (numbers CSV and SHP if NOT OK)
Geometry: self intersects	OK/NOT OK (number of errors if NOT/OK)
Geometry: double nodes	OK/NOT OK (number of errors if NOT/OK)
Geometry: multiparts	OK/NOT OK (number of errors if NOT/OK)
Geometry: geographical location within NL	OK/NOT OK (number of errors if NOT/OK)
Geometry: Check of coordinate system	OK/NOT OK (EPSG code)

2.7Crop classification

This section describes the specifications of the delivery with crop classifications from NEO

2.7.1 Background

The external supplier supplies the crop classification at superclass level. This refers to a grouping of crop codes as already described under crop codes superclasses. The intention is to carry out the crop classification in 3 parts, each year. In May, July and August. These are also referred to as the winter classification, early summer classification and late summer classification.

- The purpose of the winter classification is to distinguish between winter crops, such as grass and winter cereals. This information could be used in the future to warn applicants about the winter crops. The winter crops are classified according to the images for March through to May.
- The purpose of the early summer classification is to classify the summer crops, using the images from March through to June.
- The purpose of the late summer classification is to classify the summer crops and nitrogen binders (peas, green beans, etc.). Use is made of images from March through to August.

With every delivery, the external supplier supplies a maximum of 5 possible superclasses over the analysis period, for each FOI. The results are a probability calculation reproduced as a percentage probability that the superclass is actually present. The total of these 5 superclasses is always 100.

2.7.2 Purpose and use

The ROV receives the crop classification from the external supplier. RVO uses the crop classification in its analysis of the marker results from the external supplier and to assess the plot that has been applied for.

2.7.3 Description of file attributes

Field name	Type	Length	Obligation	Description of function
ID_MARKERRESULTAAT	Numerical	19	M	Unique identification number per classification per FOI
PRODUCTIE_ID	Text	50	M	Unique identifying characteristic origin ID_MARKERRESULTAAT from NEO
FOI_ID_LEVERANCIER	Text	50	M	Unique identifying characteristic FOI from NEO
NAAM_ALGORITME	Text	200	M	In combination with VERSIE_ALGORITME_ LEVERANCIER a unique identifying characteristic for the used algorithm.
VERSIE_ALGORITME_LEVERANCIER	Text	50	M	In combination with NAAM_ALGORITME a unique identifying characteristic for the used algorithm
DATUM_BEGIN_ANALYSEPERIODE	Date	10	M	Start of analysis period Layout: 20-05-2020
DATUM_EIND_ANALYSEPERIODE	Date	10	M	End of analysis period

				Layout: 30-05-2020
LAATST_GEBRUIKT_SIGNAAL	Date	19	C.	Shows the last signal used during the analysis period. Layout: 23-05-2020 00:00:00
SUPERKLASSE_CODE	Text	10	C.	Identifying characteristic of an early or late superclass
INDICATIE TYPE SUPERKLASSE	Numerical	2	C.	Identification early or late superclass Layout: 01 or 02
WAARSCHIJNLIJKHEID	Numerical	4.3	C.	Probability calculation whether superclass is actually present. Layout: 0.252 = 25.2%
CLASSIFICATIE_SELECTIE	Text	100	O	Indication of whether the result is used as training data
REDEN_GEEN_RESULTAAT	Text	50	C.	Explanation why there is no result for the FOI

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.7.4 Detailed description

This section contains a generic explanation of the delivery and per attribute.

Generic explanation

N/A

ID_MARKERRESULTAAT

A classification consists of 5 possible superclasses per FOI per delivery. All 5 have the same ID_MARKERRESULTAAT.

PRODUCTIE_ID

This attribute identifies from which database the classification originates and is supplied to distinguish between double issued ID_MARKERRESULTAAT. In the RVO database, this is an additional key, together with FOI_ID_LEVERANCIER to make it possible to correctly couple the classification to the FOI.

A delivery may not contain results from different environments of the external supplier. In other words, only 1 production ID may be delivered for each delivery. This restriction was added because it improves the user friendliness of the Viewer. As a result, in the Viewer, the choice for displaying a delivery always coincides with a single production environment, in other words a single set of FOIs.

FOI_ID_LEVERANCIER

No further explanation.

ALGORITME_NAAM

The name of the algorithm in combination with ALGORITME_VERSIE is a unique key for coupling the FOI to the algorithm used.

ALGORITME_VERSIE

See ALGORITME_NAAM.

DATUM_BEGIN_ANALYSEPERIODE

This attribute helps determine which images were used to calculate the marker.

DATUM_EIND_ANALYSEPERIODE

This attribute helps determine which images were used to calculate the marker.

LAATST_GEBRUIKT_SIGNAAL

This is a conditional attribute that is entered with a result and is also in principle entered if there is no result. Depending on the reason why there is no result, it is possible that the field does not have to be entered. Checks are not carried out at this level.

The purpose of this attribute is to provide an insight into which images were included in producing the crop classification. It is possible that not all images that were available within the analysis period were included, because the image was not converted into a signal at the moment of production of the crop classification.

Below an example for clarification.

Analysis period	**1-1-19**						**1-4-19**	
Recording date images		2-jan		14-feb		20-mrt		
Date and time of signal added to database			15-feb		20-feb			4-apr
Production date of marker								3-apr

In this example, the last image processed that is included in production of the marker results is 20 February. On the production date of 22 March, the image from 20 March was not yet processed into a signal and stored in the database, which you would expect to have been the case, if you consider the analysis period.

SUPERKLASSE_CODE

This is a conditional field that is empty if there is no result. In this case REDEN_GEEN RESULTAAT is entered.

INDICATIE TYPE SUPERKLASSE

This is a conditional field that is empty if there is no result. In this case REDEN_GEEN RESULTAAT is entered.

WAARSCHIJNLIJKHEID

This is a conditional field that is empty if there is no result. In this case REDEN_GEEN RESULTAAT is entered.

CLASSIFICATIE_SELECTIE

No further explanation.

REDEN_GEEN_RESULTAAT

It is possible that the algorithm is not able to generate an event. The reason why this is not possible provides an insight, and the purpose is to improve the marker result.

2.7.5 Output check

The output check by NEO consists of 6 levels. Up to and including level 5 are hard errors. If these occur, NEO is not permitted to deliver to RVO, unless decided otherwise. Errors that occur at level 6 checks need not necessarily be hard errors, but do require an explanation in the submission document for a delivery. The table below describes the checks.

Level/check	Result
LEVEL 1. Checks at file level (physical file)	
Corrupt file error	OK/NOT OK (number of errors if NOT/OK)
Empty file error	OK/NOT OK (number of errors if NOT/OK)
File name error	OK/NOT OK (number of errors if NOT/OK)
File format error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 2. Check of record type (file lines)	
Header error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 3. Check of line structure (format)	
ID MARKERRESULTAAT empty or not AN	OK/NOT OK (number of errors if NOT/OK)
FOI_ID_LEVERANCIER empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
PRODUCTIE_ID empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
NAAM_ALGORITME empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
VERSIE_ALGORITME_LEVERANCIER empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
DATUM_BEGIN_ANALYSEPERIODE empty or not DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_EIND_ANALYSEPERIODE empty or not DATE	OK/NOT OK (number of errors if NOT/OK)
LAATST_GEBRUIKT_SIGNAAL empty or not TIMESTAMP	OK/NOT OK (number of errors if NOT/OK)
SUPERKLASSE_CODE empty or not NUM if REDEN_GEEN_RESULTAAT is empty	OK/NOT OK (number of errors if NOT/OK)
INDICATIE TYPE SUPERKLASSE empty or not NUM if REDEN_GEEN_RESULTAAT is empty	OK/NOT OK (number of errors if NOT/OK)
WAARSCHIJNLIJKHEID empty or not NUM if REDEN_GEEN_RESULTAAT is empty	OK/NOT OK (number of errors if NOT/OK)
CLASSIFICATIE_SELECTIE not STRING	OK/NOT OK (number of errors if NOT/OK)
REDEN_GEEN_RESULTAAT not STRING	OK/NOT OK (number of errors if NOT/OK)
LEVEL 4. Check of line content (domains)	
DATUM_BEGIN_ANALYSEPERIODE not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_EIND_ANALYSEPERIODE not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
LAATST_GEBRUIKT_SIGNAAL not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
INDICATIE TYPE SUPERKLASSE not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
WAARSCHIJNLIJKHEID not in VALID RANGE	OK/NOT OK (number of errors if NOT/OK)
CLASSIFICATIE_SELECTIE not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
REDEN_GEEN_RESULTAAT not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
LEVEL 5. Check of relations between columns	
DATUM_BEGIN_ANALYSEPERIODE before DATUM_EIND_ANALYSEPERIODE	OK/NOT OK (number of errors if NOT/OK)
REDEN_GEEN_RESULTAAT empty and SUPERKLASSE_CODE empty	OK/NOT OK (number of errors if NOT/OK)
REDEN_GEEN_RESULTAAT empty and INDICATIE TYPE SUPERKLASSE empty	OK/NOT OK (number of errors if NOT/OK)
REDEN_GEEN_RESULTAAT empty and WAARSCHIJNLIJKHEID empty	OK/NOT OK (number of errors if NOT/OK)
LEVEL 6. Check of completeness (numbers, cross checks, etc.)	
Still to be developed.	

2.8Events

This section describes the specifications of the delivery from the external supplier with marker results focused on activities (events) such as mowing and ploughing.

2.8.1 Background

For the time being, the format of this type of delivery is geared to mowing moments, but in the future will also include ploughing, sowing and harvesting.

2.8.2 Purpose and use

The external supplier sends the marker results to RVO. RVO uses the results for validations and analyses.

2.8.3 Description of file attributes

Field name	Type	Length	Obligation	Description of function
ID_MARKERRESULTAAT	Numerical	19	M	Unique identification number per even per FOI.
PRODUCTIE_ID	Text	50	M	Unique identifying characteristic origin ID_MARKERRESULTAAT from NEO
FOI_ID_LEVERANCIER	Text	50	M	Unique identifying characteristic FOI from NEO
NAAM_ALGORITME	Text	200	M	In combination with VERSIE_ALGORITME_ LEVERANCIER a unique identifying characteristic for the used algorithm.
VERSIE_ALGORITME_LEVERANCIER	Text	50	M	In combination with NAAM_ALGORITME a unique identifying characteristic for the used algorithm
DATUM_BEGIN_ANALYSEPERIODE	Date	10	M	Start of analysis period Layout: 20-05-2020
DATUM_EIND_ANALYSEPERIODE	Date	10	M	End of analysis period Layout: 30-05-2020
LAATST_GEBRUIKT_SIGNAAL	Date	19	C.	Shows the last signal used during the analysis period. Layout: 23-05-2020 00:00:00
INTERPRETATIE	Text	50	C.	An interpretation of the trend
TREND	Text	50	C.	Explanation of the change of FOI
BEGINDATUM_EVENT	Date	19	C.	Start date of the interpreted event. Layout: 20-5-2020 00:00:00
EINDDATUM_EVENT	Date	19	C.	End date of the interpreted event. Layout: 30-5-2020 00:00:00
WAARSCHIJNLIJKHEID	Numerical	4.3	C.	Probability calculation that the interpretation is correct

				Layout: 0.252 = 25.2%
REDEN_GEEN_RESULTAAT	Text	50	C.	Explanation of why marker has no result.

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.8.4 Detailed description

This section contains a generic explanation of the delivery and per attribute.

Generic explanation

N/A

ID_MARKERRESULTAAT

Every event his its own ID_MARKERRESULTAAT.

PRODUCTIE_ID

This attribute identifies from which database the event originates and is supplied to distinguish between double issued ID_MARKERRESULTAAT. In the RVO database, this is an additional key, together with FOI_ID_LEVERANCIER to make it possible to correctly couple the event to the FOI.

A delivery may not contain results from different environments of the external supplier. In other words, only 1 production ID may be delivered for each delivery. This restriction was added because it improves the user friendliness of the Viewer. As a result, in the Viewer, the choice for displaying a delivery always coincides with a single production environment, in other words a single set of FOIs.

FOI_ID_LEVERANCIER

No further explanation.

ALGORITME_NAAM

The name of the algorithm in combination with ALGORITME_VERSIE is a unique key for coupling the FOI to the algorithm used.

ALGORITME_VERSIE

See ALGORITME_NAAM.

DATUM_BEGIN_ANALYSEPERIODE

This attribute helps determine which images were used to calculate the marker.

DATUM_EIND_ANALYSEPERIODE

This attribute helps determine which images were used to calculate the marker.

LAATST_GEBRUIKT_SIGNAAL

This is a conditional attribute that is entered with a result and is also in principle entered if there is no result. Depending on the reason why there is no result, it is possible that the field does not have to be entered. We have agreed that we will not check at this level.

The purpose of this attribute is to provide an insight into which images were included in producing the crop classification. It is possible that not all images that were available within the analysis period were included, because the image was not converted into a signal at the moment of production of the crop classification.

Below an example for clarification.

Analysis period	**1-1-19**						**1-4-19**	
Recording date images		2-jan		14-feb		20-mrt		
Date and time of signal added to database			15-feb		20-feb			4-apr

Production date of marker								3-apr

In this example, the last image processed that is included in production of the marker results is 20 February. On the production date of 22 March, the image from 20 March was not yet processed into a signal and stored in the database, which you would expect to have been the case, if you consider the analysis period.

INTERPRETATIE

It is an interpretation on the basis of the TREND. For example in the case 'vegetation declined' the interpretation would be 'mowed'. Non-events can also be recorded here. These are not events, but do help create a complete picture of the events at an FOI. An example is 'there is grass' and 'grass growing/recovered'.

This is a conditional field that is empty if there is no result.

TREND

This is a conditional field that is empty if there is no result. The field says something about the change on the plot within an FOI. For example 'vegetation increased'.

BEGINDATUM_EVENT

This is a conditional field that is empty if there is no result.

For the markers mow, plough and harvest, this means that the EVENT took place somewhere between BEGINDATUM_EVENT and EINDDATUM_EVENT. This is a range because images are not available for every day.

For non-events (see interpretation), it means that the NON-EVENT applied for the entire period BEGINDATUM_EVENT - EINDDATUM_EVENT.

EINDDATUM_EVENT

This is a conditional field that is empty if there is no result. The end date described under BEGINDATUM_EVENT.

WAARSCHIJNLIJKHEID

This is a conditional field that is empty if there is no result.

The value contains an approximation of probability. The external supplier calculates this in different ways, but the result is always a value between 0.000 and 1.000 In this case, for example 0.6 = correct in 60% of cases.

REDEN_GEEN_RESULTAAT

It is possible that the algorithm is not able to generate an event. The reason why this is not possible provides an insight, and the purpose is to improve the marker result.

2.8.5 Output check

The output check by NEO consists of 6 levels. Up to and including level 5 are hard errors. If these occur, NEO is not permitted to deliver to RVO, unless decided otherwise. Errors that occur at level 6 checks need not necessarily be hard errors, but do require an explanation in the submission document for a delivery. The table below describes the checks.

Level/check	Result
LEVEL 1. Checks at file level (physical file)	
Corrupt file error	OK/NOT OK (number of errors if NOT/OK)
Empty file error	OK/NOT OK (number of errors if NOT/OK)

File name error	OK/NOT OK (number of errors if NOT/OK)
File format error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 2. Check of record type (file lines)	
Header error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 3. Check of line structure (format)	
ID MARKERRESULTAAT empty or not AN	OK/NOT OK (number of errors if NOT/OK)
FOI_ID_LEVERANCIER empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
NAAM_ALGORITME empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
VERSIE_ALGORITME_LEVERANCIER empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
DATUM_BEGIN_ANALYSEPERIODE empty or not DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_EIND_ANALYSEPERIODE empty or not DATE	OK/NOT OK (number of errors if NOT/OK)
LAATST_GEBRUIKT_SIGNAAL empty or not TIMESTAMP	OK/NOT OK (number of errors if NOT/OK)
INTERPRETATIE not STRING	OK/NOT OK (number of errors if NOT/OK)
TREND not STRING	OK/NOT OK (number of errors if NOT/OK)
BEGINDATUM_EVENT not TIMESTAMP	OK/NOT OK (number of errors if NOT/OK)
EINDDATUM_EVENT not TIMESTAMP	OK/NOT OK (number of errors if NOT/OK)
WAARSCHIJNLIJKHEID not NUM	OK/NOT OK (number of errors if NOT/OK)
REDEN_GEEN_RESULTAAT not STRING	OK/NOT OK (number of errors if NOT/OK)
LEVEL 4. Check of line content (domains)	
ATUM_BEGIN_ANALYSEPERIODE not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_EIND_ANALYSEPERIODE not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
LAATST_GEBRUIKT_SIGNAAL not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
INTERPRETATIE not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
TREND not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
BEGINDATUM_EVENT not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
EINDDATUM_EVENT not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
WAARSCHIJNLIJKHEID not in VALID RANGE	OK/NOT OK (number of errors if NOT/OK)
REDEN_GEEN_RESULTAAT not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
LEVEL 5. Check of relations between columns	
DATUM_BEGIN_ANALYSEPERIODE before DATUM_EIND_ANALYSEPERIODE	OK/NOT OK (number of errors if NOT/OK)
EINDDATUM_EVENT before BEGINDATUM_EVENT	OK/NOT OK (number of errors if NOT/OK)
BEGINDATUM_EVENT_outside_ANALYSEPERIODE	OK/NOT OK (number of errors if NOT/OK)
EINDEDATUM_EVENT_outside_ANALYSEPERIODE	OK/NOT OK (number of errors if NOT/OK)
REDEN_GEEN_RESULTAAT empty and event attributes are empty	OK/NOT OK (number of errors if NOT/OK)
REDEN_GEEN_RESULTAAT has a value and event attributes are not empty	OK/NOT OK (number of errors if NOT/OK)
LEVEL 6. Check of completeness (numbers, cross checks, etc.)	
Still to be developed.	

2.9 Signals

This section describes the specifications for delivery with the signals used from the external supplier.

2.9.1 Background

The external supplier calculates signals on the basis of images made by the various satellites. These images are made using different techniques. The images are supplied by the European Space Agency (ESA). NEO calculates different types of signals.

2.9.2 Purpose and use

The external supplier sends the marker results to RVO. RVO uses the results for validations and analyses.

2.9.3 Description of file attributes

Field name	Type	Length	Obligation	Description of function
PRODUCTIE_ID	Text	50	M	Unique identifying characteristic origin FOI_ID_LEVERANCIER from NEO
FOI_ID_LEVERANCIER	Text	50	M	Unique identifying characteristic FOI from NEO
BRON_SIGNAAL	Text	50	M	Name of satellite that recorded the image
TYPE_SIGNAAL	Text	50	M	Technique used in recording image
SOORT_SIGNAAL	Text	50	M	Type of signal calculated
AANTAL_PIXELS	Numerical	10.2	M	Number of pixels (partially) touching the image Layout: 12345678.12
AANTAL_GEBRUIKTE_PIXELS	Numerical	8	M	Number of pixels used to calculate the delivered statistic for an FOI>
DATUM_BEELD	Date	19	M	Moment at which the satellite took the image Layout: 20-05-2020 10:13:00
CREATIE_DATUM_SIGNAAL	Date	19	M	Moment at which NEO calculated the value of the signal. Layout: 25-05-2020 10:13:00
TYPE_WAARDE	Text	50	M	Reproduction of the type of value calculated
BEREKENDE_WAARDE	Numerical	9.3	M	Calculated value that belongs to the type of value

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.9.4 Detailed description

This section contains a generic explanation of the delivery and per attribute.

Generic explanation

N/A

PRODUCTIE_ID

This attribute identifies from which database the event originates and is supplied to distinguish between double issued ID_MARKERRESULTAAT. In the RVO database, this is an additional key, together with FOI_ID_LEVERANCIER to make it possible to correctly couple the signal to the FOI.

A delivery may not contain results from different environments of the external supplier. In other words, only 1 production ID may be delivered for each delivery. This restriction was added because it improves the user friendliness of the Viewer. As a result, in the Viewer, the choice for displaying a delivery always coincides with a single production environment, in other words a single set of FOIs.

FOI_ID_LEVERANCIER

No further explanation.

BRON_SIGNAAL

No further explanation.

TYPE_SIGNAAL

Examples of the signal type are optic, radar, etc.

SOORT_SIGNAAL

This field contains values like: NDVI, VV_Coherence etc., but also if no signal could be calculated, Cloud, Haze, Shadow, etc. are entered here.

AANTAL_PIXELS

This is the total number of pixels touching the FOI irrespective of the size of the overlap between image and pixel.

AANTAL_GEBRUIKTE_PIXELS

The number of pixels used is always a full pixel.

DATUM_BEELD

No further explanation.

CREATIE_DATUM_SIGNAAL

No further explanation.

TYPE_WAARDE

Value types include: average, median, standard deviation, etc.

BEREKENDE_WAARDE

This value can be both positive and negative, and contains no fixed data range.

2.9.5 Output check

The output check by NEO consists of 6 levels. Up to and including level 5 are hard errors. If these occur, NEO is not permitted to deliver to RVO, unless decided otherwise. Errors that occur at level 6 checks need not necessarily be hard errors, but do require an explanation in the submission document for a delivery. The table below describes the checks.

Level/check	Result
LEVEL 1. Checks at file level (physical file)	
Corrupt file error	OK/NOT OK (number of errors if NOT/OK)
Empty file error	OK/NOT OK (number of errors if NOT/OK)
File name error	OK/NOT OK (number of errors if NOT/OK)
File format error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 2. Check of record type (file lines)	

Header error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 3. Check of line structure (format)	
FOI_ID_LEVERANCIER empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
PRODUCTIE_ID empty	OK/NOT OK (number of errors if NOT/OK)
BRON_SIGNAAL empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
TYPE_SIGNAAL empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
SOORT_SIGNAAL empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
AANTAL_PIXELS empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
AANTAL_GEBRUIKTE_PIXELS empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
LEVEL 4. Check of line content (domains)	
BRON_SIGNAAL not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
TYPE_SIGNAAL not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
SOORT_SIGNAAL not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
AANTAL_PIXELS = 0	OK/NOT OK (number of errors if NOT/OK)
AANTAL_GEBRUIKTE_PIXELS = 0	OK/NOT OK (number of errors if NOT/OK)
DATUM_BEELD not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
CREATIE_DATUM_SIGNAAL not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
TYPE_WAARDE not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
LEVEL 5. Check of relations between columns	
AANTAL_GEBRUIKTE_PIXELS > AANTAL_PIXELS	OK/NOT OK (number of errors if NOT/OK)
CREATIE_DATUM_SIGNAAL before DATUM_BEELD	OK/NOT OK (number of errors if NOT/OK)
SOORT_SIGNAAL and BRON_SIGNAAL incorrect combination	OK/NOT OK (number of errors if NOT/OK)
LEVEL 6. Check of completeness (numbers, cross checks, etc.)	
Double records (combination FOI_ID_LEVERANCIER, PRODUCTIE_ID, DATUM_BEELD, TYPE_WAARDE, SOORT_SIGNAAL, BRON_SIGNAAL)	OK/NOT OK (number of errors if NOT/OK)
Valid FOI_ID_LEVERANCIER (existing in FOIs delivery)	OK/NOT OK (number of errors if NOT/OK)

2.10 Ground Truth

This section describes the specifications for delivery with Ground Truth data from the external supplier.

2.10.1 Background

The Ground Truth indicates for the selected FIOs what crop is actually present or what activities have been carried out. The external supplier collects Ground Truth in 2 different ways: people inspect the field at the plots (FOIs) or Ground Truth is gathered on the basis of images. For example with aerial photographs that have a far higher resolution than the satellite images of the European Space Agency.

2.10.2 Purpose and use

Ground Truth data are primarily exchanged from the external supplier to RVO, but vice versa it is also possible for RVO to independently gather data outside the AM Viewer. The same format is used for both methods. Both RVO and the external supplier use the Ground Truth to carry out validations.

2.10.3 **Description of file attributes**

Field name	Type	Length	Obligation	Description
PRODUCTIE_ID	Text	50	M	Unique identifying characteristic origin FOI_ID_LEVERANCIER from NEO
FOI_ID_LEVERANCIER	Text	50	M	Unique identifying characteristic FOI from NEO
DATUM_BEGIN_VERZAMELPERIODE	Date	10	M	Start of gathering period Ground Truth Layout: 20-05-2020
DATUM_EIND_VERZAMELPERIODE	Date	10	M	End of gathering period Ground Truth Layout: 25-05-2020
MARKER_TYPE	Text	50	M	Marker type
MARKER_SUBTYPE	Text	50	M	Marker name
GROUND_TRUTH_METHODE	Numerical	2	M	Way in which Ground Truth is gathered
GROUND_TRUTH_BRON	Numerical	2	M	Reproduction of source for gathering Ground Truth
DATUM_GROUND_TRUTH_VERZ	Date	19	M	The date on which an employee gathered Ground Truth Layout: 20-05-2020 00:00:00
GROUND_TRUTH_INTERPRETATIE	Text	50	C.	Outcome of Ground Truth gathering for events
GROUND_TRUTH_SUPERKLASSE_CODE	Text	50	C.	Outcome of Ground Truth gathering crop classification
INDICATIE_TYPE_SUPERKLASSE	Numerical	2	C.	Identification early or late superclass
DATUM_BEGIN	Date	10	C.	The first date of the images on which an event was observed. Layout: 20-05-2020
DATUM_EINDE	Date	10	C.	The last date of the images on which an event was observed. Layout: 25-05-2020
GROUND_TRUTH_BRUIKBAAR	Numerical	2	M	Indicates whether the Ground Truth is usable.
REDEN_ONBRUIKBAAR	Numerical	2	C.	Reason why Ground Truth is unusable.
EXPLANATION	Text	500	O	Optional

M = Mandatory | C = Conditional (entry dependent on a particular condition) | O = Optional

2.10.4 **Detailed description**

This section contains a generic explanation of the delivery and per attribute.

Generic explanation

N/A

PRODUCTIE_ID

This attribute identifies from which database the event originates and is supplied to distinguish between double issued ID_MARKERRESULTAAT. In the RVO database, this is an additional key, together with FOI_ID_LEVERANCIER to make it possible to correctly couple the Ground Truth to the FOI.

A delivery may not contain results from different environments of the external supplier. In other words, only 1 production ID may be delivered for each delivery. This restriction was added because it improves the user friendliness of the Viewer. As a result, in the Viewer, the choice for displaying a delivery always coincides with a single production environment, in other words a single set of FOIs.

FOI_ID_LEVERANCIER

No further explanation.

DATUM_BEGIN_VERZAMELPERIODE

Period about which agreement has been reached with the external supplier that Ground Truth will be gathered. This is metadata for the delivery to assess whether Ground Truth was gathered over the agreed period.

DATUM_EIND_VERZAMELPERIODE

Same as DATUM_BEGIN_VERZAMELPERIODE.

MARKER_TYPE

No further explanation.

MARKER_SUBTYPE

No further explanation.

GROUND_TRUTH_METHODE

This field indicates whether data was gathered physically or using images, such as aerial photographs.

GROUND_TRUTH_BRON

The used source is generally a tool and may for example be Geopedia or the PMF viewer. If GROUND_TRUTH_METHODE is physical, this is reproduced as ‘field check check’.

DATUM_GROUND_TRUTH_VERZ

No further explanation.

GROUND_TRUTH_INTERPRETATIE

This is a conditional field that is entered if Ground Truth is gathered for events such as mowing. Non-events can also be recorded here. These are not events, but do help create a complete picture of the events at an FOI. This information is also used in training algorithms to detect ‘non events’. An example is ‘there is grass’ and ‘grass growing/recovered’.

GROUND_TRUTH_SUPERKLASSE_CODE

This is a conditional field that is entered if Ground Truth is gathered for crop classification.

INDICATIE TYPE SUPERKLASSE

This is a conditional field that is entered if Ground Truth is gathered for crop classification.

DATUM_BEGIN

This is a conditional field that is entered if Ground Truth is gathered for events such as mowing.

DATUM_EINDE

This is a conditional field that is entered if Ground Truth is gathered for events such as mowing.

GROUND_TRUTH_BRUIKBAAR

No further explanation.

REDEN_ONBRUIKBAAR

This is a conditional field that is entered if the Ground Truth is unusable.

EXPLANATION

No further explanation.

2.11 Output check

The output check by NEO consists of 6 levels. Up to and including level 5 are hard errors. If these occur, NEO is not permitted to deliver to RVO, unless decided otherwise. Errors that occur at level 6 checks need not necessarily be hard errors, but do require an explanation in the submission document for a delivery. The table below describes the checks.

Level/check	Result
LEVEL 1. Checks at file level (physical file)	
Corrupt file error	OK/NOT OK (number of errors if NOT/OK)
Empty file error	OK/NOT OK (number of errors if NOT/OK)
File name error	OK/NOT OK (number of errors if NOT/OK)
File format error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 2. Check of record type (file lines)	
Header error	OK/NOT OK (number of errors if NOT/OK)
LEVEL 3. Check of line structure (format)	
FOI_ID_LEVERANCIER empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
PRODUCTIE_ID empty	OK/NOT OK (number of errors if NOT/OK)
DATUM_BEGIN_VERZAMELPERIODE empty or not DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_EIND_VERZAMELPERIODE empty or not DATE	OK/NOT OK (number of errors if NOT/OK)
MARKER_TYPE empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
MARKER_SUBTYPE empty or not STRING	OK/NOT OK (number of errors if NOT/OK)
GROUND_TRUTH_METHODE empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
GROUND_TRUTH_BRON empty or not NUM	OK/NOT OK (number of errors if NOT/OK)
DATUM_GROUND_TRUTH_VERZ empty or not DATE	OK/NOT OK (number of errors if NOT/OK)
GROUND_TRUTH_INTERPRETATIE not STRING	OK/NOT OK (number of errors if NOT/OK)
GROUND_TRUTH_SUPERKLASSE_CODE not NUM	OK/NOT OK (number of errors if NOT/OK)
DATUM_BEGIN not DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_EINDE not DATE	OK/NOT OK (number of errors if NOT/OK)
LEVEL 4. Check of line content (domains)	
DATUM_BEGIN_VERZAMELPERIODE not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_EIND_VERZAMELPERIODE not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
MARKER_TYPE not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)

MARKER_SUBTYPE not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
GROUND_TRUTH_METHODE not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
GROUND_TRUTH_BRON not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
DATUM_GROUND_TRUTH_VERZ not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
GROUND_TRUTH_INTERPRETATIE not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
INDICATIE TYPE SUPERKLASSE not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
DATUM_BEGIN not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
DATUM_EINDE not VALID DATE	OK/NOT OK (number of errors if NOT/OK)
GROUND_TRUTH_BRUIKBAAR not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
REDEN_ONBRUIKBAAR not in DOMAIN	OK/NOT OK (number of errors if NOT/OK)
LEVEL 5. Check of relations between columns	
DATUM_EIND_VERZAMELPERIODE before DATUM_BEGIN_VERZAMELPERIODE	OK/NOT OK (number of errors if NOT/OK)
MARKER_TYPE and GROUND_TRUTH_INTERPRETATIE incorrect combination	OK/NOT OK (number of errors if NOT/OK)
MARKER_TYPE and GROUND_TRUTH_SUPERKLASSE_CODE incorrect combination	OK/NOT OK (number of errors if NOT/OK)
MARKER_TYPE and INDICATIE TYPE SUPERKLASSE incorrect combination	OK/NOT OK (number of errors if NOT/OK)
MARKER_TYPE and DATUM_BEGIN incorrect combination	OK/NOT OK (number of errors if NOT/OK)
MARKER_TYPE and DATUM_EINDE incorrect combination	OK/NOT OK (number of errors if NOT/OK)
REDEN_ONBRUIKBAAR and GROUND_TRUTH_BRUIKBAAR incorrect combination	OK/NOT OK (number of errors if NOT/OK)
LEVEL 6. Check of completeness (numbers, cross checks, etc.)	
Still to be developed.	

Annex B: Architecture, interfaces and data sources

The data sources, interfaces and architecture are presented in this document (see figure 2 and figure 3). The architecture consists of several components. In the table presented below each component is described. There is also a description of the different interfaces and data sources.

Object description

Object	Description
Run AMS marker and download results	SaaS: an authorised NEA employee is able to run specific markers using a browser-based application. They can start the process for a specific area and number of parcels, can configure certain aspects of the marker, can define the period, and can download the results.
Analysis platform	SaaS: an authorised NEA employee is able to perform specific types of analyses via a browser-based application using data available in the cloud environment, but can also upload own datasets (GPKG, shapefiles, CSV).
Interface for data query/analysis	The analysis platform is able to use existing APIs with OGC compliant services (WM(T)S, WFT, WMS) and COGs, but also specific processing functions, including batch operations.
External services for visualisation/reporting	Using an API, OGC-compliant services (WMTS, WFT, WMS) and externally authorised COGs are made available for visualisation and reporting.
Download interface for COGs and alphanumeric files	Via File Exchange files (CSV and COGs) will be delivered to NEA to be used for further processing in the AM Viewer and the NEA AMS environment.
Improve algorithms with Ground Truth NEA	A feedback loop used to improve the quality of existing algorithms based on ground truth data.
Validate parcels from NEA	Throughout the year, NEA will deliver new parcels or mutations of existing parcels. These parcels need to be validated and stored for further processing.
Extract statistics	Functionality for generating FOIs, signals and marker results.
NEA AMS environment	Oracle Apex application used as a central database for all results and used for generating traffic lights. AM Viewer is used for visualizing satellite data, signal data, marker results, collecting ground truth and for analysing marker deliveries.

Interface description

Source	Target	Number or records	Frequency	Priority level	Type	Operation
Cloud	AMS(NEA)	3,000,000 - 1 billion	3 .. 10 times a year	4	sFTP & File (monthly).	Marker results, Signals, FOIS
Cloud	AM Viewer (NEA)	Large		5	sFTP & Files CSV	Marker results, Signals, FOIS, Ground Truth
Cloud	AM Viewer (NEA)	Large		5	sFTP & Files COGs	Satellite imagery (Sentinel, Landsat, Planet Fusion) and aerial imagery
AM Viewer	Cloud			5	sFTP & Files	Ground Truth (CSV)
Geo register (NEA)	Cloud	Large	Monthly	2	sFTP & Files	Importing parcel data (GIS) - Initial set and monthly updates (mutations)
NEA	Cloud				Web GUI	Configuring and running markers (Edge, Mozilla Firefox, Google Chrome)
NEA	Cloud				Web GUI	Access to the analysis platform, through a browser (Edge, Mozilla Firefox, Google Chrome)
Cloud	NEA				OGC webservices (WMTS, WFS, ..) & COGs	Requesting Marker results, Signals, FOIs, Imagery, Ground Truth

Data sources (see also figure 2)

Object	Description
Satellite image	Image from space (radar, optical)
Signal	A signal is a physical quantity that varies with time, space or any independent variable or variables. The Copernicus program delivers a vast amount of imagery which are considered as a main source of data. The CbM-signal is designed to reduce this 'deluge' to something that is easily, reliably and accountably managed. A signal is capture for a specified FOI
Marker	A marker is an observation of a particular physical state or change of state. A marker records what has been observed on the signal. It holds both the nature of the observation and the time it was manifested in given FOI.
Marker result	Result of the analysis of satellite images with the use of algorithms. Result is indicated using a probability score that a certain activity is performed or has taken place.
Classification result	A marker result indicating a specific type of crop or crop group.
Event result	A marker result in indicating an event (e.g. mowing, ploughing, harvest).
FOIS **Feature of interest**	A FOI is the surface of the earth where the specified practice will be performed. In a farmer's view, this surface would for example correspond to his/her particular plot, meadow or orchard (or part thereof, when appropriate).
Parcel	The area cultivated and used by a farmer and declared by the farmer.
Crop Superclass	Group of crops with similar characteristics.
QA Report	A comparison between the marker results with ground truth expressed in statistical metrics.
Ground Truth	Ground truth is information that is known to be real or true, provided by direct observation and measurement (i.e. empirical evidence) as opposed to information provided by inference.

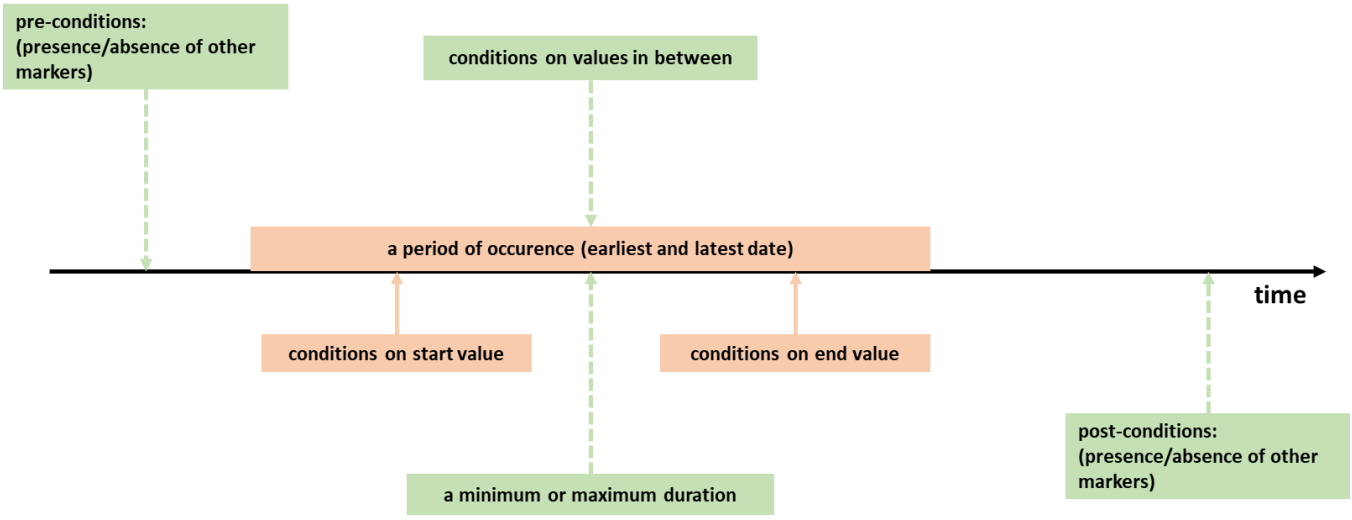
Annex C: What is a marker (source JRC)?

Markers can be seen as a unique collection (combination) of property values for a data signal that demonstrate the existence or presence of a particular continuous state or a change of state of the land phenomenon. As explained above, the 'data signal' can be the raw or calibrated DN (Digital Number)[4] values of the image time series (reflectance in a given wavelength range, backscattering coefficient) or a composite indicator (vegetation index, SAR coherence). The 'shape' of the evolution of the signal intensity over time is the key property that defines a given marker.

Not surprisingly, given their use in monitoring, markers have an important temporal aspect, and general markers can be described by:

- Optional: pre-conditions (presence/absence of other markers)
- A period of occurrence (earliest and latest date)
- Optional: a minimum or maximum duration
- Conditions on start value
- Condition on end value
- Optional condition on values in between
- Optional post-conditions (presence/absence of other markers)

The figure below provides a graphical illustration of the key temporal aspects (properties) of a marker.

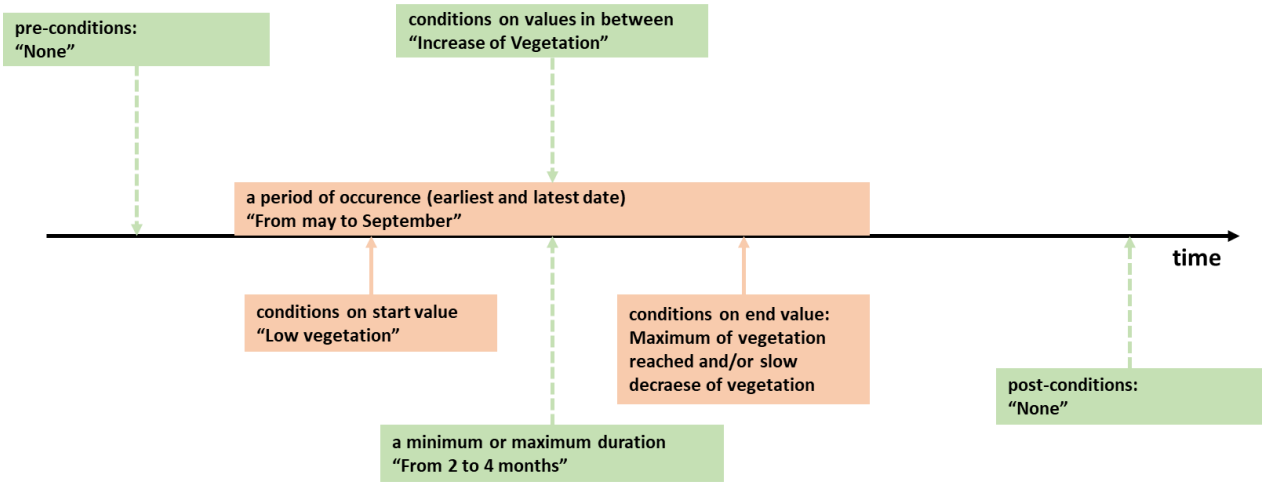


By default, markers are generic. They relate to the state of land and not the CAP-related rules. However, when they are applied in a particular locally dependent CAP scenario, they benefit from being 'parameterised'. This means that the marker properties and their values (see figure above) need to be defined to adequately reflect the local conditions. This 'parametrisation' is performed using:

- A priori information (crop calendars, prescriptions for established local practices, farmed application, data from IACS registries)
- Statistical analysis of the image time-series within the population of agriculture parcels/units of management that are in the scope of the particular scenario

The figure below shows possible marker property values for a particular land phenomenon.

[4] Each pixel also has a numerical value, called a digital number (DN), which records the intensity of electromagnetic energy measured for the ground resolution cell represented by that pixel. Digital numbers range from zero to some higher number on a grey scale.



It is also important to understand that the basic feature subject to monitoring is not the image pixel itself, but the agricultural parcel or the unit of management. In our image domain, the marker property values are derived from statistical operators (mean, median, standard deviation and others) on the multitude of image pixels representing the object of monitoring. As a result, the marker property values are 'data aggregates' that can easily be linked to the physical properties of the land phenomenon, such as material (e.g. vegetation), appearance (herbaceous) and life cycle (temporal behaviour).

The following examples aim to illustrate the selection, parametrisation and use of markers in particular scenarios, related to specific agricultural activities or agricultural practices.

Annex D: Timeframe

This annex presents an overview of all planned activities for 2023.

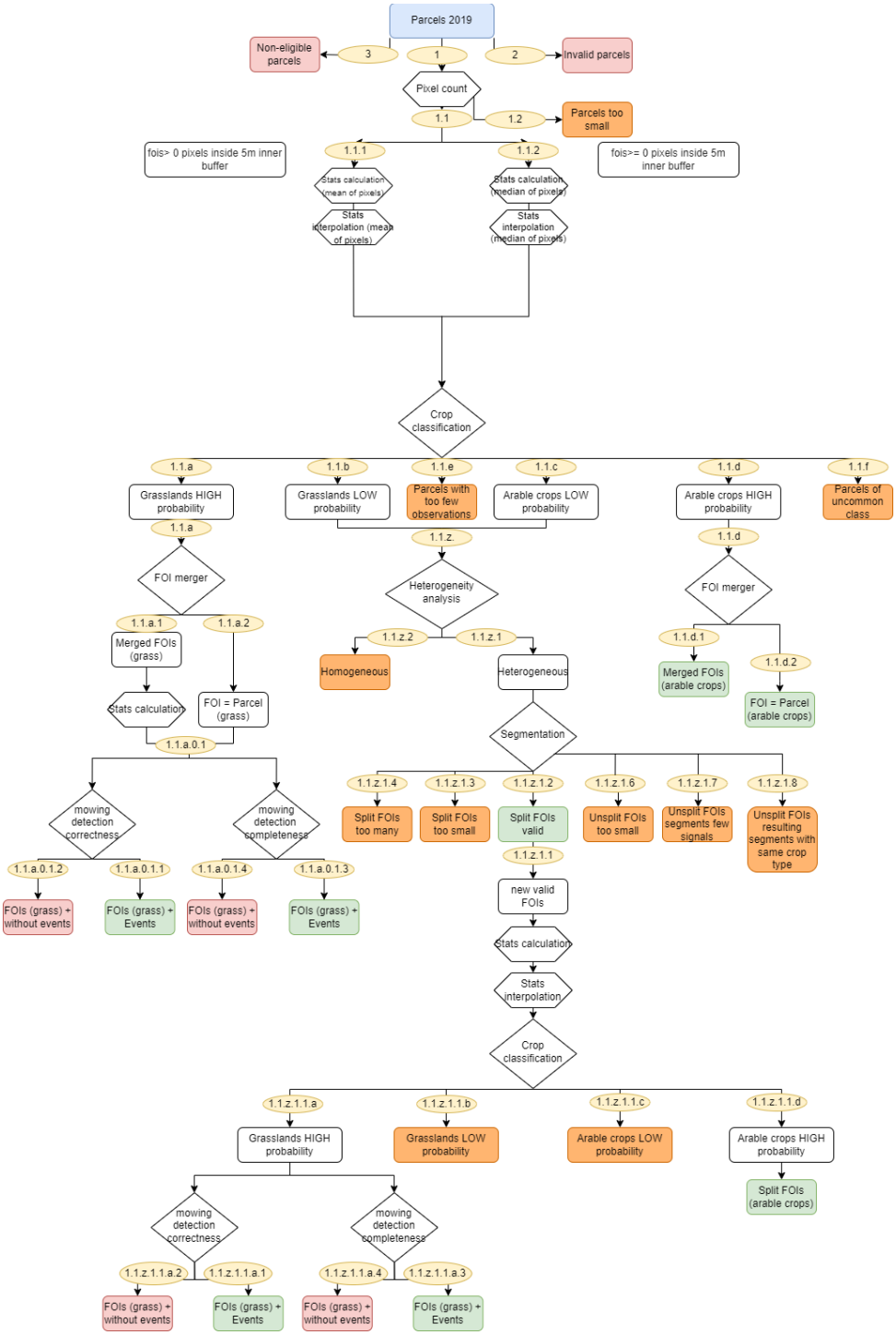
Nr	Activity	Description	2023 Q2	2023 Q3	2023 Q4	2024 Q1	2024 Q2	2024 Q3	2024 Q4	2025 Q1	2025 Q2	2025 Q3	2025 Q4
1.1	Hosting production environment	Hosting of the production environment and all available data. Production markers are also part of 1.1.											
1.2	Hosting test/acceptance environment	Hosting of a test and acceptance environment for the development of markers (including the analysis platform).											
1.3	Hosting development environment	Hosting of an environment for the development of markers											
1.4	Data transfer	Transfer of data between different cloud environments (contractor --> NEA).											
1.5	Data Satellite collecting	Purchasing data from planetfusion and optional purchasing of HR and VHR images											
1.6	Archive	Activities related to archiving of production data according to the requirements set by the EC											
2.1	Development of markers	See the list of markers to be developed in section 2.2 of annex 7.											
2.2	Development of a datapipeline	Processing of satellite to the production of marker results.											
2.3	Adjusting pipeline for the processing of planetfusiondata	Adjusting the pipeline developed as part of 2.2 to also handle planetfusion data.											
2.4	Development of a web interface for the different markers	Providing a web interface to enable the NEA to produce the markers and results autonomously											
2.5	Development of an analytics platform	Web based analytics platform accessing images, signal, zonal stats and marker results (using Jupyternotebook en Python)											
2.6	Data satellite processing	Activities related to processing (commercial) satellite data											
2.7	Signal and indices processing	Collecting zonal statistics and calculating indices.											

First deadline

Production/finetuning

Annex E: Example of FOI tracking

The example in this annex is for illustration purposes only.



Annex F: Eligibility in the Netherlands

Article 6 Hectares eligible for subsidy

1. Agricultural areas also used for non-agricultural activities are designated as areas primarily used for agricultural activities if there is no significant hindrance for the performance of agricultural activities.

2. The situation as intended in paragraph one applies if:

a. non-agricultural activities are carried out on not more than 90 days in the application year; and

b. following completion of these activities, the agricultural land is once again suitable for grazing or cultivation.

3. The situation as referred to in paragraph one also applies if non-agricultural activities are carried out on agricultural areas for more than 90 days, in the framework of contracts on the basis of ANLb subsidy schemes or the Greenblue services catalogue.

4. An area that is primarily used for non-agricultural activities and as a consequence is not considered as hectares eligible for subsidy under article 2 (1), will under all circumstances include:

a. vegetable and ornamental gardens;
b. verges up to a width of three metres from the road or wider, in as much as the traffic designation hinders agriculture;
c. playing fields;
d. strips of grassland adjacent to paved runways for air traffic;
e. unpaved runways for aerial sport and aviation;
f. strips adjacent to buildings or greenhouses narrower than one metre;
g. noise abatement embankments;
h. jumping arenas;
i. petting farms;
j. farmyards;
k. areas housing installations for the use of solar energy.

5. Contrary to paragraph four (k), the area is still considered hectares eligible for subsidy if a maximum of 100 solar panels per hectare are installed across the plot, which together occupy a maximum surface area of 100m².

Annex G: Crop list

The list presented here is provisional and subject to change.

NAME	CROP CODE	CATEGORY
Flower seeds open ground	174	Nursery crops
Wheat (winter)	233	Arable crops
Wheat (summer)	234	Arable crops
Barley (winter)	235	Arable crops
Barley (summer)	236	Arable crops
Rye (not cut rye)	237	Arable crops
Oat	238	Arable crops
Field pea (and marrowfat)	241	Arable crops
Common bean (brown)	242	Arable crops
Pea, green/yellow (green to harvest)	244	Arable crops
Caraway	246	Arable crops
Poppyseed	247	Arable crops
Sugar beet	256	Arable crops
Fodder beet	257	Arable crops
Alfalfa	258	Arable crops
Maize	259	Arable crops
Yellow onion	6660	Arable crops
Red onion	6664	Arable crops
Silver onion	263	Arable crops
Grassland, permanent	265	Grassland
Grassland, temporary	266	Grassland
Pea (dry to harvest)	308	Arable crops
Broad bean (including horse bean)	311	Arable crops
Triticale	314	Arable crops
Corn, grain	316	Arable crops
Corn, corn cob mix	317	Arable crops
Grassland, natural. With agricultural activities.	331	Grassland
Grassland, natural. Nature as main function.	332	Grassland
Natural areas (incl. heathland)	335	Grassland
Edge, on arable land and directly adjacent to forest. No agricultural production.	338	Arable crops
Ditch	343	Landscape elements
Tagetes erecta (Mexican marigold)	346	Arable crops
Tagetes patula (French marigold)	347	Arable crops
Hop	375	Arable crops
Teff	381	Arable crops
Spelt	382	Arable crops
Other green manure crops, leguminous	426	Arable crops
Other green manure crops, non-leguminous	427	Arable crops
Yellow mustard	428	Arable crops
Chicory	511	Arable crops
Sunflowers	515	Arable crops
Miscanthus (Elephant grass)	516	Arable crops
Safflower	636	Nursery crops
Lady's mantle	637	Nursery crops
Madder	652	Arable crops
Evening primrose	653	Arable crops
Nettle	654	Arable crops
Black mustard	655	Arable crops

Sun crown	656	Arable crops
Dragon plants	657	Arable crops
Forest (SBL scheme)	662	Set aside
Lupins, not bitter	663	Arable crops
Rapeseed	664	Arable crops
Soybeans	665	Arable crops
Linseed not from fibre flax (oil flax)	666	Arable crops
Rocket (nematode trap)	669	Arable crops
Japanese oats	670	Arable crops
Rocket leaf (nematode trap)	671	Arable crops
Short rotation forest trees (excl. willow coppice)	794	(Nut) trees
Willow coppice	795	(Nut) trees
Christmas trees	796	(Nut) trees
Clover, red, clover seed	6763	Arable crops
Clover, red, green manure, catch crop	6762	Arable crops
Lotus	800	Arable crops
Common sainfoin	801	Arable crops
Winter vetch (Vicia villosa)	802	Arable crops
Common vetch (Vicia sativa)	803	Arable crops
Sweet corn	814	Arable crops
Broad bean (dry harvest) (no consumption)	853	Arable crops
Broad bean (green to harvest)	854	Arable crops
Forest without replanting obligation	863	Forest
Forest (set aside scheme)	864	Forest
Hemp, fibre	944	Arable crops
Dahlia, other floriculture crops	964	Nursery crops
Dahlia, dried flowers	965	Nursery crops
Gladiolus, other floriculture crops	967	Nursery crops
Gladiolus, dried flowers	968	Nursery crops
Hyacinth, other floriculture crops	970	Nursery crops
Hyacinth, dried flowers	971	Nursery crops
Iris, other floriculture crops	973	Nursery crops
Iris, dried flowers	974	Nursery crops
Crocus, other floriculture crops	976	Nursery crops
Crocus, dried flowers	977	Nursery crops
Lily, other floriculture crops	979	Nursery crops
Lily, dried flowers	980	Nursery crops
Daffodil, other floriculture crops	982	Nursery crops
Daffodil, dried flowers	983	Nursery crops
Tulip, other floriculture crops	985	Nursery crops
Tulip, dried flowers	986	Nursery crops
Zantedeschia, other floriculture crops	988	Nursery crops
Zantedeschia, dried flowers	989	Nursery crops
Other flowers, other floriculture crops	991	Nursery crops
Other flowers, dried flowers	992	Nursery crops
Amaryllis, other floricultural crops	994	Nursery crops
Amaryllis, dried flowers	995	Nursery crops
Dahlia, flower bulbs and tubers	997	Flower bulbs and tubers
Gladiolus, flower bulbs and tubers	998	Flower bulbs and tubers
Hyacinth, flower bulbs and tubers	999	Flower bulbs and tubers
Crocus, flower bulbs and tubers	1001	Flower bulbs and tubers
Lily, flower bulbs and tubers	1002	Flower bulbs and tubers

Daffodil, flower bulbs and tubers	1003	Nursery crops
Tulip, flower bulbs and tubers	1004	Flower bulbs and tubers
Zantedeschia, bulbs and tubers	1005	Flower bulbs and tubers
Other flowers, bulbs and tubers	1006	Flower bulbs and tubers
Amaryllis, flower bulbs and tubers	1007	Flower bulbs and tubers
Ornamental onion, other floriculture crops	1010	Nursery crops
Ornamental onion, dried flowers	1011	Nursery crops
Ornamental onion, flower bulbs and tubers	1012	Flower bulbs and tubers
Grape hyacinth, other floriculture crops	1013	Nursery crops
Grape hyacinth, dried flowers	1014	Nursery crops
Grape hyacinth, flower bulbs and tubers	1015	Flower bulbs and tubers
Tassel hyacinth, other floriculture crops	1016	Nursery crops
Tassel hyacinth, dried flowers	1017	Nursery crops
Tassel hyacinth, bulbs and tubers	1018	Flower bulbs and tubers
Valerian, production	1019	Arable crops
Valerian, seeds and propagation material	1020	Arable crops
Garlic	1021	Arable crops
Quinoa	1022	Arable crops
Parsnip, production	1023	Vegetables
Parsnip, seeds and propagation material	1024	Vegetables
Peony, other floriculture crops	1025	Nursery crops
Peony, dried flowers	1026	Nursery crops
Lovage (Maggiplant), production	1028	Arable crops
Lovage (Maggiplant), seeds and propagation material	1029	Arable crops
Wild marjoram (Oregano), production	1030	Arable crops
Wild marjoram (Oregano), seeds and propagation material	1031	Arable crops
Marigold	1032	Nursery crops
Igniscum Candy	1033	Arable crops
Canary seed	1034	Arable crops
Setaria	1035	Arable crops
Parsley root	1036	Arable crops
Parsley, production	1037	Vegetables
Parsley, seeds and propagation material	1038	Vegetables
Chrysanthemum, other floriculture crops	1039	Nursery crops
Chrysanthemum, dried flowers	1040	Nursery crops
Angelica, production	1042	Vegetables
Angelica, seeds and propagation material	1043	Vegetables
Poppy	1044	Nursery crops
Adonis	1045	Nursery crops
Forget-me-not	1046	Nursery crops
Cranberry	1047	Fruit
Echinacea, production	1048	Vegetables
Echinacea, seeds and propagation material	1049	Vegetables
Snapdragons	1050	Nursery crops
Iris, spherical	1051	Flower bulbs and tubers
Iris, rhizome-forming	1052	Flower bulbs and tubers
Palms, pot and container fields	1053	Nursery crops and perennials
Peony, propagation	1054	Flower bulbs and tubers
Chrysanthemum, propagation	1055	Flower bulbs and tubers
Forest and hedge plants, open ground	1067	Nursery crops and perennials
Boxwood, open ground	1068	Nursery crops and perennials

Ericaceae (such as erica, calluna, rhododendron, azalea), open ground	1069	Nursery crops and perennials
Avenue/park trees, root stock, open ground	1070	Nursery crops and perennials
Avenue/park trees, young trees, open ground	1071	Nursery crops and perennials
Avenue/park trees, saplings, open ground	1072	Nursery crops and perennials
Rose bushes (incl. seedlings and rootstocks), open ground	1073	Nursery crops and perennials
Ornamental conifers, open ground	1074	Nursery crops and perennials
Ornamental shrubs and climbing plants, open ground	1075	Nursery crops and perennials
Flowering and berry shrubs, open ground	1076	Nursery crops and perennials
Fruit trees, nut trees, open ground	1077	Nursery crops and perennials
Fruit trees, rootstocks, open ground	1078	Nursery crops and perennials
Fruit trees, other, open ground	1079	Nursery crops and perennials
Perennials, open ground	1080	Nursery crops and perennials
Forest and hedge plants, pot and container field	1081	Nursery crops and perennials
Boxwood, pot and container field	1082	Nursery crops and perennials
Ericaceae (Such as erica, calluna, rhododendron, azalea), pot and container field	1083	Nursery crops and perennials
Avenue trees/park trees, rootstocks, pot and container field	1084	Nursery crops and perennials
Avenue trees/park trees, young trees, pot and container field	1085	Nursery crops and perennials
Avenue trees/park trees, saplings, pot and container field	1086	Nursery crops and perennials
Rose bushes (incl. seedlings and rootstocks), pot and container field	1087	Nursery crops and perennials
Ornamental conifers, pot and container field	1088	Nursery crops and perennials
Ornamental shrubs and climbing plants, pot and container field	1089	Nursery crops and perennials
Flowering and berry shrubs, pot and container field	1090	Nursery crops and perennials
Fruit trees, pot and container field	1091	Nursery crops and perennials
Fruit trees, rootstocks, pot and container field	1092	Nursery crops and perennials
Fruit trees, other, pot and container field	1093	Nursery crops and perennials
Perennials, pot and container cultivation	1094	Nursery crops and perennials
Apple. Planted current season.	1095	Fruit
Apple. Planted prior to current season.	1096	Fruit
Pear. Planted current season.	1097	Fruit
Pear. Planted prior to current season.	1098	Fruit
Grape	1099	Fruit
Other fruits with stones or seeds (such as peaches, grapes)	1100	Fruit
Blueberry	1869	Fruit
Plum	1870	Fruit
Sour cherry (yield destined for processing industry)	1872	Fruit
Blackcurrant (yield processed for processing industry)	1873	Fruit

Other small fruit (such as gooseberry, kiwi)	1874	Fruit
Ornamental foliage	1876	Nursery crops
Turf	1921	Arable crops
Rapeseed, winter	1922	Arable crops
Rapeseed, summer	1923	Arable crops
Agricultural natural mixture	1926	Arable crops
Other Arable crops	1927	Arable crops
Onion, whole plant, first year	1932	Arable crops
Onion, whole plant, second year	1933	Arable crops
Shallots	1934	Arable crops
Corn cob silage	1935	Arable crops
Forest, permanent, with obligation to replant	1936	Forest
Food forest	1940	Arable crops
Jerusalem artichoke	1949	Arable crops
Potato, consumption	2014	Arable crops
Potato, NAK plant	2015	Arable crops
Potato, TBM plant	2016	Arable crops
Potato, starch	2017	Arable crops
Potato, control measure AM	2025	Arable crops
Corn, energy	2032	Arable crops
Uncultivated land due to a cultivation ban/exemption	2300	Set aside
Redcurrant	2325	Fruit
Raspberry	2326	Fruit
Blackberry	2327	Fruit
Sweet cherry	2328	Fruit
Tree group	2617	Landscape elements
Wind hedge, in a plot for fruit cultivation	2618	Landscape elements
Wooded area	2619	Landscape elements
Pond and small historic water	2620	Landscape elements
Row of trees	2621	Landscape elements
Row of alder	2622	Landscape elements
Hedge for cutting or trimming	2624	Landscape elements
Thicket hedge	2625	Landscape elements
Lane	2626	Landscape elements
Orchard of tall trees	2628	Landscape elements
Thicket edge	2629	Landscape elements
Coppice grove	2630	Landscape elements
Brushwood plot	2631	Landscape elements
Reed strip and small reed plot	2633	Landscape elements
Natural waterside	2634	Landscape elements
Espaliers	2636	Landscape elements
Planted bank and sand bank	2637	Landscape elements
Landscape element, other	2638	Landscape elements
Water, other	2639	Landscape elements
Woods	2642	Landscape elements
Nut tree	2645	(Nut) trees
Cereal, other	2652	Arable crops
Strawberry open ground, propagation	2700	Vegetables
Strawberry open ground, waiting bed	2701	Vegetables
Strawberry open ground, production	2702	Vegetables
Strawberry open soil, seeds and propagation material	2703	Vegetables

Strawberry on frame, propagation	2704	Vegetables
Strawberry on frame, waiting bed	2705	Vegetables
Strawberry on frame, production	2706	Vegetables
Strawberry on frame, seeds and propagation material	2707	Vegetables
Endive, production	2708	Vegetables
Endive, seeds and propagation material	2709	Vegetables
Asparagus, area yielding production	2710	Vegetables
Asparagus, area not yet yielding production	2711	Vegetables
Asparagus, seeds and propagation material	2712	Vegetables
Kale, production	2715	Vegetables
Kale, seeds and propagation material	2716	Vegetables
Carrot, production	2717	Vegetables
Carrot, seeds and propagation material	2718	Vegetables
Broccoli, production	2719	Vegetables
Broccoli, seeds and propagation material	2720	Vegetables
Chinese cabbage, production	2721	Vegetables
Chinese cabbage, seeds and propagation material	2722	Vegetables
Courgette, production	2723	Vegetables
Courgette, seeds and propagation material	2724	Vegetables
Celeriac, production	2725	Vegetables
Celeriac, seeds and propagation material	2726	Vegetables
Fennel, production	2727	Vegetables
Fennel, seeds and propagation material	2728	Vegetables
Cucumber, production	2729	Vegetables
Cucumber, seeds and propagation material	2730	Vegetables
Pickling cucumber, production	2731	Vegetables
Pickling cucumber, seeds and propagation material	2732	Vegetables
Melon, production	2733	Vegetables
Melon, seeds and propagation material	2734	Vegetables
Pumpkin, production	2735	Vegetables
Pumpkin, seeds and propagation material	2736	Vegetables
Swede, production	2737	Vegetables
Swede, seeds and propagation material	2738	Vegetables
Kohlrabi, production	2739	Vegetables
Kohlrabi, seeds and propagation material	2740	Vegetables
Beetroot, production	2741	Vegetables
Beetroot, seeds and propagation material	2742	Vegetables
Herbs, production	2743	Vegetables
Herbs, seeds and propagation material	2744	Vegetables
Pak choi, production	2745	Vegetables
Pak choi, seeds and propagation material	2746	Vegetables
Mangetout, production	2747	Vegetables
Mangetout, seeds and propagation material	2748	Vegetables
Runner bean, production	2751	Vegetables
Runner bean, seeds and propagation material	2752	Vegetables
Rapini, production	2753	Vegetables
Rapini, seeds and propagation material	2754	Vegetables
Rhubarb, production	2755	Vegetables

Rhubarb, seeds and propagation material	2756	Vegetables
Radish, production	2757	Vegetables
Radish, seeds and propagation material	2758	Vegetables
Red cabbage, production	2759	Vegetables
Red cabbage, seeds and propagation material	2760	Vegetables
Savoy cabbage, production	2761	Vegetables
Savoy cabbage, seeds and propagation material	2762	Vegetables
Salsify, production	2763	Vegetables
Salsify, seeds and propagation material	2764	Vegetables
Celery (including leaf celery), production	2765	Vegetables
Celery (including leaf celery), seeds and growing material	2766	Vegetables
Lettuce, iceberg, production	2767	Vegetables
Lettuce, iceberg, seeds and propagation material	2768	Vegetables
Lettuce, radicchio rosso, production	2769	Vegetables
Lettuce, radicchio rosso, seeds and propagation material	2770	Vegetables
Lettuce, other, production	2771	Vegetables
Lettuce, other, seeds and propagation material	2772	Vegetables
Spinach production	2773	Vegetables
Spinach, seeds and propagation material	2774	Vegetables
Cabbage, production	2775	Vegetables
Cabbage, seeds and propagation material	2776	Vegetables
Brussels sprout, production	2777	Vegetables
Brussels sprout, seeds and propagation material	2778	Vegetables
Green beans, production	2779	Vegetables
Green beans, seeds and propagation material	2780	Vegetables
Flat beans, production	2781	Vegetables
Flat beans, seeds and propagation material	2782	Vegetables
Carrot, production	2783	Vegetables
Carrots, seeds and propagation material	2784	Vegetables
Winter carrot, production	2785	Vegetables
Winter carrot, seeds and propagation material	2786	Vegetables
Chicory root, production	2787	Vegetables
Chicory root, seeds and propagation material	2788	Vegetables
White cabbage, production	2789	Vegetables
White cabbage, seeds and propagation material	2790	Vegetables
Other leaf crop not mentioned, production	2791	Vegetables
Other leaf crop not mentioned, seeds and propagation material	2792	Vegetables
Other vegetable crop not mentioned, production	2793	Vegetables
Other vegetable crop not mentioned, seeds and propagation material	2794	Vegetables
Cauliflower, winter, production	2795	Vegetables
Cauliflower, winter, seeds and propagation material	2796	Vegetables
Cauliflower, summer, production	2797	Vegetables

Cauliflower, summer, seeds and propagation material	2798	Vegetables
Leek, winter, production	2799	Vegetables
Leek, winter, seeds and propagation material	2800	Vegetables
Leek, summer, production	2801	Vegetables
Leek, summer, seeds and propagation material	2802	Vegetables
Bulrush	3055	Arable crops
Clover, Alexandrian, clover seed	6757	Arable crops
Clover, Alexandrian, green manure, catch crop	6756	Arable crops
Meadow long flower, grass seed	6746	Arable crops
Meadow long flower, green manure, catch crop	6748	Arable crops
Leaf cabbage	3502	Arable crops
Leaf turnip	3503	Arable crops
Leaf radish	3504	Arable crops
Camelina	3505	Arable crops
Perennial ryegrass, grass seed	6750	Arable crops
Perennial ryegrass, green manure, catch crop	6751	Arable crops
Ethiopian mustard	3507	Vegetables
Lacy phacelia	3508	Arable crops
Festulolium, grass seed	6752	Arable crops
Festulolium, green manure, catch crop	6753	Arable crops
Buckwheat	3510	Arable crops
Clover, incarnate, clover seed	6759	Arable crops
Clover, incarnate, green manure, catch crop	6758	Arable crops
Italian ryegrass, grass seed	6754	Arable crops
Italian ryegrass, green manure, catch crop	6755	Arable crops
Westerwold ryegrass, grass seed	6790	Arable crops
Westerwold ryegrass, green manure, catch crop	6791	Arable crops
Niger	3514	Arable crops
Clover, Persian, clover seed	6761	Arable crops
Clover, Persian, green manure, catch crop	6760	Arable crops
Chinese mustard	3517	Arable crops
Seradella	3518	Arable crops
Sudan grass/Sorghum	3519	Arable crops
Spurry	3520	Arable crops
Turnip	3521	Vegetables
Herd’s grass, green manure, catch crop	6787	Arable crops
Herd’s grass, grass seed	6786	Arable crops
Smooth meadow grass, grass seed	6788	Arable crops
Smooth meadow grass, green manure, catch crop	6789	Arable crops
Clover, white, clover seed	6765	Arable crops
Clover, white, green manure, catch crop	6764	Arable crops
Flax	3736	Arable crops
Temporarily uncultivated land, due to public works	3801	Set aside
Temporarily uncultivated land, reason other than public works	3802	Set aside
Tall fescue, industrial grass	3805	Arable crops
Tall fescue, grass seed	6782	Arable crops
Tall fescue, green manure, catch crop	6783	Arable crops
Red fescue, grass seed	6784	Arable crops
Red fescue, green manure, catch crop	6785	Arable crops
Azolla	6520	Arable crops
Wild rice	6521	Arable crops

Reed	6522	Arable crops
Sweet potatoes	6632	Arable crops
Naked oats	6636	Arable crops
Field divisions	6808	Landscape elements
Lentils	6767	Arable crops
Samphire	6792	Arable crops
Sea lavender	6766	Arable crops
Rice	6799	Arable crops
Chive	6749	Arable crops
Footpath	6801	Arable crops
Plot covered with crop residues (mulching)	6798	Set aside
Cutting rye	6806	Arable crops
Green fallow, spontaneous emergence	6794	Set aside
Other grass seed	6768	Arable crops
Other clover seed	6769	Arable crops
Liatris, other floriculture crops	6797	Arable crops
Liatris, dried flowers	6796	Arable crops
Liatris, flower bulbs and tubers	6795	Arable crops
Snowdrop, other floriculture crops	6805	Arable crops
Snowdrop, dried flowers	6804	Arable crops
Snowdrop, flower bulbs and tubers	6803	Arable crops
Food hedge	6809	Landscape elements
Sedum	6802	Arable crops
Sunken lanes	6793	Landscape elements
Meadows on agricultural plots	6800	Landscape elements
Strips of wild grass	6807	Landscape elements

Annex H: Catch crops in NL

Catch crops in the Netherlands are linked to a number of support schemes and directives.

regulation	scenario	jan	feb	mrt	apr	may	jun	jul	aug	sept	ovt	nov	dec	jan
Eco scheme: under sowing catch crop	• Sow as under-sowing • Catch crop is visible following the main crop harvest • Catch crop will remain until at least December 1 • Catch crop is a different crop than main crop			no specific start date						no specific end date	no specific start date			
Eco scheme: green cover	• Catch crop remains in place until at least March 1 (obligation period from January 1 to March 1) • Catch crop is mechanically incorporated for main cultivation without spraying or burning			no specific start date										
GEAC 6: winter cover	green cover heavy clay soil								at least 6 weeks in this period					
	green cover clay soil, (but not heavy)								at least 8 weeks in this period					
GEAC 7: crop rotation	catch crop = follow up cultivation in same year till next crop in following year								no specific start date					no specific end date
RBE 2.12 - catch crop	• sow catch crop no later than 1 October, • or in case of certain main crops for the following calendar year by 31 October at the latest,								most main crops					
										certain main crops				
	main crop													
	catch crop													

ECO scheme:

Undersown catch crops

- Undersown catch crops.
- The catch crop is visible after the main crop is harvested.
- The catch crop remains on the field until at least the 1st of December.
- The catch crop is different from the main crop.
- The use of plant protection chemicals after harvesting the main crop is not allowed.

Green cover

- The catch crops remains on the field at least until 1 March (obligations terms from the 1st of January until the 1st of March).
- The catch crop is mechanically incorporated into the soil prior to sowing the main crop without using chemicals or burning the catch crop.
- Crop protection is only allowed in certain parts of the field.
- Counts in the year of ploughing.

GEAC:

GEAC 6 – Minimum soil cover (winter)

3. The destruction of grassland or permanent crops is not permitted from 16 September to 1 February, except in the case of:

   a) grassland where destruction is permitted until 30 November if tulip, crocus, iris or muscari will be planted in the relevant soil immediately after destruction;
   b) grassland on clay soil, as laid down in Appendix 1 to the Decree implementing the Fertiliser Act [Uitvoeringsbesluit Meststoffenwet], allowing destruction from 1 November to 31 December if the following cultivation is not grass;

c) grassland if landscape elements are planted immediately after destruction in accordance with the requirements set for this in the Decree implementing the Fertiliser Act ;
d) grass between permanent cultivation at nurseries and arboriculture.

4) From 1 October to 1 February, a catch crop is grown on sand, loess and peat. This applies to crops on arable land other than grassland. The obligation to sow a catch crop does not apply when a new main crop is sown or planted in autumn after a main crop, for perennial crops and for crops harvested in winter. If, on the basis of the Decree implementing the Fertiliser Act, a shorter or different period is observed for the cultivation of a catch crop and, on the basis of that legislation, a discount on the nitrogen usage standard is applied, the shorter or different adjusted period will take precedence.
5) A farmer grows a catch crop until 1 February after maize cultivation on sandy and loess soils, if established in Appendix 1 to the Decree implementing the Fertiliser Act, and from 2024 on by the Minister to designate clay and peat soils.
6) Between 1 August and 1 November, at least 80 percent of the arable land on heavy clay soils is covered with ground cover on the farm for at least 6 weeks. This ground cover can consist of a crop, catch crop, stubble, mulching, plant residues or green manure.
7) On clay soils other than heavy clay, between August 1 and November 30, at least 80 percent of the arable land on the farm is covered with a soil cover for at least 8 weeks. This soil cover can consist of a crop, catch crop, stubble, mulching, plant residues or green manure.
8) Paragraphs 1, 6 and 7 (above) do not apply if the farmer, as a result of a contract for agricultural nature management based on the AECM or the Catalogue Green-blue services subsidy schemes carries out management as a result of which they do not meet the conditions set out in these (paragraphs 1, 6 and 7).

GLMC 7 – Crop rotation on agricultural land

1. From 2024 onwards, the farmer will apply crop rotation to arable land at the parcel level, provided that with effect from 2023:

a. every year, a different crop is grown as a main crop on at least one third of their arable land, or one or more subsequent crops are grown after the main crop within the same calendar year before the sowing of the following year's main crop, provided that subsequent crops consist of a crop type other than the main crop; and
b. every fourth year a different crop is grown on the same plot as the main crop.

2. Without prejudice to the first paragraph, the farmer grows on sandy soil and/or loess soil:
a. from 1 January 2023, once every four years, a crop from the crop list 'resting crops GLCM 7' as referred to in Annex 3 is grown as the main crop; and
b. from 1 January 2027, once every three years a crop from the crop list 'resting crops GAEC 7' as referred to in Annex 3 is grown as the main crop.

3. The first and second paragraphs do not apply to plots that are in use by the farmer on the reference date and:
a. which are used for forced entry;
b. which are used for the cultivation of a crop from the 'wet crops' crop list as referred to in Annex 3;
c. which are used to grow perennial crops;
d. which are used for grasses and other herbaceous feed crops on arable land;
e. in which more than 75 percent of arable land is used for:
    i. the production of grasses or other herbaceous feed crops;
    ii. the cultivation of leguminous crops;
    iii. fallow;
    iv. a combination of 1, 2 or 3.

f. whereby more than 75 percent of the total area of agricultural land:
    i. consists of permanent grassland;
    ii. is used for the production of grasses or other herbaceous feed crops;
46 Government Gazette 2022 No. 29696-n1, 10 November 2022
    iii. is used for the cultivation of a crop from the 'wet crops' crop list referred to in Annex 3; or
    iv. a combination of 1, 2 or 3.

4. Furthermore, the obligation to apply crop rotation does not apply to:
a. parcels where the farmer applies an organic production method and the farmer's activities have been certified in accordance with Regulation (EU) 2018/848;
b. parcels where the farmer, as the result of a contract for agricultural nature management based on the agri-environment or *Catalogus Groenblauwe Diensten (green-blue services)* subsidy schemes, manages the land in such a way that they cannot meet the requirements referred to in the first paragraph; and
c. businesses in the Oldambt area and the Hoekse Waard area with heavy clay soil that apply crop diversification in combination with the continuous cultivation of winter wheat, winter barley, winter rapeseed and winter rapeseed where at least three crops are grown, of which the crop with the largest area does not exceed 75 percent of the farmland and the crop with the smallest area covers at least 5 percent of the farmland.

RBE 2.12 Article 8a Decree on the use of fertilisers

catch crop

The obligation to grow a specific catch crop no later than 1 October, or a certain main crop for the following calendar year at the latest on 31 October, after the cultivation of maize on sandy and loess soils. Destruction of the crop that is grown next to the maize is not allowed before 1 February.

Annex I: Delivery notes

The exact format for the delivery notes will be discussed with the contractor, but in all cases they should include the following items:

General			
Marker number			
Marker name			
Description	Short description		
Flowchart	A flowchart or another type of chart to illustrate the working of the marker. If there is not enough space, reference can be made to an appendix.		
Criteria	All relevant criteria		
Use			
Frequency			
Schedule			
Source	Description of the data sources used		
Resolution	n/a		
Technique	Short description of the techniques used		
Version history			
Version			
Administrator	Name of the administrator or department		
Date	Date of the last change		
Validated by	List of people involved in validating the delivery		
Status			
Acceptance NEA	Formally accepted by NEA yes/no		
Change management			
Version	**Modified by**	**Description**	**Date**
Quality			
Quality Element	**Date**	**Result**	**Reference**
What quality element(s) was/were tested?	When did the check take place?	Short summary	Reference to quality report or matrix
Exit control contractor			
Check	**Date**	**Result**	**Reference**
For example, are all columns present?			

Annex J: List of reference documents

Below you will find a list of relevant documentation in relation to the AMS. This list is by no means complete. As a contractor you are required to actively seek information regarding the AMS and keep up to date with any new developments.

Legislation

- Regulation (EU) 2021/2116 of the European Parliament and of the Council of 2 December 2021 on the financing, management and monitoring of the common agricultural policy and repealing Regulation (EU) No 1306/2013
- Commission Delegated Regulation (EU) 2022/1172 of 4 May 2022 supplementing Regulation (EU) 2021/2116 of the European Parliament and of the Council with regard to the integrated administration and control system in the common agricultural policy and the application and calculation of administrative penalties for conditionality
- Commission Implementing Regulation (EU) 2022/1173 of 31 May 2022 laying down rules for the application of Regulation (EU) 2021/2116 of the European Parliament and of the Council with regard to the integrated administration and control system in the common agricultural policy

Guidelines

Background information with regard to guidelines and best practices can be found at:

WikiCAP - European Commission (europa.eu)

- ASTRAND P.J, DEVOS Wim, LOUDJANI Philippe, Controls with Remote Sensing in the CAP2020+, EUR 30967 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76- 46708-3, doi:10.2760/117692, JRC127690
- Devos W., Sima A. and Milenov P., Conceptual basis of checks by monitoring, 2021, JRC127678
- Zieliński R., Milenov P., Sima A., Devos W, Structured template for documenting agricultural land monitoring systems, Ispra, 2022, JRC130662
- MILENOV Pavel et al., Assessing the Validity of the Feature of Interest in the context of the CAP Checks by Monitoring, Ispra, 2021, JRC123711
- SIMA A. et al. Use of geotagged photographs in the frame of Common Agriculture Policy checks, Ispra, 2020, JRC120223
- Borio D. Sedano F., Zielinski R. and Devos W., "Collection of Methods for Data Analysis: from Signal Selection to Marker Detection", Joint Research Centre, Ispra (VA), Italy, 2022, JRC130244.
- Zieliński R., Skøien J. O., Acquafresca L., Devos W., Proposed workflow for optimization of land monitoring systems - Copernicus Sentinel time series analysis within the Checks by Monitoring framework, European Commission, Ispra, 2022, JRC130659
- GUIDANCE DOCUMENT ON THE LAND PARCEL IDENTIFICATION SYSTEM (LPIS) UNDER ART. 5, 9 AND 10 OF COMMISSION DELEGATED REGULATION (EU) NO 640/2014 AND ON THE ESTABLISHMENT OF THE EFA-LAYER REFERRED TO IN ART. 70(2) OF REGULATION (EU) NO 1306/2013

Examples

Here is a list of relevant projects and examples in the context of the AMS. These websites are for illustration purposes only.

Sen4Cap (esa-sen4cap.org)

Niva4cap – New IACS Vision In Action

DIONE TOOLBOX – DIONE (dione-project.eu)

Introduction — eo-learn 1.3.1 documentation

GitHub - ec-jrc/cbm: Checks by Monitoring

Annex K: Description of parcel data

1.1 Unique identification of parcels

Each parcel has a unique ID, also known as a Functional ID (F-ID), which is only valid for one application year. The F-ID consists of an ID code, followed by a version number of the parcel. The ID and version number are separated by a point. Every time something changes in the parcel, the version number is increased. Since not all changes are relevant to monitoring and the delivery of input data for monitoring does not occur in real time, some versions may not be known to the contractor or recorded in the AMS.

1.1.1 Description of attributes for the supplier

All data will be shared with the contractor using an sFTP interface. This applies both to the alphanumeric data and the geometries (shapes). The geometries will be delivered using the GPKG format.

Data delivery shape

Fieldname	Type	Length	Required	Description
GRG_FID	Text	20	V	Unique ID for a parcel.

V = Required | C = Conditional (depends on specific requirements) | O = Optional

Data delivery alphanumeric

Fieldname	Type	Length	Required	Description
GEWASCODE	Text	10	V	Crop code
GRG_FUNCTIONEEL_ID	Text	20	V	Unique identifier for the parcel used by NEA
ZAAK_ID	Numeric	22	V	Unique identifying feature of the declaration
GDB_FROM_DATE	Timestamp	25	V	Time at which the crop parcel was recorded in the register. Format: 24MAR2020:18:44:02.219000
GDB_TO_DATE	Timestamp	25	V	Time when crop parcel is no longer valid. Format: 4MAR2020:18:44:02.219000
BEGINGELDIGHEID	Date	18	V	Format: DD-MM-JJJJ HH:MM:SS:MS
EINDGELDIGHEID	Date	18	V	Format: DD-MM-JJJJ HH:MM:SS:MS
VOLGNUMMER	Numeric	5	V	Identifying feature of each crop parcel.
GEWASCODE_VOORTEELT_1	Text	10	C	
GEWASCODE_VOORTEELT_2	Text	10	C	

GEWASCODE_NATEELT_1	Text	10	C	Unique identifier for the catch crop declared by the farmer.
GEWASCODE_NATEELT_2	Text	10	C	
ZAAIDATUM_VOORTEELT_1	Date	6	C	
ZAAIDATUM_VOORTEELT_2	Date	6	C	
ZAAIDATUM_NATEELT_1	Date	6	C	Sowing date for the declared catch crop
ZAAIDATUM_NATEELT_2	Date	6	C	
INDICATIE_BISS	Text	1	C	Relevance of parcel to BISS
INDICATIE_ECO	Text	1	C	Relevance of parcel to ECO
INDICATIE_CON	Text	1	C	Relevance of parcel to conditionality.
TYPE_PERCEELMUTATIE	Numeric	2	V	Reason parcel was changed.

V = Required | C = Conditional (depends on specific requirements) | O = Optional

There are number of reasons why a parcel can change. The table below provides a description of the types of changes and the values associated with them. There is also an indication of how these changes should be handled in the context of monitoring.

Value	Type of mutation	Clarification
0	Initial selection	This type does not refer to a change but indicates that the parcel is part of the initial delivery.
1	Parcel withdrawn	This indicates that the parcel is no longer relevant in the context of monitoring. There is a historical record indicated by the field GDB_TO_DATE. This parcel does not need to be monitored anymore and is not expected in the delivery of the marker results.
2	New parcel	A new parcel was added to the application or created by splitting an existing parcel. This parcel has to be added to the collection of parcels to be monitored.
3	Mutation geometry	The area has changed (increased or decreased) for this parcel. Use the most recent data for this parcel.
4	Mutation crop code	The crop code has been changed. Use the most recent data for this parcel.
5	Mutation crop code and geometry	Both the area and crop code have changed for this parcel. Use the most recent data for this parcel.
6	Rejected parcel	This parcel has been rejected by NEA and no longer forms part of the application. This parcel needs to be ignored and removed from the collection of parcels to be monitored. No delivery is expected.
7	Mutation crop code catch crop	The crop code of the catch crop has changed for this parcel.

		Use the most recent data for this parcel.
8	Mutation crop code catch crop and geometry	Both the crop code and area of the catch crop parcel have changed for this parcel. Use the most recent data for this parcel.
9	Mutation crop code catch crop and crop code main crop	Both the crop code of the main crop has changed and the crop code of the catch crop have changed for this parcel. Use the most recent data for this parcel.
10	Mutation crop code catch crop, crop code main crop and geometry	Both the crop code and area of the catch crop and main crop have changed for this parcel. Use the most recent data for this parcel.

Annex L: Timetable for production activities in 2023

Period	Deadline	Step	Activity	By
1-3-2023 t/m 15-5-2023	15-5		Declaration of activities + parcels declaration	Farmer
	15-5		Final declaration of parcels. The farmer can still add parcels but cannot use them for support schemes.	Farmer
		1	Collection of all parcel data needed for monitoring. *Note: the farmer can still modify to the application (reduce size, change crop code).*	NEA
1-1-2023 – 15-10-2023	1-10	2 +QA	Start monitoring of crop classification. Monitor mowing activities (final deadline for mowing 30-9). QA: collect ground truth, select sample (will be provided by the EC).	NEA/Contractor
1-1-2023 – 15-6-2023	15-6	3	First delivery of parcels with mowing activities and crop classification. Use as input for traffic light classification *Note: Mowing prior to 15 March is considered irrelevant.*	NEA/Contractor
15-6-2023 – 30-9-2023		4 After each delivery	Check the quality of crop classification and mowing results. *Note: we also expect the Tenderer to check the result prior to delivery.*	NEA
15-3-2023 – 15-7-2023	15-7	3	Second delivery of parcels with mowing activities and crop classification. Use as input for traffic light classification.	NEA/Contractor
15-7-2023 – 15-8-2023	15-7	5	Red parcels crop classification will be assessed manually (CAPI)	NEA
	15-7	6	Send a letter to all farmers who still have a red parcel after CAPI.	NEA
1-8-2023 – 15-8-2023	1-8	7	Assess proof provided by the farmer.	NEA
15-3-2023 – 15-8-2023	15-8	3	Third delivery of parcels with mowing activities and crop classification. Use as input for traffic light classification.	NEA/Contractor
15-8-2023 – 15-9-2023	15-8	5	Red parcels mowing will be manually assessed (CAPI)	NEA
	16-8	6	Send a letter to all farmers who still have a red parcel after CAPI.	NEA
15-3-2023 – 15-9-2023	15-9	3	Fourth delivery of parcels with mowing activities and crop classification. Use as input for traffic light classification.	NEA/Contractor

	16-9	5	Select all red parcels that have remained red (all parcels that in the meantime have become green, are assessed to be correct based on CAPI or are amended by the applicant are excluded).	NEA
	17-9	6	Send letter 1. To farmers who have not responded yet. 2. To farmers who received a letter but after CAPI no longer have red parcels.	NEA
15-9-2023 – 1-1-2024		QA	Check for the AMS-QA parcels the crop code and mowing activity. This only has to be done for the green and orange parcels. The red parcels were already checked in the previous steps. Record the result of all checked parcels.	NEA
30-9-2023 – 30-11-2023	30-9	7	Until these dates the farmer can use the GPA to prove mowing activity. Other proof can also be provided later.	farmer
17-9-2023 – 30-11-2023	30-11	8	Assess the proof provided by the farmer.	NEA
15-3-2023 – 15-10-2023	15-10	3	Fifth delivery of mowing events and crop classification. Final date for mowing is 30 September.	NEA/Contractor
15-10-2023 – 30-11-2023	30-11		During this period the farmer can make the final application and change this application. If the farmer does not respond to information requests from NEA, the red parcels will be excluded from the application.	
30-11-2023 – 15-1-2023		QA	Check the final number of parcels that were initially flagged red: - Approved after CAPI - Mowing activity took place - Withdrawn by the farmer - Still red after no response from the farmer. These parcels can be reduced to zero until 30 November.	NEA
Farmer has 6 weeks to appeal after receiving final decision from NEA.		objection	Process objections from the farmer: parcels that were non-compliant according to NEA.	Legal department

The new CAP is bringing a lot of changes. One of these changes is the introduction of the area monitoring system (AMS). In 2023, all European member states will be obliged to set up an AMS. The AMS makes it possible to monitor agricultural activities nationwide on the basis of freely available satellite images (Copernicus Programme). Using data that the farmer has passed on to NEA, we can see whether what the farmer has declared is actually being achieved and whether the requirements

associated with the CAP are being complied with. For example, we can see whether the crop specified is correct and, in the case of a grassland parcel, whether it is also being mowed. If the results of the AMS do not match what the farmer has stated, we will contact the farmer and ask for a further explanation.

For the Scheme Transcending Controls (ROC) team, this means a change in the current working method. In this document, we take you through these changes using a step-by-step plan. For the time being, the focus is on monitoring minimum activity. This means that the farmer must specify an eligible crop and, in the case of grassland, the parcel must be mowed at least once a year or grazed with certain exceptions.

The **first step** involves collecting all the data needed for monitoring. In this case, that means all crop fields specified by the business partner. In principle, this process is automated. A script is being written for the AMS that selects all relevant field data and then prepares this in an FTP environment. Since crop parcels change over the season, the initial delivery will be supplemented with changes every month. This process is also automated. The management of this process lies with the ROC team.

The **second step** is the actual beginning of the start of the AMS process. The file containing crop plots is fed into an external party's system or into an environment that is managed by RVO itself. Both variants are currently being considered. Once the file has been processed, the actual monitoring can begin. After importing, all relevant satellite images are first collected. This collection grows as the season progresses. In principle, this process is automated. This process will also be overseen mainly by the ROC team.

We expect the first results in June. Then we will know whether a large number of crops are eligible for subsidy and whether the grassland parcel has also been mowed/grazed. We will feed the results into the MONA MOVE application in order to determine whether the declared crop is eligible. This is the **third step**. We will determine the status of each plot using a number of decision trees. In the beginning, the result will be uncertain for a number of plots, but as the season progresses we will find out more and more and will be able to say with sufficient certainty whether the plot meets the relevant requirements for more and more plots. The processing of the files will be done by the ROC team. This can be done both automatically and manually.

In addition to processing the files, the ROC team will also regularly test the quality of the results delivered. This is the **fourth step**. Should issues emerge following quality control, this may result in adjustments to the AMS process where the observations (crop, mown) are generated.

In the **fifth step**, all abnormal parcels will first be viewed manually. The AM Viewer is used for this, enabling the employee to go through all the satellite images and aerial photos that we have available. In June/July, the focus will initially be on the results of the crop classification. From August/September, the plots on which no mowing activity has been observed will be added.

After a manual check, all the plots where we still believe that the specified crop plot does not meet the conditions will be submitted to the farmer for a further explanation. This is the **sixth step** in the process. There are two options here: either the farmer will receive a letter from us or the farmer will be asked to download a special RVO app and provide the required evidence using this app. This app is also known as the GeotagPhotoApp (GPA). Both scenarios will be accommodated in 2023. The farmer will then have four options:

- Do nothing. In that case, the parcels will be rejected.
- Perform the activity after all. For example mow the parcel.
- Provide proof that the parcel meets the conditions.

- Modify the application.

For crop classification, we will start this process in July. For mowing we will wait until August/September.

In the **final step**, we will complete the AMS controls for 2023 and ensure that the farmer has sufficient time to submit the final application.

Annex M: Good practices in relation to APIs

Overview of API best practices based on: https://www.w3.org/TR/2017/REC-dwbp-20170131/

1: Provide metadata
2: Provide descriptive metadata
3: Provide structural metadata
4: Provide data license information
5: Provide data provenance information
6: Provide data quality information
7: Provide a version indicator
8: Provide version history
9: Use persistent URIs as identifiers of datasets
10: Use persistent URIs as identifiers within datasets
11: Assign URIs to dataset versions and series
12: Use machine-readable standardised data formats
13: Use locale-neutral data representations
14: Provide data in multiple formats
15: Reuse vocabularies, preferably standardised ones
16: Choose the right formalisation level
17: Provide bulk download
18: Provide subsets for large datasets
19: Use content negotiation for serving data available in multiple formats
20: Provide real-time access
21: Provide data up to date
22: Provide an explanation for data that is not available
23: Make data available through an API
24: Use web standards as the foundation of APIs
25: Provide complete documentation for your API
26: Avoid breaking changes to Your API
27: Preserve identifiers
28: Assess dataset coverage
29: Gather feedback from data consumers
30: Make feedback available
31: Enrich data by generating new data
32: Provide complementary presentations
33: Provide feedback to the original publisher
34: Follow licensing terms
35: Cite the original publication