

Overview of the IACS quality assessment in 2023

Union level methodology

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Document history

Date	Revision	Location	Short Description of Changes
04/23	V1.1	page i	Document history: added section
08/23	V1.2	Section 2, page 4-5	New definitions added
08/23	V1.2	Section 5, page 14-15	Additional sentences and footnotes clarifying different aspects including the link between regulation articles and Partial Area Impact (PAI) conditions, handling of all non-conclusive parcels and impact of partial in-compliances
08/23	V1.2	Section 5, page 16	Additional paragraph with respect to error counting in the case of claim changes
08/23	V1.2	Section 5, page 17	Additional paragraph regarding area quantification in AMS quality assessment
08/23	V1.2	Section 6, page 22	Additional paragraph specifying that the scope of the GSA quality assessment also includes the impact of partial incompliances
08/23	V1.2	General	Update of the links to the new WikiCAP
08/23	V1.2	Section 6, page 24	Clarification on the evaluation of the eligible area and addition of a new figure (Figure 5) to clarify the related concepts. Adaptation of the related equations
08/23	V1.2	Section 6, page 27	Update of section 6.2 with the inclusion of additional elements in the list of items to be considered for IT testing
08/23	V1.2	Section 7, page 28	Table 8 and 9 merged in a single table with the LPIS different quality elements
08/23	V1.2	Section 7, page 31	Update of section 7.3 with reference to the LPIS ETS guidelines
08/23	V1.2	Section 8, page 33	New section on remedial actions
08/23	V1.2	Section 9, page 32	Update of section 9.1 to take into account the new definition of eligible area
08/23	V1.2	Section 10, page 37	New section on holding-level eligibility conditions
08/23	V1.2	Annex 2	Removal of Annex 2
10/23	V1.3	Section 4.1.1, page 8	Update on the sample size selection (lot > 1000 items). Possibility to select sample size and Ac. New Table 1
10/23	V1.3	Section 4.1.2, page 10	Update on the sample size selection (lot ≤ 1000 items). Possibility to select sample size and Ac. New Table 3
10/23	V1.3	Sections 5.4.1 page 22, 5.4.2 page 23, and 8.1, page 33	Update on the level at which the number of AMS reds have to be quantified and resulting remedial actions formulated.
10/23	V1.3	Section 8.4, page 33	Added sentence on the need for clear conclusions on the results

10/23	V1.3	Section 10.2, page 38	Restructuring of the section with new subsections
10/23	V1.3	Section 10.2.1, page 38	Clarification on the selection of holdings in the quality assessment sample
10/23	V1.3	Section 10.2.2, page 38	Clarification on the selection of parcels per holding in the AMS quality assessment sample for holding level eligibility conditions
10/23	V1.3	Section 10.2.2, page 38	New Figure 6 with examples illustrating the selection of parcels per holding in the AMS quality assessment sample (for holding level eligibility conditions)
10/23	V1.3	Section 10.2.3, page 39	Clarification on the parcel selection per holding for the GSA quality assessment sample (for holding level eligibility conditions)
10/23	V1.3	Section 10.2.3, page 39	New Figure 7 and Figure 8 illustrating the selection of parcels per holding in the GSA quality assessment sample (for holding level eligibility conditions)

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Summary

The Regulation (EU) 2021/2116 on the financing, management and monitoring of the common agricultural policy 2023-2027 entered into force on 1 January 2023. Among the many novelties, it requires that the three elements of the integrated administration and control system (the identification system for agricultural parcels, the geo-spatial application system and the area monitoring system) are quality assessed in accordance with a methodology set up at Union level. This document, elaborated by DG AGRI in collaboration with the Joint Research Centre (JRC), introduces and discusses the key principles of this methodology for the claim year 2023, with the goal of optimising the implementation of the policy and reaching its targets across all Member States.

After defining the key terms used, the document describes the VHR images that the European Commission will provide to Member States, and illustrates the size and selection process of the parcel samples that Member States must assess. Starting from the samples, the methodology discusses the key quality assessment inspection principles, including what should be assessed and how, and the conditions that require remedial actions, using explanatory examples whenever possible. Finally, the timeline of the expected workflow for the claim year 2023 is illustrated.

Foreword

The new common agricultural policy (CAP) 2023–2027 delivery model introduces a shift from compliance to a performance- and results-based approach. This allows CAP interventions to be tailored to local conditions and needs, while increasing European Union ambitions in terms of sustainability. In this new framework, the regulation foresees that the quality assessment of the integrated system must play a major role in meeting these goals.

This document provides Member States with the principles at Union level regarding the technical implementation of the quality assessments, based on innovative methods and tools that capitalise on past experiences. It summarises, evolves and extends what has been communicated to Member States so far.

Defining a feasible methodology proved challenging because of the ambitious targets of the new CAP and because of the many new elements, such as the Area Monitoring System (AMS). Therefore, the methodology will have to be tested in its first year of application and, if required, improved in the following years. The European Commission [has been exchanging views](#) with Member States through specialised technical meetings to clarify the principles presented in this document and to learn about possible hurdles in their implementation.

These guidelines are the result of a joint collaborative effort between DG AGRI, who set up the methodology, and the JRC, who provided the technical and scientific basis for it.

[This is the third version of the same document produced in April 2023 and updated in August 2023.](#) All remarks have been collected and processed in this version: new parts and major changes are provided in blue.

1 Introduction

The scope of this document is to share with Member States the methodology set up at European Union level on the quality assessments of the Area Monitoring System (AMS), the Geo-Spatial Application system (GSA) and the identification system for agricultural parcels (Land Parcel Identification System - LPIS). Member States will be informed in due time about any possible updates related to subsequent claim years.

The general rules applying to the integrated system (Integrated Administration and Control System – IACS) for the CAP period 2023-2027 are defined in Regulation (EU) 2021/2116. In the context of this document, the following articles are relevant: Articles 24, 68, 69 and 70. Article 24 specifies the rules for satellite imagery acquisition by the European Commission for Member States. Articles 68, 69 and 70 specify that the quality of LPIS, GSA and AMS shall be assessed in accordance with the methodology set up at Union level. Moreover, these articles also specify that if deficiencies are revealed during the above-mentioned quality assessments, Member States shall adopt appropriate remedial actions or, failing that, shall be requested by the European Commission to set up an action plan in accordance with Article 42. More detailed rules on the implementation of the quality assessments can be found in the secondary legislation. Rules for the quality assessments as such are detailed in the Commission Delegated Regulation (EU) 2022/1172, Articles 3 (LPIS quality assessment), 4 (GSA quality assessment) and 5 (AMS quality assessment). Furthermore, the Commission Implementing Regulation (EU) 2022/1173 describes rules concerning the quality assessment reports (Article 2) and the acquisition of satellite data (Article 12).

This document focuses on the quality assessments of three IACS elements (LPIS, GSA and AMS) and not on the control and penalty system described in Article 72 of Regulation (EU) 2021/2116. The quality assessments serve a different purpose than the control and penalty system. The main purposes of the quality assessments are the assessment of the reliable implementation of each system, to provide diagnostic information on the sources of incorrect decisions at the level of interventions and eligibility conditions (AMS quality assessment) and to ensure that the integrated system provides reliable, comprehensive and verifiable data in the Annual Performance Reporting (APR). The quality assessments shall be carried out following a methodology set up at European Union level for each Strategic Plan (SP). By contrast, the main purpose of the control and penalty system is to have assurance on expenditure. This system is a mandatory part of IACS. Its design and implementation are, however, not part of the European Commission's empowerment for the current CAP and are left to the subsidiarity of Member States.

DG AGRI and the Joint Research Centre (JRC) closely collaborate to develop the methodology set up at European Union level and support the Member States. DG AGRI's responsibilities lie in the interpretation of policy requirements, the drafting and sharing of guidance documents, and the acquisition of satellite data. Furthermore, DG AGRI remains the main contact point for Member States concerning the implementation of IACS. The JRC's responsibilities lie in the technical support for the elaboration of the quality assessment methodology, development and research and operation of the data exchange with Member States.

In line with the description above, two contact points have been created. For questions linked to policy, implementation and the acquisition of satellite data: AGRI-IMPLEMENTATION-SUPPORT@ec.europa.eu. For questions linked to technical elements, research and data exchange procedures: JRC-CAP-QA@ec.europa.eu.

2 Definitions and concepts

This section is intended to provide the definitions of the main concepts used in this document in alphabetical order.

Annual Performance Report (APR): Member States shall provide an APR on the implementation of the CAP Strategic Plan in the previous financial year. The APR shall set out key qualitative and quantitative information on the implementation of the CAP Strategic Plan by reference to financial data and to output and result indicators, including at regional level where relevant. The quantitative information shall include the realised outputs, the expenditure declared in the annual accounts and relevant to the outputs (before application of any penalties or other reductions), the ratio between expenditure and relevant outputs, results and distance to corresponding milestones. The information shall be broken down per unit amount as set out in the CAP Strategic Plan for the purpose of performance clearance.

Declared area (or claimed area): This is the area claimed by the beneficiary as being eligible for payment under a given unit amount. Declared area can apply to individual parcels as well as at holding level.

Eligible area: This is the area corresponding to the number of hectares for which all conditions under a claimed unit amount have been met. Eligible area can apply to individual parcels as well as at holding level.

Eligibility conditions (ElCo): Set of conditions and requirements that a beneficiary must fulfil to render the area declared eligible for a specific intervention, including (where applicable) eligibility conditions, commitments, eligibility criteria and other obligations (cf. point 5(c) of Annex I of Regulation (EU) 2021/2289).

Grouping of unit amounts: To reduce the workload in the quality assessment of a high number of interventions / unit amounts defined by the Member States in their CAP Strategic Plans, the European Commission allows similar elements to be grouped together. Such grouping is not mandatory and aims only to, after an initial additional effort, reduce the workload of the quality assessment process without impacting the reliability of the results. If chosen, this option must be developed by Member States and justifications must be documented for each group of unit amounts with which the administration decides to work. As interventions are highly dependent on each CAP Strategic Plan, it is up to each Member State to define, document and justify what is understood as similar elements, providing that the following general principles are respected.

- It is not possible to group different type of interventions. For example, the Basic Income Support for Sustainability (BISS) and the Complementary Income Support for young farmers (CIS-YF) interventions cannot be grouped together, nor can Eco-schemes be grouped with Agri Environmental Commitments.
- Do not group if this would lead to a limited reduction of the workload.
- Pay specific attention not to group if the operation would lead to results that are difficult to interpret.
- Do not group unit amounts under the same type of intervention together if they have different eligibility conditions
- Whenever an intervention has only one unit amount, there is no need to group.
- Whenever an intervention has more than one unit amount, a grouping is possible provided that they have similar eligibility conditions and a similar monitoring approach. Thus, it is possible to group when the only difference is the financial amount paid.
- It is possible to group **unit amounts with** non-monitored eligibility conditions **provided** these are similar.

Some theoretical examples of possible groupings are presented below. They all concern the grouping together of unit amounts under the same type of intervention with similar eligibility conditions and similar monitoring approaches.

1. Intervention on BISS, grouping various unit amounts corresponding to various regional application of BISS.
2. Intervention on Eco-schemes on provision of land to improve biodiversity and habitat conservation, where the variation of the different unit amounts is based on the financial amounts allocated per hectare.
3. Intervention on Eco-scheme on provision of land to improve biodiversity and habitat conservation, where the variation in the different unit amounts is based on the establishment of flower strips in permanent crops or on arable land.
4. Intervention related to rural development and environmental commitments for improving biodiversity such as mowing limitation where the variation of the various unit amounts is based on the date of mowing.

Ineligible area: Non-eligible area(s) occurring within the boundaries of a GSA-declared parcel due to delineation issues occurring either on the outer perimeter of a GSA-declared parcel or else on the outer perimeter of a permanent non-eligible feature located partially or fully within the GSA-declared parcel.

Interventions: A support instrument with a set of eligibility conditions specified by a Member State in its CAP Strategic Plan and based on a type of intervention provided for in Regulation (EU) 2021/2115 (Article 3(3)).

Lot: The set of parcels (size N) declared for a given unit amount (or group of unit amounts).

Non-compliant area: Non-eligible area(s) occurring within the boundaries of a GSA-declared parcel specifically for eligibility conditions where failure to comply with typically impacts only a part of the declared area. Non-compliant areas may occur within correctly delineated agricultural parcels (i.e., in parcels without ineligible area) and may cover all or part of the declared area of a parcel.

Output indicators: Related to the realised output of the interventions supported. There is a one-to-one relationship between an intervention and an output indicator. For the same output indicator there may be outputs measured with different units of measurement. For the purpose of this document, only output indicators with unit of measurement *hectares* are relevant.

Parcel (or agricultural parcel): Unit, defined by Member States in their CAP Strategic Plans, of agricultural area (Article 65(4)(d) of Regulation (EU) 2021/2116). The agricultural area can comprise arable land, permanent crops and permanent grassland (including when they form agroforestry systems on that area (Article 4(3) of Regulation (EU) 2021/2115).

Population: The full set of GSA parcels in a claim year.

Quota: is the number of parcels in a holding that are to be inspected for a holding-level eligibility condition.

Ranked list: List of all GSA parcels reported by the Member States on an annual basis, and subsequently ordered randomly by the European Commission.

Reference parcel: Geographically delimited area retaining a unique identification as registered in the LPIS (Article 68 of Regulation (EU) 2021/2116). A reference parcel shall contain a unit of land representing agricultural area, and where appropriate, shall also contain non-agricultural areas considered eligible by Member States for receiving support for area-based interventions under IACS (Article 2(2) of Regulation (EU) 2022/1172). See also guidance document in previous regulation: DS/CDP/2018/11).

Result indicators: Used for the establishment of quantified milestones and targets in relation to specific objectives in the CAP Strategic Plans and for assessing progress towards those targets. Result indicators establish the link between an intervention and its purpose. Most result indicators are specific to the type of intervention. In most cases, interventions are linked to different result indicators depending on whether the support is granted to farming (primary agricultural production) or activities other than farming. For the purpose of this document, only result indicators with the share of *utilised agricultural area* (UAA) are relevant.

Sample: A subset (size n) of a lot that is used for quality assessment, i.e., the parcels that will be inspected during the quality assessments. It is drawn from the ranked list.

Type of interventions: High level of intervention. Examples are BISS, CIS for young farmers, Eco-schemes, Environmental, climate-related and other management commitments (see Articles 16, 42, 69 of Regulation (EU) 2021/2115).

Unit amount (UA): Low (more detailed) level of an intervention as defined in each CAP Strategic Plan and described by a set of eligible conditions. The notion of unit amount within this document is not the potentially allocated financial amounts of a specific aid but the ensemble of eligibility conditions that characterise each unit amount in a Member States' CAP Strategic Plan for a given intervention. Interventions may come with a single or multiple unit amounts in Member States' CAP Strategic Plans.

3 VHR imagery provided by the European Commission in claim year 2023

The area covered by Very High-Resolution (VHR) imagery drives the prioritization of parcels in the selection of samples for quality assessment. The European Commission defined the location and size of the images that will be provided to Member States in 2023, ensuring maximum randomness and representativeness of all the parcels in the GSA and LPIS populations in the samples that are quality assessed. In this document we use *imagery* as a generic term referring to a group or a type of images captured by the same sensor, and *image* for individual observations.

3.1 Image specifications

The images will be acquired respecting a set of technical specifications that are based on the need to measure areas in the GSA quality assessment and in the LPIS quality assessment with level of accuracy that is at least equivalent to that of cartography at a scale of 1:5 000 as referred in Regulation (EU) 2021/2116, Article 68.

Parcels can have common boundaries with areas covered with forest or high vegetation, buildings and high fences that might obstruct the visibility of its borders. In order to minimise the influence of those adjacent obstructing objects, images will be acquired with a > 80 degrees elevation angle that corresponds to a view angle of between -10 degrees and +10 degrees. The acquisition of satellite imagery in the eastern part of Europe for civil purposes is significantly impacted by the Russian aggression on Ukraine. To improve the chances of acquiring images on these areas, it might be necessary to consider a wider view angle for specific tiles, extending the view angle range from -15 to +15 degrees.

The parcels are distributed over different types of relief, from flat to very rugged terrain. This potentially leads to orthorectification errors (in the case of rugged areas). Therefore, a small ground sampling distance (GSD) of less than or equal to 0.5 metres/pixel is imposed to ensure the required positional accuracy in all types of terrain.

The presence of clouds, cloud shadows, haze, and fog can have a major influence on the usability of an image. The threshold for cloud cover is set to 10%, but each image will be checked individually to assess the influence of clouds or other atmospheric factors on the area of interest prior to sending to Member States. In addition, the presence of snow, water (flooding), and artefacts can lead to the rejection of the image.

The acquisition windows (timeframe in the year when images are to be acquired) are based on the LPIS Quality Assurance campaigns conducted in the past. The acquisition windows is influenced by the specific conditions for each Member State, for example climatic conditions and agricultural practices. For the 2023 campaign, in general, the acquisition windows are from 1 March to 31 August, with changes in the start date up to 15 June for a limited number of areas. The information collected in the claim year 2023 will be analysed to optimise the acquisition windows in the following years.

Data will cover the visible/near-infrared spectral range with a minimum of 4 bands plus panchromatic and 30 cm resolution.

3.2 Quality control and delivery to the Member States

Quality control of the imagery is defined as the steps performed to ensure that the product meets a set of accepted standards. At a minimum, it includes assessment of the images with regard to data integrity, readability, completeness, cloud cover, haze or thin clouds, fog, smoke, smog, snow, flares and cloud shadows. Other parameters evaluated during the image quality control include geometry, radiometry, image characteristics (e.g., dropouts) and production parameters (resampling algorithm, bit depth). Quality control is performed by the European Commission. After passing the quality control, the images can be delivered to the Member State. Each image is made available to the Member States via sFTP protocol by the image provider as soon as it passes the quality control. The details for accessing the sFTP location will be provided by the European Commission.

The data provided will be non-orthorectified, native resolution, pansharpened images with 4 multispectral bands. Data will be provided at georeferenced level, without correction from acquisition and off-nadir terrain effects, to allow for independent orthorectification. The reference system will be UTM/WGS84 with zone depending on the tile location, delivered in a 16 bits GeoTIFF format. The coverage will present homogeneous characteristics with respect to temporal, spectral and spatial properties (acquisition windows, spectral bands, radiometry stability).

If any issues with images are found after orthorectification (performed by the Member State), the image provider will be notified. Depending on the stage of the campaign and rationale, the provider will either reprocess the image or attempt a new acquisition.

3.3 Image selection methodology

The imagery provided by the European Commission should cover enough parcels to quality assess each (group of) unit amount(s). Unfortunately, at the beginning of 2023, when the images were ordered, it was not possible to have an accurate estimate of the spatial distribution of the interventions defined in each Member State's Strategic Plan. In the data submission of November 2022, the areas where interventions are expected to be declared were requested of the Member States, but this only provided very rough information due to uncertainty. For this reason, a homogeneous distribution of all interventions was assumed for claim year 2023, and the image tiles were extracted randomly over the entire territory of each country. The tiles were selected from a regular grid of 10 km by 10 km, as a compromise between the total number of images, the coverage of different areas, and the cost per square kilometre. Countries with a full coverage of national VHR images were excluded from the process because

no additional images are needed. Member States who acquired the images indicated by the European Commission using their own resources were also excluded. The number of tiles acquired for each country depends on the total agricultural area derived from the LPIS 2022. The individual image tiles were selected randomly with a weight based on the number of LPIS parcels in each tile, after excluding those with less than 1 000 hectares of agricultural area and containing less than 300 LPIS parcels. The image selection procedure will be optimised with a specific study in claim year 2024 based on GSA data for claim year 2023.

4 Sample selection in claim year 2023

This section describes the procedure to be adopted for the sample selection in 2023. This procedure includes determination of the sample size and the rules to be followed by the Member States for drawing samples from the list of parcels ranked by the European Commission. The relationship between the samples of the different quality assessments is also discussed.

The sample selection is driven by the AMS quality assessment. [The GSA quality assessment follows the AMS quality assessment sample](#). The sample inspected in the LPIS quality assessment is derived from the GSA quality assessment sample as each GSA parcel polygon is directly linked to a reference parcel of the LPIS population.

The AMS quality assessment must cover both monitored and non-monitored (non-monitorable and not yet monitored) conditions (Article 5(3)(a) of Regulation (EU) 2021/1172). This implies that samples will also be extracted for lots characterised by non-monitored conditions. This methodology will be adopted to test whether or not the error rate is within the specified Limiting Quality (LQ).

4.1 Sample size calculation

The sample size is calculated using the approach detailed in the ISO 2859-2 standard (ISO 2859-2:2020). The sample size needs to be determined along with other parameters that define the specific application for which the sample is selected.

The selection of the sample size is driven by the AMS quality assessment where we are interested in testing whether the number of errors (i.e., parcels that are included in the performance report even if they do not respect one or more eligibility conditions) is below a predefined LQ in a given lot. A *lot* (defined in Section 2) refers to a (group of) unit amount(s). In the following, a *test* is understood as a procedure to verify whether a statement on a lot is true or not. This test is defined by the lot, sample, and number of errors found in the sample. The LQ is the maximum error rate of the full lot. The error rate is defined as the ratio between the number of actual errors in the full lot and the lot size.

The test aims to answer the following question:

“Is the error rate, i.e., the number of errors within the full lot divided by N (the lot size) lower than or equal to LQ?”

This is done by inspecting only a small sample taken from the full lot and counting the number of errors (n_1) within the sample. The formula for the test is:

$$n_1 \leq A_c, \quad (1)$$

where A_c is the acceptance number. The test is passed if n_1 is lower than or equal to A_c . An estimate of the error rate is the ratio between n_1 and n (the sample size). Thus, an additional element defining the test is the acceptance number, which is the maximum number of errors found in the sample to pass the test.

Given the elements defined above, it emerges that only the sample size (n) and the acceptance number (A_c) need to be determined. Indeed, LQ is a design parameter and is fixed. In this respect, there are several equivalent tests for different values of (n , A_c). This implies that the sample size has to be determined together with A_c . The two parameters, (n , A_c), define the sampling plan. [In this section, several sampling plans are defined. These sampling plans are equivalent in terms of LQ and Consumer Risk \(CR\), which is introduced in the next section. By selecting the sampling plan that best suits Member States needs, the combination of sample size and acceptance number is defined.](#)

In the AMS quality assessment, each element inspected in the sample will provide either a positive or a negative outcome. Since each element will be extracted from a lot (of size N) to form a sample (of size n) *without re-introduction*, the resulting statistical model is captured by the *hypergeometric distribution*. However, when the population size (N) is large the hypergeometric distribution can be approximated by a *binomial distribution*.

The results provided below are at first derived using a binomial distribution where a large population size (N) is assumed (i.e., with more than 1 000 elements). This is done to illustrate the approach adopted for the sample plan derivation. Cases obtained for small populations, analysed using the hypergeometric distribution, are then considered.

Note that A_c is usually smaller than $LQ \cdot n$, since it needs to protect against sampling effects, i.e., the case where, by chance, only (or a majority of) good samples are extracted from the population.

4.1.1 Lots larger than 1 000 elements

A_c , n and LQ are related through the Consumer Risk (CR), i.e., the probability that the test is erroneously passed. CR is defined as:

$$\max_{N_1} P(n_1 \leq A_c | N_1 > LQ \cdot N) \leq \beta \quad (2)$$

where N_1 is the actual number of errors that would be observed if the full lot were inspected, and β is the maximum acceptable CR. The maximisation in (2) is needed to consider the worst case scenario where the largest probability of erroneously accepting

the test is considered with respect to the unknown parameters, in this case N_1 . Since a binomial approximation is used, the ratio $\frac{N_1}{N}$ defines p (the probability of error). Eq. (2) is maximised when $p = LQ$.

As already mentioned, once LQ is fixed there are two remaining parameters to be determined: the sample size (n), and the acceptance number (Ac). Eq. (2) provides an additional condition that reduces the test parameter space for a fixed CR, however, several pairs (n, Ac) can satisfy Eq. (2). These options allow one to select a trade-off between sample size and strictness of the test: the smaller the sample size (n), the stricter the acceptance number (Ac).

For the AMS quality assessment, the European Commission has adopted:

- LQ = 0.02, i.e., 2%;
- CR = β = 0.3.

Given these design choices, n and Ac still need to be determined.

One can start determining the minimum sample size leading to a test with the given CR. This minimum sample size is obtained for Ac = 0 and can be computed in closed form using the binomial approximation.

The formula is:

$$\max_{N_1} P(n_1 = 0 | N_1 > LQ \cdot N) = (1 - Lq)^{n^*} \leq \beta \quad (3)$$

where n^* is the minimum sample size.

From (3), it follows:

$$n^* = \left\lceil \frac{\log(\beta)}{\log(1-Lq)} \right\rceil, \quad (4)$$

where $\lceil \cdot \rceil$ is the ceil operator. Using this formula and the values of CR and LQ reported above, the minimum sample size for this case is 60:

$$n^* = 60 \text{ for } LQ = 0.02 \text{ and } \beta = 0.3 \quad (5)$$

Thus, 60 is the minimum sample size allowing a test with a CR = 0.3. Note that the CR is equal to 1- α , where α is the level of the test. However, a sample of 60 elements would not give the system any possibility to make a mistake. With less than 60 items (elements in the sample), it is not possible to determine whether the test is passed even if there were no errors in the sample.

Table 1 provides the different values of n and Ac leading to a CR = 0.3 for a LQ = 0.02:

Table 1: Summary of calculated sample sizes and acceptance numbers leading to a test with CR = 0.3 for LQ = 0.02 for large lot sizes ($N > 1000$).

n	[60-121]	[122-179]	[180-237]	[238-293]	[294-349]	[350-404]	[405-459]	[460-500]
Ac	0	1	2	3	4	5	6	7

Note that there exist several values of n that, for a fixed value of Ac, satisfy Eq. (2). For this reason, the first row of Table 1 provides ranges of n that satisfy Eq. (2). While any (n, Ac) pair in Table 1 can potentially be adopted for the test, standardized representative sample size values are provided in Table 2. The values have been obtained by rounding up to the closest ten the lower sample size of the ranges provided in the first row of Table 1.

Table 2: Representative sample size values extracted from Table 1 as a function of the different acceptance numbers.

n	60	130	180	240	300	350	410	460
Ac	0	1	2	3	4	5	6	7

Member States shall select their sampling plans for populations greater than 1000 from Table 2.

While Member States have the option to select any sampling plan in Table 2, the recommended option is

$$\begin{cases} n = 300 \\ Ac = 4 \end{cases} \quad (6)$$

Note that for a sample of 300 elements, the Ac is 4 and not 6 (2% of 300) in accordance with ISO 2859-2 (ISO 2859-2:2020). This difference takes into consideration the probability that the error rate observed in the sample may be lower than that of the whole lot (i.e., margin against lucky draws). Similar considerations apply to the values reported in Table 2.

The choice given in Table 2 is only valid for the sample used in the scope of the AMS and GSA quality assessments. Member States have to select the sampling plan described in Eq. (6) in the scope of the LPIS quality assessment.

4.1.2 Lots smaller than 1 000 elements

The sampling plans obtained in the previous section are related to the case where the input lot is significantly larger than the sample inspected. In such a case, a binomial approximation can be used and the dependence on the lot size is dropped.

In this section, sampling plans are provided for small input lots, i.e., for cases where the binomial assumption is not valid. These sampling plans are defined in Table 3. For lots with sizes of up to 50 items, all the elements have to be inspected, and no errors should be committed. Indeed 1 error in a lot of 50 items corresponds to an error rate of 2%, which is the limiting quality, LQ. Dark cells in Table 3 indicate that for the specified acceptance number and lot sizes there is not a valid sampling plan satisfying the CR requirement. Moreover, sample size provided with an asterisk (*) indicate that if the specified sample size is larger than the lot size, then the full lot should be inspected. The following examples illustrate the use of the table.

Example 1: assume that a (group of) unit amount(s) has a size $N = 350$ items. Then the 6th row in Table 3 should be considered since it is used for lot sizes between 301 and 400 items. Since in this row there are no dark cells, sampling plans are available for Ac ranging from 0 to 5. MS are free to decide the Ac value in such range. Assume that $Ac = 3$ is finally selected: this value corresponds to 5th column in Table 3. The intersection of the 5th column and 6th row identifies the cell the specifies the sample size. In this case, 215 items have to be inspected.

Example 2: assume that the lot size is $N = 80$. In this case, the 3rd row of Table 3 has to be considered. Given the small lot size, only two sampling plans are available for $Ac = 0$ and $Ac = 1$. If $Ac = 0$ is selected, then a sample of 50 elements should be inspected. For $Ac = 1$, the table specifies a sample size of 85 items. Since the lot size is 80, which is less than 85, then the full lot should be inspected.

The sampling plans reported in the table have been derived considering the results depicted in Figure 1. The figure provides a graphical representation of the different sampling plans available for $CR = 0.3$ and $LQ = 0.02$. Since a hypergeometric distribution is used, each sampling plan is determined by the input lot size (N , horizontal axis), the sample size (n , vertical axis) and the acceptance number (Ac). Each coloured region corresponds to a different Ac value. Only points inside a coloured band correspond to valid sampling plans. Only acceptance numbers less than or equal to 4 have been considered in accordance with the results obtained for large populations. Continuous horizontal lines correspond to the sample sizes obtained using the binomial approximation for different values of Ac . The dashed black line corresponds to the sampling plans recommended for the different lot sizes and defined in Table 4. This line crosses the different coloured regions, which define the acceptance numbers.

Table 3: Sampling sizes as a function of the input lot size, N, and acceptance number, Ac. For N ≤ 50 all items in the lot should be inspected. Dark cells indicate that for the specified acceptance number and lot sizes there is not a valid sampling plan satisfying the CR requirement. Numbers with an asterisk (*) indicate that if the sample size is larger than the lot size, then the full lot should be inspected.

Acceptance Num. →	Ac = 0	Ac = 1	Ac = 2	Ac = 3	Ac = 4	Ac = 5
Lot Size (N) ↓						
[1-50]	N					
[51-100]	50	85*				
[101-200]	50	105*	150*			
[201-300]	55	110	160	205*	250*	
[301-400]	60	110	165	215	260	300
[401-500]	60	115	170	220	270	315
[501-600]	60	115	170	220	275	320
[601-700]	60	120	170	225	275	325
[701-800]	60	120	175	225	280	330
[801-900]	60	120	175	230	280	330
[901-1 000]	60	125	175	230	290	340

Table 4: Recommended sampling sizes as a function of the input lot size, N, for N lower than 1000.

Lot Size (N)	Sample Size	Ac
[1-50]	N	0
[51-250]	50	0
[251-500]	115	1
[501-750]	175	2
[751-1 000]	230	3
> 1 000	300	4

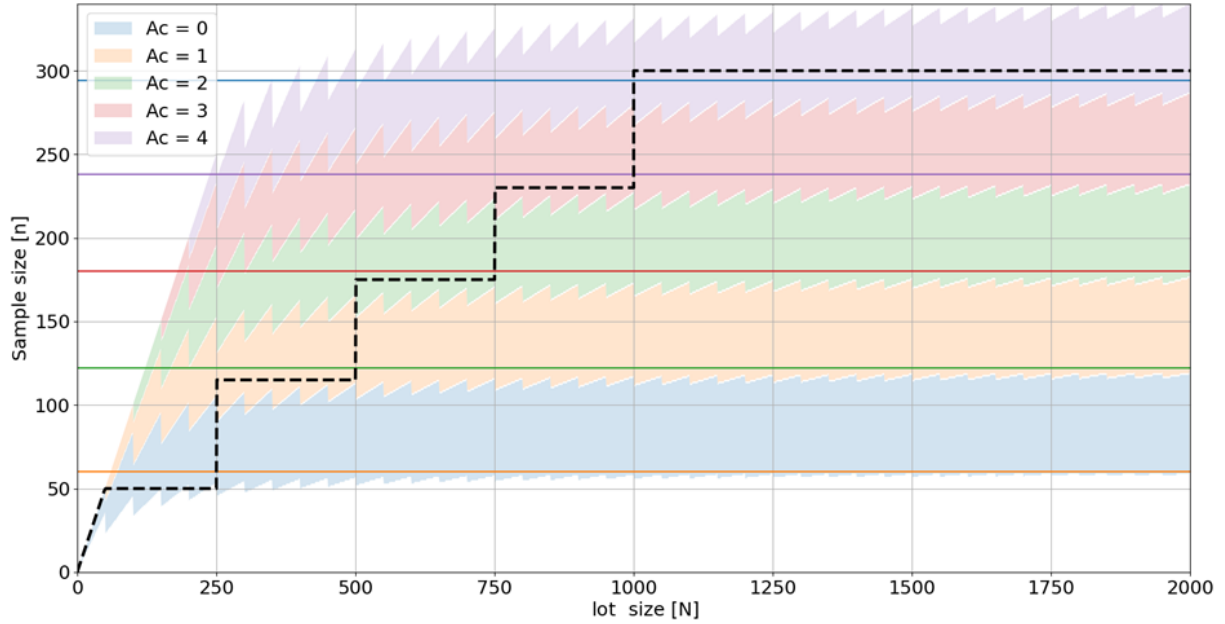


Figure 1: Graphical representation of the different sampling plans available for CR = 0.3 and LQ = 0.02. Since a hypergeometric distribution is used, each sampling plan is determined by input lot size (N, horizontal axis), the sample size (n, vertical axis) and the acceptance number (Ac). Each coloured region corresponds to a different Ac value. Continuous horizontal lines correspond to the binomial approximation. The dashed black line corresponds to the sampling plans defined in Table 4.

Note that the different coloured regions are characterised by a saw-tooth pattern. This is because the hypergeometric distribution is parametrised by N_1 , the total number of errors in the full lot. This number is directly derived from LQ and N (the population size) as:

$$N_1 = [LQ \cdot N]. \quad (7)$$

The product $LQ \cdot N$ is an integer only when N is a multiple of 50. For N values that are not a multiple of 50, N_1 is bigger than the pure product $LQ \cdot N$, leading to different sample sizes: the patterns in the coloured areas reflect this.

The sampling plans defined in Table 3 should be adopted to determine the sample sizes for lots smaller than 1 000 elements.

4.1.3 Estimation of the error rate and its variance

Sections 4.1.1 and 4.1.2 discussed the derivation of the sample sizes with respect to the definition of the test adopted by the AMS quality assessment, which will be further discussed in Section 5.2.6. It was shown that several tests exist with the same CR: these are obtained considering different combinations of sample sizes and acceptance numbers. While MS can select the sample plan, a different view on the sample size can be obtained by considering the estimation of the actual error rate:

$$p = \frac{N_1}{N}, \quad (8)$$

that is the ratio between N_1 (the number of errors that one would observe if the full lot were inspected) and N (the lot size). Since the full lot cannot be inspected, an estimate of p is obtained as the ratio between n_1 , (the number of errors found in the sample) and n (the sample size):

$$p \approx \hat{p} = \frac{n_1}{n}. \quad (9)$$

For large lot size, n_1 can be described as a binomial random variable with mean pn and variance $np(1 - p)$. Thus, the variance of $\hat{p}$ is given by

$$Var\left(\frac{n_1}{n}\right) = \frac{1}{n}p(1 - p). \quad (10)$$

While the real error rate, p , in (10) is actually unknown, the variance of its estimate decreases with the sample size, n . If we assume that the test introduced above is passed, then $p < 0.02$ and variance (10) is bounded by:

$$\frac{1}{n}0.02(1 - 0.98) = \frac{0.0196}{n} \quad (11)$$

For $n = 300$, this is equivalent to a variance of $6.53\text{e-}5$ or to a standard deviation of 0.0081 (0.81%). This fact should be taken into account when selecting the sample plan since small sample sizes can lead to large standard deviations.

4.2 Sample selection as ranked list

In claim year 2023, there is no reliable information available to estimate the spatial distribution of the interventions declared. For this reason, in this first year of the new CAP (2023-2027), the selection of the samples for each lot is carried out under the form of a ranked list containing all parcels/applications submitted by a Member State (full GSAA 2022 population) from which samples will be drawn when the interventions declared will be known. The European Commission provided this ranked list to each Member State in March 2023. The ranked list was created with the following procedure:

1. The GSAA 2022 (or GSA 2023, when available) parcel points submitted by Member States in February 2023 were intersected with the area covered by the VHR image tiles that will be provided by the European Commission. This selection of parcels was randomly ranked first.
2. Then, if national VHR imagery is available, parcels covered by it were randomly ranked after the parcels covered by the VHR image tiles provided by the European Commission.
3. Finally, all other parcels were randomly ranked after those covered by the European Commission VHR image tiles and/or national imagery. For countries with a complete coverage of national imagery, all parcels were randomly ranked without any prioritization.
4. When the GSA 2023 parcels/applications and their declarations are available, the corresponding polygons will be spatially joined by Member States with the points of the GSAA parcels 2022 (Figure 2), without any intervention of the European Commission. As a result, the ranked list of parcels based on GSAA 2022 is transformed into a ranked list of the parcels from GSA 2023. If, after the spatial joining, a GSA 2023 parcel appears two or more times in the ranked list (e.g., due to the merging of two or more GSAA 2022 parcels in GSA 2023), only the first occurrence in the list is considered. Note that for countries that submitted GSA 2023 populations in February 2023, this step is not needed.

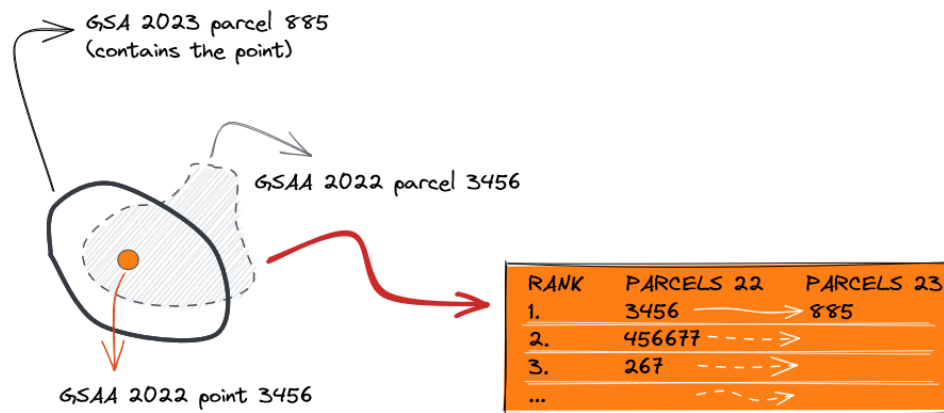


Figure 2: A spatial join (a GSAA 2022 parcel point in a GSA 2023 parcel polygon) links the ranked list based on GSAA 2022 to GSA 2023.

The ranked list is then used to build the different samples, one per (group of) unit amount(s) according to the methodology discussed in the following. The ranked list provides an approximately random order of the parcels, which are associated with the different lots (groups of unit amounts). Given the random nature of such ordering, it is expected that parcels belonging to the largest unit amounts are ranked first. This is because a higher probability is expected when selecting a parcel belonging to a lot with a larger size. Thus, the ranked list should be used from top to bottom for the construction of the samples.

The methodology of sample construction, illustrated in Figure 3, is denoted as a *bucket-filling* process. For each lot, a sample of size n has to be constructed. This is done by filling a bucket that will contain the sample. Thus, a bucket is associated with each lot. At the beginning of the process, all of the buckets are empty.

Ranked list of GSA parcels

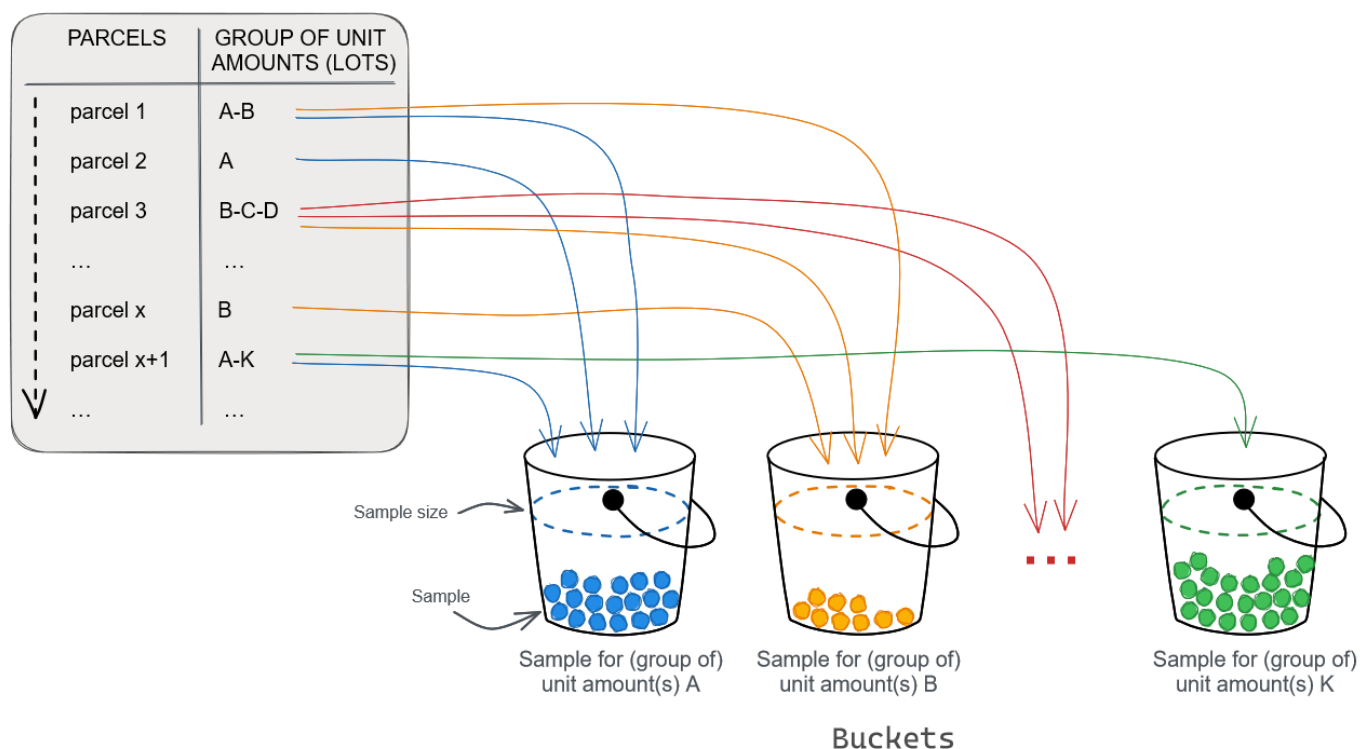


Figure 3: Process of bucket filling from the ranked list. This mechanism allows the creation of the different samples from the ranked list with the reuse of parcels/items in different samples.

To fill the different buckets, the ranked list is progressively read. Consider the example in Figure 3: the first item of the ranked list belongs to lot A and lot B. Thus, this parcel is used to fill the buckets associated with lot A and lot B. After reading the first item of the list, all of the buckets are empty except for bucket A and bucket B, which each contain one item. The process continues as the list is read from top to bottom. Each parcel read from the list is included in the associated buckets until the required sample size is reached. For instance, parcel 2 in Figure 3 is included only in bucket A, parcel 3 in buckets B, C and D.

When a bucket reaches the required sample size, it is excluded from the bucket-filling process since it is already filled. When a parcel is associated with buckets that are all already filled, it is simply discarded (skipped) from the process, which ends when all of the buckets are full and all of the samples are determined.

The pseudo-code associated with this process is provided in the Box 1 below.

Box 1. Summary of the procedure for determining the different samples from the ranked list

Initialization:

- Allocate the different buckets, one for each (group of) unit amount(s). Each bucket is characterised by a sample size
- A bucket is full, when it contains a number of parcels equal to the associated sample size

While <there is a non-full bucket>:

- read item i of the ranked list (from top to bottom)
- determine the list of (groups of) unit amount(s) containing parcel i [list denoted as L_i]

for g , (group of) unit amount(s), in L_i :

if bucket associated with g is **not full**:

Append parcel i to bucket associated with g

This methodology allows for the construction of samples for quality assessment reusing a parcel for several lots. The random nature of the ranked list ensures the random nature of the samples.

The procedure will be optimised in claim year 2024, as the sample selection will be based on data generated in claim year 2023.

4.3 Skipping

While the European Commission expects parcels to serve for both GSA and AMS quality assessment (cf. Recital 6 Regulation (EU) 2022/1172), the ranked list of parcels allows for the skipping of certain parcels. While the ranked list should be sequentially followed from top to bottom until the required sample sizes are reached, a parcel could be skipped if strictly necessary and justified. The option of skipping should not be abused. Moreover, the list of skipped parcels must be provided as part of the final quality assessment reports. For each skipped parcel, the reason for skipping must be provided.

Examples of reasons for skipping are:

- a parcel is out of the scope of the quality assessments (e.g., parcel not declared for any of the lots assessed, application withdrawn by the farmer, confirmed non-compliance detected by the AMS);
- a parcel not completely covered by the images provided by the European Commission or covered by clouds in the image (if there are enough parcels covered by VHR images to reach the target sample size);
- insufficient data for performing quality assessments (e.g., change of a declaration made too late in the season to collect new data).

Skipping does not imply a reduction of the sample size: each skipped parcel must be replaced by another parcel that will be extracted from the ranked list. Member States are responsible for reaching the required sample sizes. [The European Commission advises that Member States add additional parcels to the sample in order to avoid a situation where not enough parcels have been inspected to conclude significantly on the need for remedial actions.](#)

5 AMS quality assessment inspection principles

This section describes the principles underpinning the AMS quality assessment. Sections 5.1 to 5.3 are relevant with respect to Article 5(3)(a) of the Delegated Regulation (EU) 2022/1172, whereas Section 5.4 refers to Article 5(3)(b).

5.1 Background

The AMS quality assessment shall i) assess the reliability of the implementation of the AMS, ii) provide diagnostic information on the sources of incorrect decisions at the level of interventions and eligibility conditions, and iii) assess the correctness of the information provided by relevant indicators in the APR. The focus of the AMS quality assessment therefore is on eligibility conditions and not on other general aspects such as absence of double claims that do not fall under AMS quality assessment but should be dealt with via systematic administrative checks.

From 2023, the AMS quality assessment must cover all area-based interventions subject to IACS, irrespective of whether all, some, or none of the eligibility conditions for these interventions are monitored by the AMS. In each case, the AMS quality assessment will assess whether the decision of the Member States on compliance of all area-based interventions was correct since this has a direct impact on the hectares reported in the APR.

5.1.1 Eligibility conditions

Eligibility conditions can be categorised *a priori* with respect to the impact that they have, in case of confirmed non-compliance, on the number of hectares from a given claim that would become ineligible for reporting, namely:

1. eligibility conditions that always render the full area declared ineligible for inclusion in the APR, e.g., active farmer, age of farmer, certification.
2. eligibility conditions that may render parts of the area declared ineligible for inclusion in the APR, e.g., agricultural activities not covering the full area declared, ineligible land use¹ within area declared.
3. eligibility conditions that never affect the area included in APR (but may affect payment/reductions), e.g., access to water, level of floristic diversification.

5.1.2 AMS results

In 2023, the AMS should, as a minimum, cover all relevant eligibility conditions for both the BISS and for interventions for areas of natural or other specific constraints (ANCs). To guarantee reliable observation, tracking and assessment of agricultural activities and practices, in line with Article 65(4)(b) of Regulation (EU) 2021/2116, the AMS shall, at the level of the agricultural parcels or units of land containing non-agricultural areas considered eligible by Member States, ensure the detection of i) ineligible area (in particular due to permanent structures), ii) ineligible land use (with respect to the intervention claimed) and iii) changes in the category of agricultural area (i.e., arable land, permanent crop, permanent grassland). The AMS shall cover all parcels in the lot for which a given (group of) unit amount(s) is claimed.

A *stable* AMS result occurs when further changes in the status of the monitored eligibility condition are no longer possible or considered unlikely. A stable AMS result can be conclusive or non-conclusive. Where the stable AMS result is conclusive, i.e., where the AMS finding indicates that an eligibility condition is either complied with or not complied with, Member States typically accept and mirror these findings in their decision regarding compliance of the intervention claimed (for a given parcel and unit amount). Where the stable AMS result is non-conclusive, Member States must take a final decision as to the intervention claimed (for the concerned parcel and unit amount). Specifically, so as to ensure equal handling of all non-conclusive results:

- Member States may decide upfront to handle all cases where stable AMS results are non-conclusive as situations without tangible evidence regarding a possible non-compliance.
- Member States may *a priori* opt for a cascaded AMS approach to reduce the number of non-conclusive cases, for example, by first applying an automated analysis to Sentinel satellite images and then by performing an automated analysis on geotagged photos requested only for the population of the non-conclusive Sentinel results.
- Member States may opt for a non-automated follow-up procedure (that is applied systematically following non-conclusive AMS results).

The first two of the above approaches imply that (for a fully monitored unit amount) a final decision is taken solely on the basis of automated AMS processing. Where Member States opt for systematic yet non-automated decision-making processes in addition to the AMS, it is the final decision obtained via the non-AMS process that will be assessed in the AMS quality assessment.

A note on the **colour status** of AMS findings:

¹ all three conditions listed in Article 10(7) of Implementing Regulation (EU) 2022/1173 fall under this category of eligibility condition.

- Individual AMS-monitored eligibility conditions on a parcel: The colour status of a non-conclusive AMS-monitored eligibility condition is “yellow”, whereas the colour status of a conclusive AMS result may either be “green” (if compliance with a given eligibility condition has been found) or “red” (if a non-compliance was detected).
- All AMS-monitored eligibility conditions for a given (group of) unit amount(s) for a given parcel: The colour status of an AMS-monitored parcel is only based on the AMS findings for eligibility conditions where failure to comply implies that all or part of the declared area is ineligible for inclusion in the APR. Thus, the colour status of an AMS-monitored parcel is “red” if at least one of the AMS-monitored and APR-relevant eligibility conditions is *red* for the unit amount concerned. The colour status of an AMS-monitored parcel is “green” if all of the AMS-monitored and APR-relevant eligibility conditions are *green*. The colour status of an AMS-monitored parcel is “yellow” if it is neither *red* nor *green*.

The hectares associated with claimed unit amounts on parcels having a *red* AMS after the deadline for GSA amendments, are not included in the APR and therefore must also not be part of the AMS quality assessment sample for that unit amount (corresponding parcels must be skipped).

5.1.3 Incorrect decisions

Where the AMS quality assessment inspection process identifies a difference between the declaration and reality for an eligibility condition, then this difference becomes an *incorrect decision* if all of the following are true:

- it concerns a type of eligibility condition, where a failure to comply impacts the hectares reported in the APR.
- it would have gone unnoticed had it occurred outside of the AMS quality assessment sample.
- it would result in hectares incorrectly entering the APR.

Where identified differences between the declaration and reality lead to a partial non-compliance (i.e., part of the declared area remains eligible) this counts as an incorrect decision. More specifically:

- for non-monitored eligibility conditions (whether they are non-monitorable or not yet monitored) any mismatch between the declaration and reality constitutes an incorrect decision if the eligibility condition affected is of a type that can impact the hectares reported in the APR and the mismatch would have resulted in hectares incorrectly entering the APR.
- for monitored eligibility conditions, where the decision on compliance is solely based on the outcome of the AMS, an incorrect decision occurs if the AMS result is not *red* and the AMS quality assessment inspection found a mismatch between the declaration and reality that would have resulted in hectares incorrectly entering the APR.

By consequence, eligibility conditions where a failure to comply has no impact on the APR, as well as so-called “false red” AMS results (where the AMS identifies a non-compliance that is however not corroborated by the AMS quality assessment inspection), do not fall under the above definition of incorrect decisions.

The number of incorrect decisions will be used to determine whether remedial action is required (see Section 5.2.6).

5.2 AMS quality assessment inspection tasks

The AMS quality assessment inspection is a non-automated (i.e., operator-based) process that must be carried out in an unbiased manner, i.e., without altering or interfering with other IACS processes such as the AMS feedback to farmers. Member States therefore should refrain from announcing inspection efforts of the AMS quality assessment upfront to concerned beneficiaries. Instead, beneficiaries should only be informed when their support/presence is truly required (for example when verifying non-monitorable eligibility conditions) and even then, these inspection efforts should be timed to occur, whenever possible, towards the end of the period so as to ensure that other eligibility conditions were properly evaluated prior to informing the beneficiary.

Member States shall not substitute AMS findings by AMS quality assessment results. Instead, for monitorable eligibility conditions Member States may choose to communicate information (obtained via the inspection process of the AMS quality assessment) to beneficiaries in time for GSA amendments. Where Member States choose to do so, this constitutes an external interference with the nominal functioning of IACS and therefore implies that the inspection process of the AMS quality assessment on the parcel has achieved its goal for the unit amount(s) triggering the communication to the beneficiary. In most cases, the communication thus will imply that for the purpose of the AMS quality assessment the decision is considered incorrect and hence counts toward the statistical test for remedial actions (see Section 5.2.6). In some cases, however, the communication may imply that the Member States will have to skip this parcel from the quality assessment effort and inspect another parcel with the same (group of) unit amount(s) (see Section 5.2.3).

All incorrect decisions discovered via the AMS quality assessment inspection process count toward estimating the need for remedial actions. In combination with the inspection process of the GSA quality assessment they also contribute toward estimating the area error in the concerned unit amount (see Section 9). As such, whenever an error discovered via the AMS quality assessment inspection process is communicated to a beneficiary or otherwise leads to a change in the aid declaration then the AMS quality assessment inspection has achieved its goal for the concerned parcel and (group of) unit amount(s). In that

case, as explained in the previous paragraph, the communicated error will generally count toward the statistical test for remedial actions and the corresponding area errors will have to be quantified with respect to the last aid declaration prior to the communication of the said error (see Section 6.1).

Overall, the AMS quality assessment inspection can be subdivided into three separate parts:

- to gather reference data on the parcel selected for the AMS quality assessment.
- to compare the real situation against what would be expected based on the declaration.
- to assess whether observed differences between declaration and reality constitute an incorrect decision.

5.2.1 Acquisition of reference data

The inspection process of the AMS quality assessment on a parcel begins with the acquisition of reference data. In general, the aim should be to record reliable and conclusive information with respect to the actual situation on the ground, and to store (ideally graphical) evidence. Where reference data cannot be acquired, the parcel must be skipped from the sample of parcels contributing to the AMS quality assessment of the concerned (group of) unit amount(s) and the reason for this skipping must be recorded (see Section 4.3).

No area measurements are required for the AMS quality assessment. These will be derived from the GSA quality assessment. However, when eligibility conditions are defined in terms of a minimum/maximum area-share or density-per-hectare criterion then area quantifications may be needed to conclude on compliance (as described in Section 5.2.2). In addition, where parts of parcels feature non-compliances (with respect to eligibility conditions labelled as type 2 in Section 5.1.1) or where ineligible areas not identified in the declaration are visually noted during the AMS quality assessment inspection process, then these shall be “flagged” to the GSA quality assessment using one of the means described in Section 10.3.3.

Reference data must allow for the evaluation of all individual eligibility conditions pertaining to the unit amounts that are to be assessed for the parcel under inspection. Reference data should be acquired in a manner that enables conclusive assessments as to whether all (monitored and non-monitored) eligibility conditions that are relevant for the unit amounts claimed by a beneficiary on a GSA declared area have actually been complied with, irrespective of possible claim amendments made during the course of the year. Where AMS quality assessment reference data does not allow an amended claim to be re-assessed, Member States should aim, where possible, to acquire missing reference data before deciding to skip the parcel (for the unit amount subject to inspection).

In case of documentary checks, AMS quality assessment efforts must go beyond manual extractions of IACS database info. Where such checks were already carried out successfully by the Member State since the last update of the concerned GIS/database systems and their data content, there is no need to repeat these checks again during the inspection effort of the AMS quality assessment. Where documentary checks require interacting with the beneficiary, these efforts should ideally be performed towards the end of the period so as to ensure that reference data has already been collected for the majority of other eligibility conditions.

Member States may choose to acquire AMS quality assessment reference data:

- using *in situ* visits carried out at any time of the year (and to the extent possible covering all eligibility conditions relevant for a given beneficiary during the same visit);
- via non-automated analysis of images of the same calendar year able to provide conclusive and reliable results with respect to the actual situation on ground.

Where Member States opt for imagery as the data source for obtaining reference data, the data source should be chosen carefully to enable the provision of conclusive and reliable results regarding the actual situation. Where a specific choice of imagery does not allow for a reliable conclusion on a given eligibility condition, then either more suitable imagery must be used or a field visit envisaged to obtain the required information. Where none of these are possible, the parcel must be skipped for those unit amounts affected.

The timing of AMS quality assessment inspection efforts may depend on the definition of the eligibility condition(s). While it is possible to do an inspection before the deadline for a certain eligibility condition has expired, such an effort can be conclusive only in some cases, as discussed below.

1. Where the eligibility condition requires beneficiaries to perform an action X before time T, then if the AMS quality assessment inspection is carried out before time T it can only be conclusive if action X was performed (i.e., for cases that were already compliant at the time of the quality assessment inspection). Otherwise, it will be non-conclusive and hence the inspection effort of the AMS quality assessment should be repeated later.
2. Where the eligibility condition requires not to perform an action X before time T, then if the AMS quality assessment inspection is carried out before time T it can only be conclusive if Action X was performed (i.e., for cases that were already non-compliant at the time of the quality assessment inspection). Otherwise, it will be non-conclusive and hence the inspection effort of the AMS quality assessment should be repeated later.

Where it is not possible to obtain conclusive and reliable reference data for all eligibility conditions of a given (group of) unit amount(s) on a parcel in the sample, then that parcel must be skipped for the AMS quality assessment inspection of the concerned (group of) unit amount(s).

It is possible to do the AMS quality assessment inspection before the farmer has received the AMS result for the concerned parcel. However, irrespective of the dates chosen by the Member States for communicating AMS results to beneficiaries and for carrying out the AMS quality assessment inspection efforts, Member States must not substitute the AMS findings with the results of the AMS quality assessment inspection process.

5.2.2 Comparison between the declaration and reality

Assessments as to whether the declaration differs from reality must be carried out for each eligibility condition of a given (group of) unit amount(s) using the latest available declaration. Where a declaration is subsequently amended by the beneficiary, whether as a result of an AMS alert or spontaneously, that is, in absence of external warnings, then the comparison between the declaration and reality must be repeated.

Where after a declaration amendment it is no longer possible to compare the declaration against reality due to missing reference data, the said reference data must be acquired or where this is no longer possible the parcel skipped.

Where during the AMS quality assessment inspection process any one spatial, temporal or other aspects of a given eligibility condition is considered not to be met in full, on the basis of reliable reference data for the claimed unit amount, then the declaration is said to differ from reality for this eligibility condition.

Table 5 provides examples of possible spatial, temporal and other aspects that may be (explicitly or implicitly) required for an eligibility condition to be considered as being met (left column). It also lists the corresponding conditions that would result in a declaration that differs from reality during the AMS quality assessment inspection process.

For example, the first row of Table 5 describes the case where an eligibility condition must be implemented across all of the declared area in order to be considered as being met. If the AMS quality assessment inspection is capable of concluding, on the grounds of a visual assessment, that the said eligibility condition was not implemented across all of the area declared via the GSA, then for that eligibility condition the inspection will find that the declaration differs from reality.

Table 5: Overview of possible spatial, temporal and other aspects that may be (explicitly or implicitly) required for an eligibility condition to be considered as being met (left column) together with the corresponding condition (right column) that would result in the AMS quality assessment inspection finding that the declaration differs from reality.

	ELCo is met if it occurs:	AMS quality assessment inspection yields: 'declaration differs from reality' status if:
Spatial conditions	across all of the declared area	ELCo cover is less than the declared area*
	in more than a minimum percentage of the declared area	ELCo cover is less than minimum % of the declared area*
	in less than a maximum percentage of the declared area	ELCo cover is more than maximum % of the declared area*
	anywhere in the declared area	absence of ELCo evidence within the declared area*
Temporal conditions	before/after a fixed date	fixed date is not respected
	within/outside a fixed time period	time period is not respected
	anytime/throughout the claim year	not carried out or stopped within the claim year
Other	irrespective of the declared area	ELCo is not fulfilled

* = ideally via visual assessment only

For eligibility conditions defined in terms of spatial conditions, such as those listed in Table 5, the situation may arise that the AMS quality assessment inspection effort is not able to reliably conclude by visual assessment as to whether a required minimum (or maximum) area percentage has been reached or not. In such a case, Member States may quantify the concerned eligible areas by analogy to the means described in Section 10.3.2 for the flagging of ineligible and/or non-compliant areas. If so, then a conservative delineation approach shall be applied to avoid any overestimation of eligible area.

5.2.3 Identifying and communicating incorrect decisions

Where the declaration differs from reality for a given eligibility condition, Member States must determine whether this difference implies an incorrect decision (as defined in Section 5.1.3, i.e., with respect to the hectares that would have been included in the APR had the said parcel not been part of the AMS quality assessment sample).

The identification of incorrect decisions for monitored eligibility conditions should be based on stable AMS results.

Member States are also to decide whether they wish to communicate incorrect decisions to beneficiaries in time for amendment, knowing that:

- declarations may only be amended if the communicated incorrect decision concerns a monitored eligibility condition.
- upon communication of an incorrect decision the AMS quality assessment inspection process ends for all (groups of) unit amounts on the concerned parcel for which the eligibility condition with the incorrect decision is relevant and counts as an error in the AMS quality assessment test. The communicated incorrect decision(s) will thus enter the AMS quality assessment even if the beneficiary subsequently amends the declaration for monitored eligibility conditions.
- communicating an incorrect decision too far ahead of the deadline for GSA amendments effectively reduces the likelihood that spontaneous declaration amendments by the beneficiaries would remedy issues detected by the AMS quality assessment. Early communications of incorrect decisions may also imply a loss of diagnostic information for eligibility conditions not yet inspected or without stable AMS results on the concerned parcel.

In the light of the above, Member States wishing to communicate incorrect decisions detected by the AMS quality assessment to beneficiaries prior to the deadline for GSA amendments, are advised to do so at the latest possible date prior to the deadline for GSA amendments.

Where the AMS quality assessment inspection identifies differences between the declaration and reality that concern monitored eligibility conditions not having any impact on the amount of hectares included in the APR, and where the Member State intends to communicate these findings to the beneficiary in time for GSA amendment, then this has no impact on the AMS quality assessment process provided that all other eligibility conditions, that could have an impact on the hectares included in the APR, were already evaluated during the inspection process prior to the said communication to the beneficiary. However, if the latter was not the case, and no non-compliance was detected for the subset of already inspected APR-relevant eligibility conditions at the time of the said communication, then the parcel cannot be part of the AMS quality assessment sample for the unit amount for which the Member State chooses to communicate the observed difference between the declaration and reality in time for GSA amendments. Table 6 illustrates eligibility conditions that can generate incorrect decisions and the possibility to amend if Member States choose to communicate it to farmers.

Table 6: Overview as to what eligibility condition types can yield incorrect decisions (first three columns) and whether beneficiaries could amend their declaration if Member States choose to communicate AMS quality assessment derived incorrect decisions to them prior to the deadline for GSA amendment (last column).

Impact of EICo failure on APR	Can AMS quality assessment inspection yield incorrect decision?	Is EICo monitored?	Can beneficiary amend if Member States communicates AMS quality assessment finding before GSA deadline?
always full area	yes	yes	yes
		no	no
variable area	yes	yes	yes
		no	no
no area impact	no	yes	yes
		no	no

5.2.4 Examples

Inspection outcome for a parcel with a delineation issue

The schematic representation in Figure 4 showcases the situation of a parcel with a delineation issue that was declared for the BISS intervention and that was selected for AMS quality assessment (and GSA quality assessment). The two sketches on the left indicate the declared (blue) and verified actual situation on the ground (green/red) on the parcel. The right part of the schema lists the relevant eligibility conditions, together with information as to whether the AMS quality assessment inspection process concludes that the declaration differs from reality for each eligibility condition and whether such differences imply that an incorrect decision would have resulted (with respect to the hectares included in the APR) had the parcel not been inspected as part of the AMS quality assessment.

In this example the presence of an area labelled as *forest* is visually apparent during the AMS quality assessment inspection. Since this part of the declared parcel is not eligible for BISS, the AMS quality assessment inspection will flag the concerned area for measurement during the GSA quality assessment (which subsequently will determine it to be 1 hectare [ha] in size whereas the wheat covered area is reduced to 10 hectares of the declared 11 hectares). Although *agricultural activity* is present on a large part of the area declared for the BISS intervention, the fact that one can visually detect that some of the declared area is not covered by *agricultural activity* therefore constitutes a difference between the declaration and reality. The same is true for

the requirement that there should be *no ineligible land use* and *no ineligible land cover* present within the declared area. For each of these three monitored eligibility conditions, the observed difference between the declaration and reality translates into an incorrect decision if the stable AMS result is not conclusively non-compliant (i.e., the AMS result is not *red*). Alternatively, if the stable AMS result is *red* and the farmer does not amend the declaration, then the difference observed during the AMS quality assessment inspection process will not constitute an incorrect decision since declarations with a *red* AMS result after the deadline for GSA amendments cannot enter the APR. At the same time, if the AMS result is *red* and the declaration would subsequently be amended, then both the AMS analysis and the declaration-versus-reality check of the AMS quality assessment would have to be re-performed prior to deciding on whether a decision was incorrect or not.

The schematic example assumes that all non-monitored eligibility conditions are complied with and that there are no ineligible structures present on the parcel. The latter implies that for the *no ineligible structures* eligibility condition, the declaration will not differ from reality and there will be no incorrect decision detected for this eligibility condition irrespective of what the findings of the AMS may turn out to be. For example, if the AMS were to indicate a non-compliance for the *no ineligible structures* eligibility condition, then this would constitute a *false red* situation, which may have diagnostic value but which does not constitute an incorrect decision with respect to the APR.

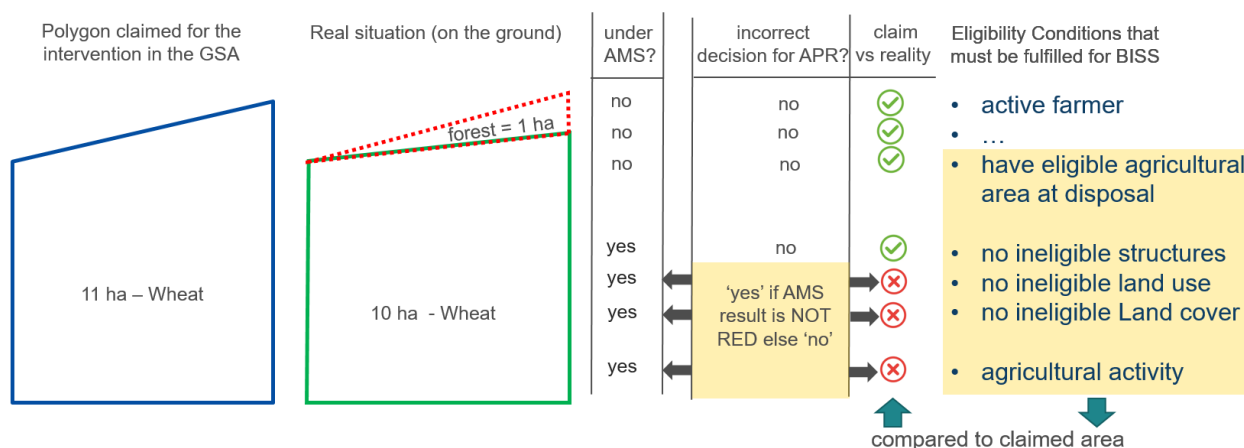


Figure 4: Schematic representation of a situation of a parcel with a delineation issue that was declared for the BISS intervention and that was selected for AMS and GSA quality assessment.

Table 7 summarises the reasoning regarding incorrect decisions for the above example taking into account the final AMS finding for the parcel concerned.

Table 7: Summary of the reasoning regarding incorrect decisions for the example in Figure 4, taking into account the final AMS finding for the parcel concerned.

final AMS finding for parcel	AMS quality assessment findings for parcel:		
	Summary of reference data	What is the 'declaration versus reality' status?	Is there an incorrect decision?
AMS = red	Delineation issue: forest on part of the declared area, declared crop doesn't cover the total declared area for BISS. Need for GSA quality assessment to measure (which will conclude that forest corresponds to 1 ha and wheat is present in 10 ha out of the 11 ha declared)	The declaration differs from reality for three eligibility conditions: ineligible land use, ineligible land cover and agricultural activity	No - because parcels that are non-compliant cannot enter the APR.
AMS = green			Yes - since Member States would decide on parcel compliance and the three concerned eligibility conditions affect the hectares reported in the APR.

AMS quality assessment inspection workflow

A flowchart example to detect incorrect decisions at eligibility condition level for the parcels that undergo the AMS quality assessment inspection workflow for a specific unit amount is provided and discussed in Annex 1.

5.2.5 Diagnostic information to improve IACS/AMS quality

AMS quality assessment inspection findings can be combined with other diagnostic information to improve IACS/AMS quality:

In order to identify relevant actions for improving the quality of their system, Member States should first identify, which decision-making step in their IACS/AMS setup caused the incorrect decision (or any other of the relevant inspection outcomes, such as those listed in Annex 1). Patterns and insights that emerge from this process will be relevant for formulating pertinent actions. For example they should allow the following questions to be answered: Were the observed issues for a given unit amount all limited to one specific eligibility condition? Was it a monitored eligibility condition? Were the erroneous decisions based on conclusive or non-conclusive AMS findings? Was the cause for erroneous AMS findings linked to delineation issues?

In a second step, it may also be relevant to look at the characteristics of the concerned parcel, i.e., the specificities of those parcels where the inspection process of the AMS quality assessment identified errors. For example, it may be pertinent to look for patterns with respect to land cover, crop type, size and slope, or whether it is regional differences in AMS algorithms (for federal Member States) that could explain the spatial pattern of observed incorrect decisions.

5.2.6 Determine the need for remedial actions

For each (group of) unit amount(s) defined by the Member States, all parcels with at least one incorrect decision among those eligibility conditions, for which failure to comply with implies that either part or all of the declared area is ineligible for inclusion in the APR, must be used when testing whether the number of incorrect decisions in the sample exceeds the acceptance number. Within each sample, Member States must identify incorrect decisions according to the procedure discussed above. The number of incorrect decisions found in the sample needs to be compared with the acceptance number derived from Table 2. The test is passed if the condition shown in Eq. (1) is met. If the condition is not met, remedial actions will be triggered.

In addition, Member States shall assess for each (group of) unit amount(s) whether the number of mismatches between the declaration and reality for eligibility conditions, where failure to comply does not affect the area included in APR (but rather payments through reductions and sanctions), warrants remedial actions.

5.3 Quantifying the area error due to incorrect decisions on eligibility conditions

Member States shall express the result of their quantification of errors due to incorrect decisions on eligibility conditions on parcels under an area-based intervention in hectares (as specified in Article 5(3)(a) of Delegated Regulation (EU) 2022/1172). For this, the AMS quality assessment and GSA quality assessment (area) results have to be combined and the resulting area error has to be up-scaled to the lot level.

To ensure that the largest area error among different types of eligibility conditions prevails, an indicator function (1_{el}) is introduced in Eq. (17). The value of that indicator function is equal to 1 if no incorrect decision was found among the set of eligibility conditions, where failure to comply always renders the full area declared ineligible for inclusion in the APR. Otherwise the indicator function is 0.

The full procedure to quantify the area error is described in Section 9.1.

5.4 Quantifying the number of AMS reds

MS have to provide two different types of information concerning Article 5(3)(b) of Delegated Regulation (EU) 2022/1172: the number of parcels with an AMS *red* before deadline for GSA amendment, and the number of parcels with an AMS *red* after the deadline for GSA amendment.

5.4.1 Number of parcels with an AMS red before the deadline for GSA amendment

Member States shall quantify at the level of [unit amount](#) the number of parcels where the AMS found non-compliance with eligibility conditions. More specifically, this number shall be computed on the basis of:

- the full set of parcels (lot) for a given (group of) unit amount(s);
- the entire period ranging from the first GSA submission to the deadline for providing beneficiaries with AMS results in time for GSA amendments;
- the occurrence of at least one AMS-detected non-compliance (*red*) among the monitored eligibility conditions.

5.4.2 Number of parcels with an AMS red after the deadline for GSA amendment

Member States shall quantify at the level of [unit amount](#) the number of parcels not meeting eligibility conditions after the deadline for amendments of aid applications. More specifically, this shall be computed for AMS detected non-compliances on the basis of:

- the full set of parcels (lot) for a given (group of) unit amount(s);
- the AMS results once GSA amendments are no longer possible;
- the occurrence of at least one AMS-detected non-compliance (*red*) among the monitored eligibility conditions.

6 GSA quality assessment inspection principles

This section describes the principles underpinning the GSA quality assessment. Section 6.1 is relevant with respect to Article 4(2)(b) of the Delegated Regulation (EU) 2022/1172, whereas Section 6.2 refers to Article 4(2)(a), (c) and (d).

6.1 Area-related element

According to Article 4(2)(b) of the Delegated Regulation (EU) 2022/1172, the area-related element of the GSA quality assessment has the goal of verifying that the area declared by the beneficiary for an intervention was correctly established in relation to the applicable eligibility conditions.

In order to verify the correctness of the area declared by the beneficiary, area measurements should be performed. This may require multiple visits to a given parcel, in particular, if unit amounts are defined in terms of eligibility conditions having cut-off dates at different times of the year and the evidence of non-compliances affecting only parts of GSA-declared parcels can be expected to be highly transient, i.e., not visible for long. Non-compliant areas affecting only a part of a parcel (and/or undeclared permanently ineligible areas) that are noticed during an AMS quality assessment inspection effort have to be flagged to the GSA quality assessment. Various means to do so are described in Section 10.3.3. Non-compliant areas affecting only a part of a parcel (and/or undeclared permanently ineligible areas) that are noticed at different moments in time shall be combined in a manner analogous to Figure 9 in Section 10.4.1.1) to assess the actual eligible area within a given GSA-declared parcel. Where multiple unit amounts are claimed for a given parcel and these unit amounts feature different sets of eligibility conditions then the resulting eligible area within that GSA-declared parcel therefore may differ from one such unit amount to the other.

The principles guiding the measurement process in the GSA quality assessment are derived from the LPIS Quality Assurance (QA) (<https://wikis.ec.europa.eu/display/GUIDANCEANDTOOLSFORCAP/>) and are reviewed in Section 6.1.2. When the area measurement of a parcel in the sample detects an area (expressed in hectares with 4 decimals) that should not be included in the APR, then the error is used to estimate the error rate at the level of the lot and determine if it is below the acceptance threshold that has been fixed at 2%. If this condition is not met, Member States will need to propose adequate remedial actions. These aspects are discussed in Section 6.1.3.

The area-related element of the GSA quality assessment has to be performed on the same parcels as for the AMS quality assessment. Thus, the parcels extracted using the procedure described in Section 4 have to be considered for performing the GSA quality assessment. For (groups of) unit amounts that only have parcel-level eligibility conditions, a parcel that cannot be assessed for the GSA quality assessment must also be skipped for the AMS quality assessment.

The following two cases should be considered:

- where Member States do not wish to communicate incorrect decisions on monitored eligibility conditions to beneficiaries prior to the deadline for GSA amendment, the evaluation of the quality of the GSA should be based on the final GSA declaration, i.e., when the beneficiary can no longer amend his/her declaration;
- where Member States chose to communicate incorrect decisions on monitored eligibility conditions to beneficiaries prior to the deadline for GSA amendment, the evaluation of the quality of the GSA should be based on the GSA declaration prior to the communication.

6.1.1 Acquisition of reference data

For the purpose of the GSA quality assessment, data sources allowing area measurement (1:5 000 scale or equivalent) should be adopted. This includes orthoimagery with the specifications described in Section 3, and field measurements (based on GNSS or equivalent). If orthoimagery is used, the geometric and radiometric quality of satellite and aerial imagery used for the inspection and delineation should be compliant with the technical specifications defined for the purpose of the LPIS described in <https://wikis.ec.europa.eu/display/GUIDANCEANDTOOLSFORCAP/Orthoimagery+for+the+IACS+processes>. National imagery can be also used for delineation (spatial reference). As a result, area measurement inspection can always use satellite or aerial imagery provided they respect the requested specifications.

All the relevant ancillary data, including any performed field observations, the previous year's GSA declarations and LPIS information can be used to support evaluation while the area measurement itself has to be based on the specifications reported above. For all items under inspection (feasible for measurement), the AMS and the AMS quality assessment results should be made available to the operator. This includes the information about the eligibility conditions and any other relevant record that can help assess the GSA declaration. This will help interpretation and measurement, especially in case of issues with the delineation of the GSA parcel.

The [data source\(s\)](#) used for the GSA quality assessment should be reported.

6.1.2 Area measurement: procedures and tolerances

The GSA quality assessment entails the inspection and, whenever needed, the area measurement for the [GSA parcels](#) in the samples. Before any measurement is performed, it is important to determine whether the parcel should be measured or not. The

procedure summarised below is from European Commission, 2018), whose principles are considered valid and are adopted for the current methodology.

The need for measurements should be primarily determined by visual inspection, to decide whether the declared area is in accordance with the actual condition as visible on the VHR image or on the ground. In the case where the declaration matches reality, i.e., the declared area corresponds to the actual condition, then the parcel can be considered as measured, and the eligible area is considered to be equal to the declared area. When there are visible deviations, for instance due to delineation issues or to the presence of undeclared ineligible features, the measurement must be performed. In any case, if the AMS/GSA quality assessment reveals an inconsistency/delineation issue, a measurement should be conducted.

Whenever the declared area corresponds to the prefilled area of the GSA, which may or may not correspond to the total eligible area of the LPIS reference parcel, with a “click and confirm by the beneficiary” process, and a visual inspection determines that there are significant deviations between the declared area and the actual situation, then in addition to the measurement itself, whenever relevant the necessary actions in terms of updating the LPIS should be performed as soon as possible in order to have the correct results available at least for the next claim year. If ineligible features are found in the GSA parcel inspected, these features also have to be recorded in the corresponding LPIS reference parcel.

The area measurement should be carried out in such a way as to map the real situation. There may be cases where it is difficult to determine the actual border of a GSA parcel. In the case of two adjacent GSA parcels with the same land cover (e.g., same declaration but from two different farmers), if there is no overlapping between parcels (feature to be checked in the GSA IT testing), the declared common border, even if difficult to delineate, should be assumed to be correct.

After determining the need for actual measurements, the relevant principles of the methodology developed for On-The-Spot Checks (OTSC) should be adopted for area measurement. Details on the methodology can be found in the OTSC guideline (DSCG-2014-32-FINAL_REV_4_OTSC_guideline_2018_CLEAN, European Commission, 2018).

The overall principles of the methodology can be summarised as follows: the GSA parcel for which a measurement has to be performed needs to be delineated either using VHR images, GNSS field measurements or equivalent methods. The area of the delineated (measured) parcel should be compared with the declared area. The difference obtained can be compared with the single buffer tolerance. Details on the determination of the single buffer tolerance can be found in <https://wikis.ec.europa.eu/download/attachments/86968763/Guidance%20CTS%20-%202022.pdf>. The single buffer tolerance is multiplied by the perimeter of the parcel polygon under measurement and converted into an area tolerance. Note that the maximum area tolerance, independently from the parcel perimeter, is set to 1.0 hectare. Thus, the final area tolerance is obtained as the minimum between the single buffer tolerance times the parcel perimeter and the 1.0 hectare threshold. If the difference between declared and the measured eligible areas is lower than the area tolerance, it is assumed that the eligible area is equal to the declared area.

In the previous step, the presence of ineligible features might not be accounted for, however all ineligible features must be determined and correctly reported in order to reflect reality. This process is performed after the comparison with the area tolerance in order to avoid small ineligible features being masked or unaccounted for because the resulting area difference is below the area tolerance.

More specifically, one should identify by visual inspection, map out and exclude from the area of the declared parcel, all non-eligible features, including, for instance, artificial sealed surfaces, forests and woodlands, scrublands, water bodies, natural bare areas and waterlogged vegetation. It is also necessary to exclude by mapping (as polygons, lines or points) any distinguishable landscape features **not** in the eligible profile from the **eligible area** within the parcel.

The area of all ineligible features identified in the measurement process must be accounted for when determining the eligible area. If the whole parcel is non-compliant for eligibility conditions that may render parts of the area declared ineligible for inclusion in the APR, the eligible area should be set to 0.

6.1.3 Skipping

As for the AMS quality assessment, in the GSA quality assessment Member States have the possibility to skip parcels. This is done as part of the selection process performed when considering the ranked list introduced in Section 4.2. Skipping should be performed only if strictly necessary. Moreover, the reason for skipping should be reported. If a parcel is skipped during the AMS quality assessment exercise **for (groups of) unit amounts that only have parcel-level eligibility conditions**, skipping should be applied also to the sample adopted for GSA quality assessment (for the same lot), because the two samples must be the same. Similarly, if a parcel is skipped during the GSA quality assessment exercise, the skip must also be applied to the sample adopted for the AMS quality assessment.

In the case of GSA quality assessment, Member States can skip a parcel if:

- 1) there are deficiencies associated with the VHR imagery, for example:
 - a. parcel is fully or partly outside the image footprint,
 - b. presence of cloud cover or haze, which prevent the inspection of the parcel,

- c. occurrence of isolated image processing-related artefacts that cannot be attributed to a particular land cover nor land use phenomena (e.g., smoke from a chimney, a passing airplane),
- d. presence of any force majeure circumstances occurring on the land that prevent the inspection of the parcel (e.g., floods, fires),

and

- 2) physical obstacles are present that prevent measurement in the field.

6.1.4 Determine the need for remedial actions

After inspecting the parcels in the different samples and performing measurements according to the criteria discussed in 6.1.2, it is possible to compute the *overestimation area error* (i.e., the area overdeclared). The following procedure should be adopted:

For each parcel in each GSA quality assessment sample compute:

$$\Delta E_i = (A_{d,i} - A_{e,i}), \quad (12)$$

which is the difference between the declared area, $A_{d,i}$, and the eligible area, $A_{e,i}$, found within the GSA-declared parcel. Both areas are expressed in hectares. The declared area should be determined according to the communication choices of Member States listed at the end of Section 6.1. The eligible area is the one eventually measured according to the procedure discussed in 6.1.2, and takes into account the tolerances introduced to avoid area error overestimation. Note that the eligible area shall be found within the boundaries of the GSA-declared polygon. This concept is illustrated in Figure 5 for three different cases.

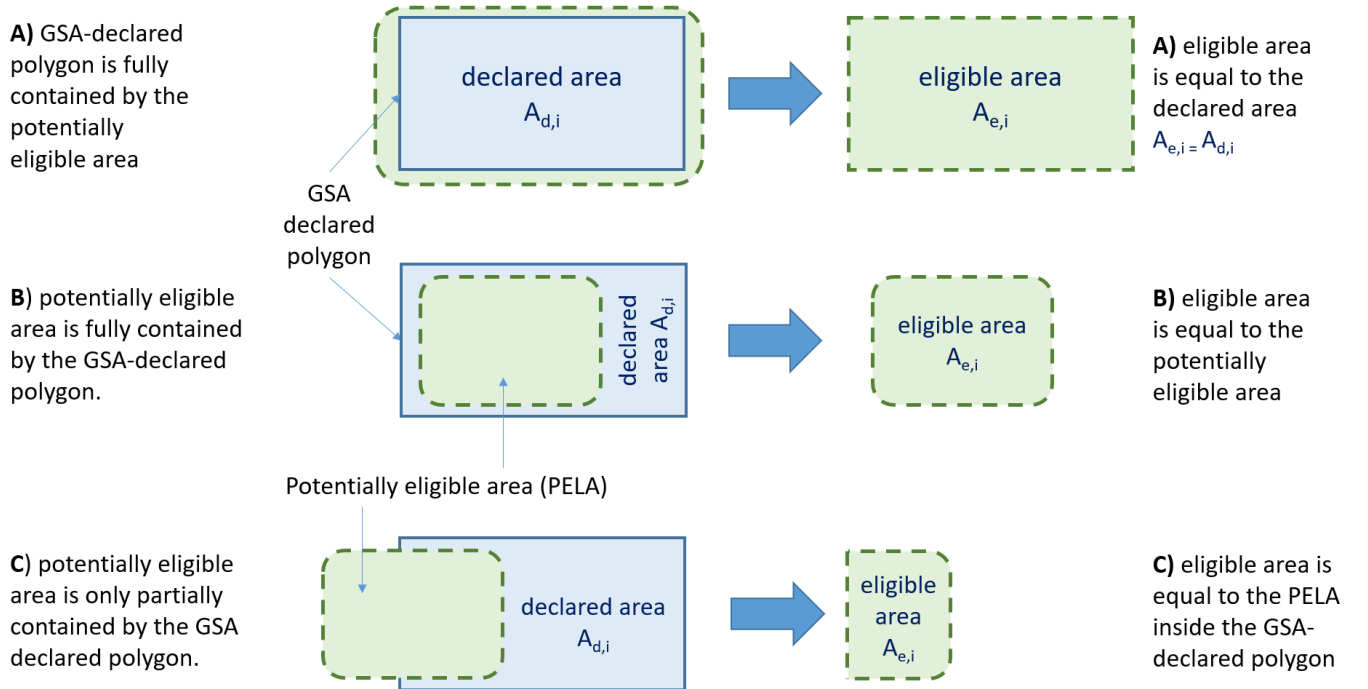


Figure 5: Illustration of the evaluation of the eligible area ($A_{e,i}$) present within the boundary of the GSA-declared parcel.

The index i is used to denote quantities related to the i^{th} parcel in the specific GSA quality assessment sample.

Since, in all cases, the eligible area, $A_{e,i}$, has to be found within the boundary of the corresponding GSA-declared parcel, the condition:

$$\Delta E_i \geq 0 \quad (13)$$

is always met. For this reason, ΔE_i is also denoted as the positive area error. Finally, all the positive area errors are summed together, leading to the total overestimated area (OEA):

$$OEA = \sum_{i=0}^{n-1} \Delta E_i \quad (14)$$

where n is the sample size, as defined in Section 4.1.

The overestimated area is normalised with respect to the total area declared in the sample:

$$OAR = \frac{OEA}{\sum_{i=0}^{n-1} A_{d,i}} \quad (15)$$

and the overestimation area error rate (OAR) for the specific lot is finally found. The overestimation error rate can be used to estimate the overestimated area in hectares at the lot level, i.e., at the level of (group of) unit amount(s). This is done through the multiplication by the total area declared in the (group of) unit amount(s) from which the sample is extracted.

For GSA quality assessment purposes, the overestimation area error rate is used to test if a remedial action is required with respect to a specific (group of) unit amount(s). In particular, the overestimation area error rate is compared against a 2% threshold:

$$OAR < 2\% \quad (16)$$

If the threshold is exceeded, a remedial action will be required.

6.2 Non area-related elements: IT testing

The GSA quality assessment, in accordance with Article 4 of Regulation (EU) 2022/1172, has to comprise a part related to the IT testing of the GSA system itself (Article 4(2)(a), (c) and (d)). Member States should provide evidence similar to that already provided for the prior CAP, namely, to respond to the request of the certification body(ies).

The quality assessment must verify the completeness and correctness of the pre-filled information in the geo-spatial application, the inclusion in the application process of guiding alerts for all eligibility conditions and relevant conditionality requirements, and the traceability of all changes registered in the geo-spatial applications after its submission. The quality assessment is carried out by means of IT testing and reperformance of the application process on a sample of aid applications to cover all interventions, which means that if different GSA systems are used in the framework of the same APR, all of the individual systems must be assessed.

In the context of this specific section, “sample of aid applications” should be understood as a set of aid applications, sufficient in number to prove beyond doubt that the relevant features and functionalities mentioned below (bullet list) have been verified.

The reporting will be structured as a checklist of data, features and functionalities that must be present in the interface/system and that result in effective support for all the declarations.

The relevant features and functionalities are mentioned below. Note that this list may evolve in subsequent years.

- Reference parcel information is used to prefill the GSA for beneficiaries;
- The beneficiary has the possibility to delineate the area declared within the parcel at the reference scale 1:5000;
- The interface for parcel polygon delineation is intuitive and user-friendly;
- Delineation outside the reference parcel borders is prevented to avoid over declaration at parcel level;
- A verification system that all eligibility conditions are met is in place for each individual declaration and for each intervention;
- A warning is sent to the farmer when incorrect eligibility conditions are detected (minimum area, geographical eligibility) for all the eligibility conditions where this is possible;
- It is possible to upload documents to address some eligibility conditions;
- All amendments of the GSA after its submission are recorded;
- When an amendment is recorded, its source (e.g., an AMS warning, an LPIS update, a spontaneous action of the beneficiary), date, justification, the related parcel and the related intervention are always recorded;
- It is only possible to amend a GSA declaration according to the possibilities provided in Article 7 of Regulation (EU) 2022/1173;
- Overlaps between parcel declarations are correctly handled.

6.2.1 Determine the need for remedial actions.

All the data, features and functionalities in the checklist that [is](#) provided by the European Commission must be implemented in the GSA systems. If any are missing, this automatically triggers remedial actions to include them, unless Member States demonstrate that the element assessed is not applicable to their specific case.

7 LPIS quality assessment inspection principles

Quality assessment of the LPIS shall be executed according to Article 3 of the EU Regulation (EU) 2022/1172. The quality assessment shall cover the following elements:

- the correct quantification of the maximum eligible area;
- the proportion and distribution of reference parcels where the maximum eligible area takes ineligible areas into account or where it does not take agricultural area into account;
- the occurrence of reference parcels with critical defects;
- the correct classification of agricultural area as arable land, permanent grassland or permanent crop in each reference parcel;
- the ratio of area declarations per reference parcel;
- the categorisation of reference parcels where the maximum eligible area takes ineligible areas into account, where it does not take agricultural area into account or reveals a critical defect;
- the percentage of reference parcels that have been subject to change, accumulated over the regular update cycle.

Member States shall also ensure that all requests for the update of the LPIS are carried out in a way that it is possible to trace whether they resulted from the AMS, an action of the beneficiary or any other source.

Member States shall perform the assessment on the basis of a sample of reference parcels. They shall use data allowing to assess the actual situation on the ground.

In case the results of the quality assessment reveal deficiencies, Member States shall propose adequate remedial actions.

The LPIS quality assessment within the new CAP (2023-2027) follows the same general principles already established during the previous CAP. Nevertheless, some changes have been introduced as discussed in the following.

7.1 LPIS sample in claim year 2023

In the previous LPIS Quality Assurance (QA), a sample pre-selection was defined by the European Commission. In the new LPIS quality assessment, Member States are responsible for determining the LPIS sample using the ranked list and the rules discussed in Section 4. In particular, the LPIS quality assessment sample shall be derived from the AMS/GSA quality assessments sample used for BISS interventions. As already discussed in Section 4, each GSA parcel is linked to a LPIS reference parcel. Thus, the LPIS quality assessment sample is directly derived from the GSA quality assessment sample through the association between GSA parcels and LPIS reference parcels. If two or more GSA parcels are related to the same LPIS reference parcel and the sample size defined in Section 4.1.1 is not reached, additional reference parcels have to be selected until the required sample size is obtained. The selection is done through the ranked list that should be used to determine additional parcels in the BISS intervention. These parcels will be used to retrieve the corresponding LPIS reference parcels and complete the sample for the LPIS quality assessment.

The number of reference parcels to inspect is adapted to the methodological approach used for the IACS quality assessment exercise and a sample size of 300 elements should be considered (it is assumed that all lots related to BISS intervention have at least 1 000 elements). Note that [for the LPIS quality assessment a sample of 300 elements has to be selected and, as specified at the end of Section 4.1.1, MS do not have the possibility of chose different sampling plans](#). A size of 300 elements is compatible with the requirements of the previous LPIS Quality Assurance where a minimum sample size of 200 elements was specified. Moreover 300 elements, while respecting previous minimum LPIS requirements, are less than the previously specified sample sizes (500, 800 or 1250). This reduction takes into account the fact that LPIS quality assessment results are complemented by GSA quality assessment findings, which will require additional inspections.

Note that 300 elements have to be measured to reach the minimum number of measured reference parcels: lack of feasibility of measurement is possible, however a reference parcel flagged as not feasible for measurement will require an additional reference parcel to reach the minimum number of measured reference parcels. Inclusion of additional reference parcels is performed using the ranked list introduced in Section 4.

All the reference parcels flagged as not feasible for measurement have to be inspected according to the previous LPIS Quality Assurance methodology. The number parcels flagged as not feasible for measurement will be used to determine the percentage of parcels feasible for measurements.

The notion of homogeneous LPIS and consequently the lots needed to evaluate their quality remain identical. This implies that assessment must be done by LPIS system or sub system in case of non-homogeneity due to, for example, different reference parcel type systems.

7.2 Quality Elements

The six Quality Elements (QE) present in the previous LPIS Quality Assurance are maintained. A summary of these quality elements, divided into two conformance classes, is provided in Table 8 and Table 9. A detailed description of such quality elements can be found in <https://wikis.ec.europa.eu/display/GUIDANCEANDTOOLSFORCAP/LPIS+QA+-+LPIS+Quality+Assurance+framework>.

Table 8: Summary of the LPIS quality elements in conformance class 1 of the previous LPIS Quality Assurance.

Element	Code	Description
QE1 Assessment of the maximum eligible area of the system		
	QE1a	Absence of bias (i.e., accuracy) of the land represented in the LPIS as a whole.
	QE1b1	Parcel level precision of the land represented in the LPIS as a whole: overestimation
	QE1b2	Parcel level precision of the land represented in the LPIS as a whole: underestimation
QE2 Assessment of individual parcels with correctness issues.		
	QE2a1	Proportion of RPs (whole set of data) with incorrectly recorded area or contaminated or with ineligible features
	QE2a2	Proportion of RPs (>0.1 ha) with incorrectly recorded area or contaminated with ineligible features
	QE2b	Distribution of RPs, according to the correctness of the eligible area recorded
	QE2c	Number of non-conforming reference parcels in LPIS with classification error
QE3 Number of reference parcels that have functional issues (Critical Defects)		

Table 9: Summary of the LPIS quality elements in conformance class 2 of the previous LPIS Quality Assurance.

Element	Code	Description
QE4		Categorization of the non-conformities
QE5		Ratio of total declared area in relation to the total area recorded for the area conforming RPs
QE6		Rate of non-conforming reference parcels due to undetected and unaccounted land cover change, as observed in ETS, accumulated over the years

Two main changes are introduced with respect to the quality elements shown in Table 8 and Table 9. First, quality element QE2c, which relates to the quality of the land cover classification, is now defined as a separated quality element denoted as QEc. The QEc will be independent from QE2a and classification errors will be evaluated separately from the area error.

Quality element QE6 (rate of non-conforming reference parcels due to undetected and unaccounted land cover change, as observed in ETS, accumulated over the years) remains identical with the exception of a more detailed information to be reported by the Member States in order to ensure a correct follow-up of the reported figures. This information requires the origin of update that can be one of the following:

- triggered by a *regular* LPIS update;
- triggered by AMS;
- triggered by GSA update;
- triggered by a GSA or AMS quality assessment.

The updated quality elements are presented in Table 10 along with the updated criteria defining conformance/non-conformance with respect to a specific quality element. The same conditions and criteria used for the previous LPIS Quality Assurance are considered for the new exercise. When the pass/fail criterion was defined by a percentage in the previous LPIS Quality Assurance, the same percentage has been maintained for the new exercise. This is the case of quality elements QE1a, QE1b1, QE1b1 and QE6. When a test was defined with respect to a LQ and CR, the same parameters have been adopted for the current LPIS quality assessment. In particular, a CR = 10% was maintained for the LPIS quality assessment. Different LQs are defined for different quality elements (2% and 12.5%).

Note that, as also detailed in Section 13 of <https://wikis.ec.europa.eu/display/GUIDANCEANDTOOLSFORCAP/LPIS+QA+-+LPIS+Quality+Assurance+framework>, the acceptance numbers are determined by the sample size (now 300), LQ and CR. Thus, the acceptance numbers have been updated according to the new sample size, which now is fixed to 300 elements. In this respect, the new LPIS quality assessment is in line with previous LPIS Quality Assurance specifications and ISO 2859-2 principles.

7.3 Update of LPIS ETS guidelines

The general principles for the quality assessment of LPIS reference parcels are mostly the same as those in the LPIS Quality Assurance exercise defined in the previous Executable Test Suite (ETS) documentation (version 6.4). For technical reason the old wikicap website is not available anymore and has been replaced with a new website <https://wikis.ec.europa.eu/display/GUIDANCEANDTOOLSFORCAP/>.

A new complementary, additional and separate [update on the LPIS ETS guidance \(European Union, 2023\)](#) has been prepared with a focus on new elements introduced with the new CAP regulation, differences and important points to remember.

Table 10: Summary of the LPIS quality elements of the new LPIS quality assessment.

Element	Code	Description	Lq	Ac/Threshold
QE1		Assessment of the maximum eligible area of the system		
	QE1a	Absence of bias (i.e., accuracy) of the land represented in the LPIS as a whole	-	$\geq 98\%$, $\leq 102\%$
	QE1b1	Parcel level precision of the land represented in the LPIS as a whole: overestimation	-	LIB $\geq -2\%$
	QE1b2	Parcel level precision of the land represented in the LPIS as a whole: underestimation	-	UIB $\leq 2\%$
QE2		Assessment of individual parcels with correctness issues		
	QE2a1	Proportion of RPs (whole set of data) with incorrectly recorded area or contaminated or with ineligible features	12.5	Ac = 29
	QE2a2	Proportion of RPs (>0.1 ha) with incorrectly recorded area or contaminated with ineligible features	12.5	Ac = 29
	QE2b	Distribution of RPs, according to the correctness of the eligible area recorded	-	-
QEc		Number of non-conforming reference parcels in LPIS with classification error	12.5	Ac = 29
QE3		Number of reference parcels that have functional issues (Critical Defects)	2	Ac = 2
QE4		Categorization of the non-conformities	12.5	Ac = 29
QE5		Ratio of total declared area in relation to the total area recorded for the area conforming RPs	-	-
QE6		Rate of non-conforming reference parcels due to undetected and unaccounted land cover change, as observed in ETS, accumulated over the years	-	25%

8 MS actions following quality assessment results: remedial actions.

Where the outcome of the quality assessments described in Sections 5, 6 and 7 reveals deficiencies in the system, Member States shall adopt appropriate remedial actions (Articles 68, 69, 70 of Regulation (EU) 2021/2116). These remedial actions are at the initiative of Member States and must be implemented by the Member States ideally prior to the next claim year. They must not be confused with the remedial actions referred to in the scope of action plans that the Commission could be requesting under Article 42 of Regulation (EU) 2021/2116.

8.1 Remedial actions resulting from AMS quality assessment.

Remedial actions may be triggered in relation to Article 5(3)a of Regulation (EU) 2022/1172. The trigger is a number of incorrect decisions above the threshold set by the Commission (see Section 5.2.6).

Once a remedial action is triggered, Member States should use diagnostic information to identify meaningful actions to improve the elements of the system that caused the error. For example, it is possible that delineation issues are the underlying cause for incorrect decisions triggering a remedial action within the AMS quality assessment. This could be the inclusion of non-eligible areas within the declared area.

Where delineation issues are a significant contributor to incorrect decisions, Member States are to decide whether these can be best addressed via improvements of the GSA and/or LPIS, or, via improvements of AMS. It is helpful here to relate the inspection findings of the AMS quality assessment to those of the GSA quality assessment inspection for the concerned parcels. This will allow to identify whether the delineation errors were big enough so that improvements in AMS algorithms – for example to ensure the absence of ineligible land use and ineligible permanent structures – become meaningful, or whether a better support may be needed to draw parcel delineations in GSA, for example.

Where remedial actions are triggered due to monitored eligibility conditions having non-conclusive AMS results, Member States may, for example, decide to improve the concerned AMS algorithm, to systematically acquire additional evidence such as geotagged pictures, or to introduce field visits as a means of deterring the occurrence of future non-compliances.

Where remedial actions are triggered due to non-monitored eligibility conditions, Member States may, for example, decide to make these eligibility conditions monitorable (e.g., by developing AMS algorithms applied to Sentinel satellite imagery, geotagged photos, or other available imagery), or, to introduce field visits as a means of deterring the occurrence of future non-compliances.

Remedial actions may be triggered in relation to Article 5(3)b of Regulation (EU) 2022/1172. For instance, the difference between the number of AMS reds per [unit amount](#) before and after the last date for GSA amendments could suggest an inadequate implication of the farmer in their CAP application process. In that case, Member States shall propose remedial actions to remedy the situation so that beneficiaries can optimally benefit from feedback provided by the AMS.

8.2 Remedial actions resulting from GSA quality assessment.

Remedial actions may be triggered in relation to Article 4(2)a, b, c, d of Regulation (EU) 2022/1172.

The trigger for a remedial action under article 4(2)b is an area error that is above the threshold set by the Commission (see Section 6.1.4). Once a remedial action is triggered, Member States should use diagnostic information to identify meaningful actions to improve the elements of the system that caused the error.

For example, it is possible that the eligible area determined in Section 6.1.4 differs from the declared area because a required agricultural activity was not implemented fully (or because a not permitted activity took place on a small part) within the declared area. Where partial non-compliances with APR-relevant eligibility conditions (labelled as type 2 in Section 5.1.1) are a significant contributor to the overestimation area error rate triggering remedial actions within the GSA quality assessment, Member States are to decide whether these can be best addressed via improvements or developments of AMS algorithms or (e.g., if the eligibility condition is not monitorable) by other means.

The trigger for remedial actions under article 4(2)a, c and d is the lack of a single functionality or guiding alert which reduces the quality of the GSA IT systems (see Section 6.2).

If, for example, the GSA quality assessment detects that the GSA IT system is allowing a parcel with an ineligible agricultural area to be claimed for a unit amount without issuing a guiding alert to the beneficiary, the remedial action shall consist in the correction of the situation for the following claim year, avoiding the same deficiency.

8.3 Remedial actions resulting from LPIS quality assessment.

The same general principles of the previous LPIS Quality Assurance methodology of the former CAP apply, the trigger of a remedial action for LPIS is based on failing to be conforming in quality element 1, 2, c or 3.

8.4 Reporting content concerning remedial action.

In the reporting, each remedial action shall be described with clear indications on the following:

- the purpose of the remedial action. A complete information on the IACS element(s) targeted by the remedial action and description of the specific weakness(es) that the action is focusing on. Whenever different LPIS, GSA or AMS systems are used in one Member State the description should clearly indicate the systems that are targeted;
- the description of the action should be complete and detailed to enable the European Commission to understand the scope and effort planned. It must include information on the activities linked to that remedial action, the geographic extent of the remedial action (where relevant) and on the expected results;
- the timeline of the activities planned (start, phases, end). The expected results of each phase of the remedial action should be described. Efforts should aim to solve the revealed deficiencies before the next claim year;
- the risk of not completing or implementing only partially the remedial action with a description of possible issues and mitigations;
- the status of the remedial action indicating if the remedial action is already partially implemented or has already been completed by the time of submission of the quality assessment report. Whenever applicable, final conclusions of each action should be presented summarizing the situation but also including possible future expectations and developments;
- The status of remedial actions referring to previous claim years should also be added.

It is recommended not to close a planned action without a clear conclusion on the result. It could be perfectly normal to abandon an action due to insufficient results or due to new IT developments rendering it obsolete or due to changes in strategy. Documentation should always be provided.

9 Estimating area errors in performance indicators

Article 2(2) of Implementing Regulation (EU) 2022/1173 indicates that the results of the quality assessments shall be combined to quantify the error in the number of hectares or share of areas reported in the APR. This section will address these aspects.

9.1 Combined area error from AMS and GSA quality assessment

For the purpose of Article 5(3)(a) of Delegated Regulation (EU) 2022/1172 as well as Article 2(2) of Implementing Regulation (EU) 2022/1173, the AMS quality assessment and GSA quality assessment results have to be combined to determine a composite indicator related to the total area error per (group of) unit amount(s).

This indicator is based on the AMS/GSA quality assessment samples (per lot) and takes into account area errors arising from eligibility conditions as well as from delineation and ineligible features issues observed during the inspection processes. The indicator is computed according to the following steps.

At first, the total area error within the sample will be computed. This is defined as the sum of the area errors observed on the parcels considered in the AMS/GSA quality assessment sample:

$$a_{er,s} = \sum_{i=0}^{n-1} [1_{el}(i)\Delta E_i + (1 - 1_{el}(i))A_{d,i}]. \quad (17)$$

where $A_{d,i}$ is the declared area and ΔE_i is the positive area error inside the GSA-declared parcel (both expressed in hectares). There are two contributions to the total area error of the quality assessment sample. To distinguish between these two error sources, the indicator function:

$$1_{el}(i) = \begin{cases} 1 & \text{all FAI ElCos are met for parcel } i \\ 0 & \text{at least one FAI ElCos is not met for parcel } i \end{cases} \quad (18)$$

has been introduced. $1_{el}(i)$ takes as input the parcel index (i) within the sample. If all FAI eligibility conditions (i.e., eligibility conditions where failure to comply with makes the full area declared ineligible for inclusion into the APR as described in Section 5.1.1) are met for the i^{th} parcel, then $1_{el}(i)$ is equal to 1. Otherwise, it should be set to 0. The indicator function is used to distinguish between the following two cases:

- 1) the full area of the parcel is ineligible for inclusion in the APR because at least one eligibility condition with FAI was not met on the parcel ($1_{el}(i) = 0$);
- 2) a part (or all) of the area of the parcel is ineligible for inclusion in the APR because of delineation issues, the presence of ineligible features, or because of APR-relevant eligibility conditions other than FAI that are not fully implemented across the declared area ($1_{el}(i) = 1$).

The value of the indicator function is directly found during the AMS quality assessment process as discussed in Section 5. The positive area error

$$\Delta E_i = A_{d,i} - A_{e,i}$$

is defined with respect to $A_{e,i}$ (which is the eligible area found within the boundaries of the GSA-declared parcel) and was already introduced in Section 6.1.4 as a means to determine the need for remedial actions in the context of the GSA quality assessment. ΔE_i is only retained in the summation in Eq. (17) if all of the FAI eligibility conditions are met. Otherwise, the full area component $A_{d,i}$ is counted as an error.

Prior to upscaling to the lot size, the area error in Eq. (17) needs to be normalized by the total area declared in the sample in order to obtain the final area error rate (AER):

$$AER = \frac{a_{er,s}}{\sum_{i=0}^{n-1} A_{d,i}} \quad (19)$$

When multiplied by the total area declared in the lot, i.e., the set of parcels of a (group of) unit amount(s), an estimate in hectares of the area erroneously declared in the lot, is found:

$$A_{er,l} = AER \cdot A_{Tot} \quad (20)$$

where A_{Tot} is the total area (in hectares) declared in the lot. It is calculated as the sum of the declared area of the parcels in the lot established as follows:

- for parcels not in the quality assessment sample, sum the area declared after the deadline for GSA amendment;
- for parcels in the quality assessment sample, sum the corresponding $A_{d,i}$ calculated in accordance with the Member States choice on communicating incorrect decisions as outlined at the end of Section 6.1.

This quantity ($A_{er,l}$) must be reported as will be outlined in Section 11.

Additional instructions regarding the estimation of the area-related bias in output and result indicators are currently under development and will be included in due time.

10 Holding-level eligibility conditions

This section is relevant for unit amounts featuring at least one eligibility condition for which compliance must be evaluated over areas that exceed the single parcel.

As such, instructions on the rate at which parcels shall be inspected when eligibility conditions concern multiple parcels in a holding are given first. This is followed by a series of sections providing more detailed information on any deviations and changes to the procedures already provided in Sections 4, 5, 6 and 9.

10.1 Parcel inspection rate

If the decision on compliance with an eligibility condition is taken on the basis of evidence concerning agricultural activities and/or conditions across multiple (or possibly even all) relevant parcels of a holding, then it is no longer the single parcel but rather the ensemble of all relevant areas in the holding that becomes the item of inspection. To assess compliance with such eligibility conditions – which for simplicity will all be termed holding-level eligibility conditions here – thus require Member States to adopt a parcel inspection rate, that is, a percentage of relevant parcels in a holding which must be inspected by default.

Obviously, to obtain full certainty on compliance with holding-level eligibility conditions a parcel inspection rate of 100% would be needed. However, in order to permit for an acceptable balance between workload and reliability of the quality assessment, the inspection process may be limited to a smaller but representative sample of parcels in the holding. By analogy to past control approaches², this representative sample shall be at least 50% of those parcels in a holding that are relevant for the concerned eligibility condition. More specifically, to inspect holding-level eligibility conditions:

- Member States shall adopt a parcel inspection rate that covers between 50% and 100% of all relevant parcels in a holding.
- Member States shall apply the parcel inspection rate to all of the holdings in the quality assessment sample whenever holding-level eligibility conditions have to be assessed³.
- The inspection findings obtained with the parcel inspection rate shall be used – in accordance with the instructions provided in this section – to 1) assess compliance with holding-level eligibility conditions, 2) count toward the statistical test to assess the need for remedial actions, and 3) quantify the area error in APR indicators.

While the above constitutes the default procedure for holding-level eligibility conditions, it is however possible to adopt a lower parcel inspection rate for specific holding-level eligibility conditions provided that the Member State submits supporting evidence as to the reliability, representativeness, and equivalence of such a choice. This evidence shall be acquired and submitted in the year prior to the planned use of the reduced parcel inspection rate so as to ensure a proper evaluation by Commission services.

The supporting evidence shall include, for each holding-level eligibility condition concerned, empirical data on the number of non-compliances obtained as well as on the eligible area share estimated with a) the reduced parcel inspection rate, b) the default parcel inspection rate of at least 50%, and c) the full parcel inspection rate (100%). These empirical data shall be gathered over the first 1/3 of the holdings in the quality assessment sample and this in a manner that reliably depicts the actual agricultural situation. Member States wishing to reduce the parcel inspection rate for specific holding-level eligibility conditions therefore shall, as from claim year 2024:

- inform the Commission of their intention to do so, as well as of the methodology planned for the acquisition of the empirical data, by 15th February of year N (i.e., the year where the empirical data will be acquired). The Commission will review these plans and provide feedback as to their adequacy.
- submit a report containing the required statistical evidence (see above) no later than 1st December of year N. The Commission will analyse this report and where need be ask for clarifications.
- receive feedback from Commission services by 15th February of year N+1 (i.e., after analysis of the supporting evidence derived on the basis of empirical data gathered in year N) as to whether the reduced sampling rate may apply for the concerned holding-level eligibility conditions from year N+1 onwards.

In the following, it is assumed that a default parcel inspection rate – equal to at least 50% of the relevant parcels in a holding – is used for the inspection of holding-level eligibility conditions.

² See for example page 18/35 (Sample of parcels to be determined/measured) in Technical Guidance for the On-The-Spot Checks (OTSC) and area measurement according to Art. 24, 25, 26, 27, 30, 31, 34, 35, 36, 37, 38, 39, 40, 41 of Regulation (EU) No 809/2014 as amended by Regulation (EU) 2018/746 available at: <https://wikis.ec.europa.eu/download/attachments/86968763/Guidance%20CTS%20-%202022.pdf>

³ This excludes holding-level eligibility conditions where compliance cannot be assessed on the basis of inspection results obtained from the subset of parcels in the holding that corresponds to the parcel inspection rate. For example, if eligibility is linked to the presence of a fixed number of hectares of a specific crop – and this minimum number of hectares is not linked to the size of the holding – then the criteria to check is the minimum number of hectares with the specific crop even if this would imply to inspect more parcels than what corresponds to the parcel inspection rate for a given holding.

10.2 Sample selection

For a (group of) unit amount(s) featuring at least one holding-level eligibility condition, the sample selection has to address three different aspects:

10.2.1 Selecting the number of holdings to include in the quality assessment sample

The number of holdings to include in the quality assessment sample shall be determined in accordance with the lot size of the (group of) unit amount(s) concerned (as described in Section 4.1). The specific holdings that are to feature in the quality assessment sample shall be selected using the ranked list of parcels introduced in Section 4.2. Each parcel that is drawn from the ranked list and that features the unit amount under consideration will have its holding become part of the quality assessment sample for holding-level eligibility conditions.

The first parcel selected per holding will be called the *primary* parcel of that holding. If further parcels of the same holding are picked from the ranked list, then these shall be skipped for the purpose of identifying the required number of holdings in the quality assessment sample. For the bucket-filling process in Section 4.2, only the unit amounts that are claimed for primary parcels shall be relevant.

The procedure for selecting the parcels to be inspected for both the AMS quality assessment (Section 10.2.2) and the GSA quality assessment (Section 10.2.3) should be carried out on the holdings selected as described in this section.

10.2.2 Selecting the parcels to inspect in the AMS quality assessment sample

The AMS quality assessment evaluates compliance with one (or more) holding-level eligibility conditions that are relevant for a given unit amount. It does so on the basis of inspection results obtained from (a subset of) relevant parcels in each one of the holdings previously assigned to the quality assessment sample for that unit amount.

The parcels to inspect for the AMS quality assessment in the selected holdings shall be drawn from the ranked parcel list. Specifically, parcels shall be selected from the ranked list provided that they are relevant for the holding-level eligibility condition in question and provided that they belong to a holding that is to be inspected. Parcels from the ranked list that satisfy these criteria are earmarked for inspection until at least 50% (assuming here that the standard parcel inspection rate is applied) of the total number of relevant parcels in the holding have been reached. If a holding has an odd number of relevant parcels, then this implies that as a minimum half of the relevant parcels plus one have to be selected in total.

The number of parcels selected with this process will be denoted the *quota* of parcels that are to be inspected per holding. The quota of parcels in a holding thus is the product of the number of parcels in a holding (that are relevant for the holding-level eligibility condition under inspection) and the inspection rate adopted by the Member State. For example, a holding with 100 relevant parcels would have a quota of 50 parcels to inspect if an inspection rate of 50% was used. While holdings can be expected to feature different numbers of parcels, the parcel inspection rate is constant as described in section 10.1. Thus, the quota of parcels to inspect for a given holding-level eligibility condition will most likely differ between holdings in the AMS quality assessment sample. The primary parcel will only be part of the quota if it is relevant for a given holding-level eligibility condition.

To decide what parcels are relevant for the selection of the quota will depend on the definition of the holding-level eligibility condition. For example: If a holding-level eligibility condition were to require that a specific agricultural activity is carried out on a minimum share of the grassland in a holding, then only the grassland parcels in the holding would be considered relevant parcels for determining the quota of this holding-level eligibility condition. On the other hand, if the holding-level eligibility condition were to relate to a minimum percentage of grassland that must exist within a holding, then all parcels of the holding would be part of the set of relevant parcels from which to select the quota of parcels to inspect.

To illustrate the above concepts, Figure 6 provides schematic examples as to what constitutes the set of relevant parcels for a given holding-level eligibility condition and how this affects the quota of parcels that then need to be inspected for the purpose of evaluating compliance in the context of the AMS quality assessment. More specifically, the top panel refers to a holding-level eligibility condition defined in terms of a minimum share of all parcels in the holding, whereas the bottom panel relates to a holding-level eligibility condition defined in terms of a subset of parcels in the holding (i.e., only the grassland parcels).

If a (group of) unit amount(s) features multiple holding-level eligibility conditions that apply to different parcel characteristics and thus also to different sets of relevant parcels in a holding, then the ranked list shall be used repeatedly (as described above) to identify which parcels are to be inspected for each one of these holding-level eligibility conditions. In that case, the exact list of parcels that need to be inspected would differ between the concerned holding-level eligibility conditions.

The AMS quality assessment inspection effort of parcels in the quota for a given holding-level eligibility condition shall be limited to evaluating compliance with the holding-level eligibility condition for which the quota of parcels was selected in the first place.

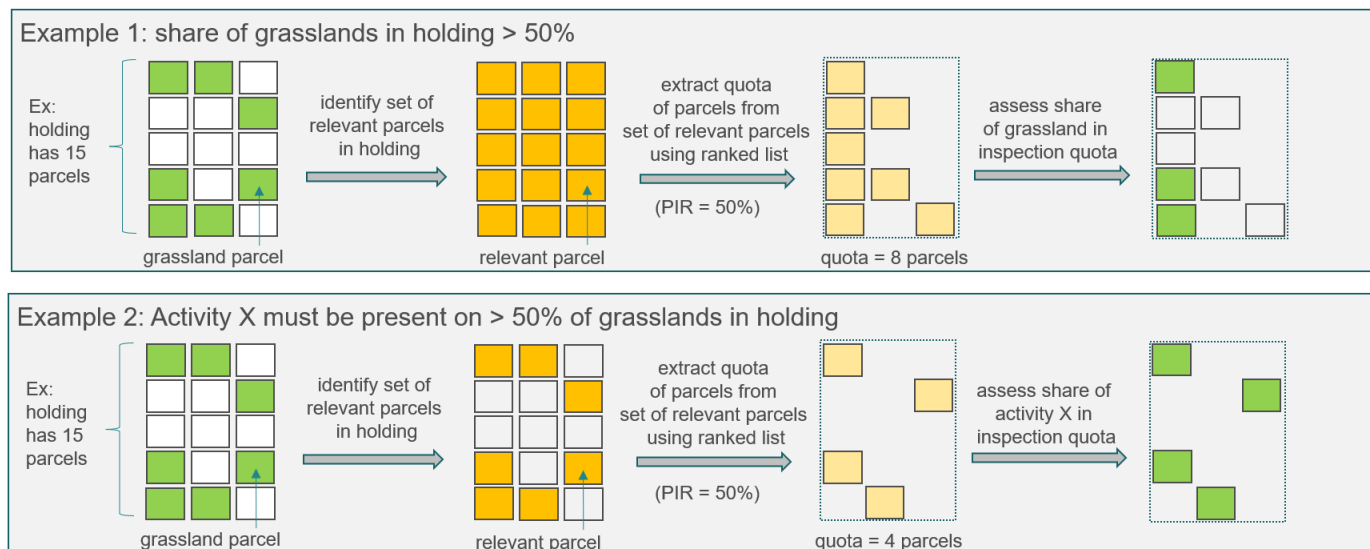


Figure 6: Schematics depicting what parcels to inspect in the context of the AMS quality assessment inspection of a given holding-level eligibility condition. The examples refer to a holding featuring 15 parcels overall of which there are 7 grassland parcels. Top Panel: Example of a holding-level eligibility condition for which the set of relevant parcels (to assess compliance) is equal to all of the parcels in the holding. A parcel inspection rate (PIR) of 50% is assumed thus resulting in $(15 * 0.5 = 7.5$ which is rounded up to) 8 parcels that must be inspected as part of the AMS quality assessment to evaluate whether more than 50% of the holding's area is grassland. Bottom panel: Example of a holding-level eligibility condition for which the set of relevant parcels (to assess compliance) is equal to a subset of (7 grassland) parcels in the holding. A parcel inspection rate (PIR) of 50% is assumed thus resulting in $(7 * 0.5 = 3.5$ which is rounded up to) 4 parcels that must be inspected as part of the AMS quality assessment to evaluate whether activity X has been carried out on more than 50% of the grassland.

10.2.3 Selecting the parcels to inspect in the GSA quality assessment sample

The GSA quality assessment evaluates the eligible areas for a given unit amount which has at least one holding-level eligibility condition. It does so on the basis of inspection results obtained from (a subset of) relevant parcels in each one of the holdings previously assigned to the quality assessment sample for that unit amount.

The parcels to inspect for the GSA quality assessment in the selected holdings shall be drawn from the ranked parcel list. The selection shall be determined in relation to the area qualifying for annual performance reporting as follows:

- 1) Where the area relevant for reporting is equal to the eligible area of one GSA-declared parcel, the GSA quality assessment inspection effort shall focus only on the eligible area of the one parcel that is reported. In practice, this would imply to apply the procedure described in Section 6 to the primary parcel alone, accounting however for the possibility that its eligible area may have to be set equal to zero for the purpose of determining the need for remedial actions if a holding-level eligibility condition failed due to parcels other than the primary parcel (as described under item 1 in the top of section 10.4.2).
- 2) Where the area relevant for reporting equals the eligible area of all of the GSA-declared parcels for which compliance with holding-level eligibility conditions was found to be met, then the union of all quotas of parcels that were inspected (under the AMS quality assessment effort) for the various holding-level eligibility conditions shall be used as the quota of parcels for the GSA quality assessment. Two cases are possible as depicted schematically in Figure 7. Perhaps the most likely scenario is where all holding-level eligibility conditions refer to the same set of relevant parcels in a holding. In that case, the list of parcels in the quota of the GSA quality assessment is identical to that of the AMS quality assessment for holding-level eligibility conditions. On the other hand, where the list of parcels that were inspected (under the AMS quality assessment effort) are different for the various holding-level eligibility conditions relevant for the unit amount under inspection, then the list of parcels in the quota of the GSA quality assessment must be equal to the union of these various sets of parcels (inspected under the AMS quality assessment effort).

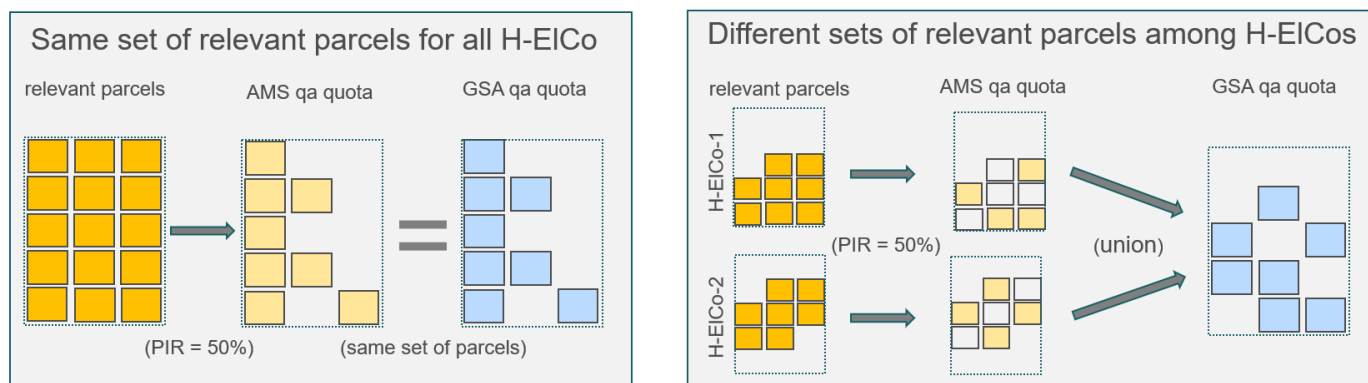


Figure 7: Schematics depicting what parcels in a holding to inspect in the context of the GSA (area) quality assessment (qa) inspection of a unit amount where the area relevant for reporting equals to the eligible area of all GSA-declared parcels for which the eligibility conditions were found to be met. The examples refer to a holding featuring 15 parcels overall. Left Panel: All parcels of the holding are part of the set of relevant parcels (deep orange coloured squares) and thus would be reported if the eligibility conditions are met. The same set of relevant parcels applies for all of the holding-level eligibility conditions (H-ElCo) defined for the concerned unit amount. As such, the same set of 8 parcels – assuming a parcel inspection rate (PIR) of 50% – will feature in the inspection quotas of the AMS quality assessment (light orange coloured squares) and GSA (area) quality assessment (blue coloured squares). Right Panel: The set of relevant parcels (dark orange coloured squares) during the AMS quality assessment effort of Holding-Level eligibility condition 1 (H-ElCo-1) differ from those of Holding-Level eligibility condition 2 (H-ElCo-2). In this case, the eligible area of the union of the two sets of (8 and 7) relevant parcels would be reported if all eligibility conditions are met with. Similarly, the union of the two sets of 4 parcels in the AMS quality assessment quotas – assuming a parcel inspection rate of 50% – would form the quota of parcels to inspect during the GSA (area) quality assessment effort (blue coloured squares).

- 3) Where the area relevant for reporting is larger than the eligible area of all of the GSA-declared parcels for which compliance with eligibility conditions was found to be met with, then the GSA (area) quality assessment quota shall be derived from all of the GSA-declared parcels relevant for the reporting.

In practice this means that, the set of parcels identified under item (2) above must be complemented by adding parcels selected from the set of parcels in the holding that were not relevant for evaluating compliance with eligibility conditions of the unit amount concerned but that would nevertheless contribute to the hectares included in the APR. The selection of such parcels shall occur in the order they appear in the ranked list. The number of such parcels to select shall be equal to the parcel inspection rate applied to this subset of parcels in the holding, that is, the set of parcels not relevant for determining the quota(s) for the inspection efforts of the AMS quality assessment but relevant for the reporting. The process is depicted schematically in Figure 8.

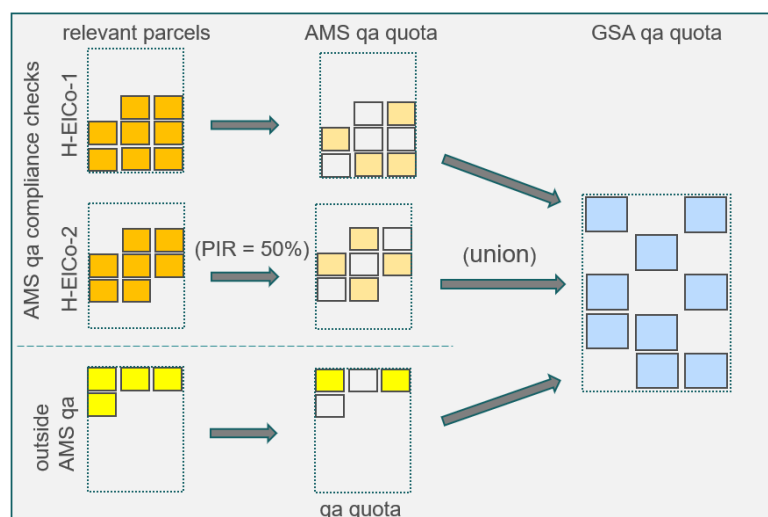


Figure 8: Schematics depicting what parcels in a holding to inspect in the context of the GSA (area) quality assessment (qa) inspection of a unit amount where the area relevant for reporting is larger than the eligible area of all GSA-declared parcels for which the eligibility conditions were found to be met. The examples refer to a holding with 15 parcels overall. The set of relevant parcels (dark orange coloured squares) as well as the set of parcels to inspect (light orange coloured squares) during the AMS quality assessment effort of holding-level eligibility condition 1 (H-ElCo-1) differ from those of holding-Level eligibility condition 2 (H-ElCo-2). A parcel inspection rate (PIR) of 50% is applied to obtain the AMS quality assessment (qa) quotas for both holding-level eligibility conditions as well as for the quota to inspect for parcels that are not part of the AMS quality assessment effort but that are relevant for reporting (bright yellow coloured squares). In this

example, the eligible area of the union of the three sets of relevant parcels (i.e., all the 15 parcels of the holding) would be reported if all eligibility conditions were met with. Similarly, the union of the two sets of (4) parcels in the AMS quality assessment quotas and the 2 parcels in the new quota of (2) parcels, would form the overall quota of parcels to inspect during the GSA (area) quality assessment effort (blue coloured squares).

Note that it may be advantageous to draw all parcels of a holding that are relevant for a given unit amount from the ranked list in a single step. From this ranked sub-list, the required quota of parcels is then taken in the order they appear (as described above).

10.3 Specificities regarding AMS quality assessment inspection principles

The inspection effort described in Section 5.2 shall cover all holdings in the quality assessment sample. The purpose of the inspection effort is to collect reference data permitting to evaluate all eligibility conditions of the concerned (group of) unit amount(s) and this irrespective of possible amendments to the aid application.

Parcel-level eligibility conditions are evaluated with respect to primary parcels, that is, on the first parcel that was selected for a given holding from the ranked list.

Holding-level eligibility conditions shall be evaluated over the full quota of parcels required to attain the inspection rate adopted by the Member State. The parcels are selected in accordance with the process described in Section 10.2. Except for cases where Member States are permitted to adopt a reduced parcel inspection rate, this implies that at least 50% of the relevant parcels in the holding are inspected (see Section 10.1). One notable exception to the latter is where the definition of a holding-level eligibility condition allows it to be evaluated conclusively prior to attaining the number of parcels prescribed by the parcel inspection rate for this holding (see Section 10.3.1).

Where the testing of a holding-level eligibility condition fails on the basis of the reference data obtained from the set of inspected parcels within the holding, then this non-compliance – if not detected by the AMS and not remedied by the beneficiary prior to the last date for GSA amendments – shall constitute an “incorrect decision” relevant for the test on triggering remedial actions (described in Section 5.2.6).

It is worthwhile to recall that, as stated in Section 5.1.2, the hectares of parcels associated with unit amounts having a *red* AMS colour status after the last date for GSA amendments cannot be included in the APR and therefore must also not be part of the AMS quality assessment sample for that unit amount. By analogy, whenever a red AMS colour status remains for a holding-level eligibility condition after the last date for GSA amendments, then the said holding must be skipped from the quality assessment. This includes the case where a holding-level eligibility condition is failed due to parcels other than the primary parcel.

10.3.1 Test criteria for holding-level eligibility conditions

Focusing on holding-level eligibility conditions where compliance can be evaluated based on a quota of parcels equal to the parcel inspection rate:

If a holding-level eligibility condition is expressed as a simple share of area that shall (or shall not) be exceeded in order to be compliant, then this “area share” criteria does not have to be adapted to a particular parcel inspection rate since it is not dependent on the size of the set of randomly drawn parcels that are inspected within the holding. An example of such a holding-level eligibility condition would be a criterion specifying that a given crop or agricultural activity must exist within a minimum percentage of the holding area. The actual number specified by the Member State for the minimum percentage of area that must be covered by the said crop/agricultural activity will not change if only a subset of relevant parcels in the holding are inspected. Relevant parcels in this example, would thus be all declared parcels of the holding. In general, the testing of such types of holding-level eligibility conditions thus requires only to compare the predefined percentage criteria against the area share that is found to be covered by the required crop/agricultural activity when inspecting at least 50% of relevant parcels in the holding.

By contrast, where a holding-level eligibility condition relates to a variable that is defined with respect to the actual area of the holding then this number may have to be scaled in accordance with the area of the parcels that are going to be inspected. A case in point here is the “maximum livestock density” requirement where the number of Livestock Units (LU) per hectare must be lower than a given threshold (T_d) to be compliant. Typically, the number of animals (converted into LU) is determined administratively by querying the system for the identification and registration of animals whereas the hectares to be considered are those declared in the GSA as (permanent or temporary) grassland. Mathematically, the “maximum livestock density” condition can be expressed as:

$$\frac{LU}{A_{gh}^e} < T_d$$

where A_{gh}^e is the eligible area of grassland at the level of the holding. However, since the inspection of holding-level eligibility conditions is carried out on a subset of (at least 50% of) the relevant parcels in a holding, one will not have access to A_{gh}^e but

rather to the quantity $A_{g_s}^e$, which is the area identified as eligible grassland during the inspection of the sample of at least 50% of the declared grassland parcels in the holding. To account for this fact, the “maximum livestock density” condition must be scaled accordingly. Conceptually, this can be done for any one of the three terms in the above equation using as scaling factor: $f_{s \rightarrow h} = A_{g_s}^d / A_{g_h}^d$, which is the ratio between the grassland area declared for the inspected sample of parcels and the grassland area declared for the full holding. As such, one could choose any of the following to assess compliance:

- Set $A_{g_h}^e = A_{g_s}^e / f_{s \rightarrow h}$ and evaluate the above “maximum livestock density” condition, or
- Rescale the livestock units as $LU' = LU \cdot f_{s \rightarrow h}$ and evaluate whether $LU' / A_{g_s}^e < T_d$, or
- Redefine $T_d^* = T_d / f_{s \rightarrow h}$ and evaluate whether $LU / A_{g_s}^e < T_d^*$.

When all relevant parcels in the holding are inspected (i.e., $f_{s \rightarrow h} = 1$) then $A_{g_s}^e = A_{g_h}^e$ and the initial mathematical expression for the “maximum livestock density” condition is obtained anew.

Last but not least, where a holding-level eligibility condition can be conclusively concluded upon prior to inspecting the full sample of at least 50% of relevant parcels in a holding, then the inspection can stop for this holding-level eligibility condition even if the nominal parcel inspection rate has not yet been achieved. A case in point here is the above “maximum livestock density” condition, which can be rewritten as:

$$A_{g_s}^e = \sum_{i=0}^{quota-1} A_{g_s}^{e,i} > \frac{LU'}{T_d}$$

on the basis of the total eligible grassland area found ($A_{g_s}^e$) during the inspection of all the parcels in the quota of parcels for this holding. Since the cumulative eligible area of grassland can only increase (but never decrease) as more and more eligible grassland area is found during inspection, it is possible that the number of hectares of the already confirmed eligible grassland satisfies the “maximum livestock density” condition already before all parcels in the quota of parcels for the holding were inspected. Once this is the case then compliance with the “maximum livestock density” condition cannot be refuted anymore by inspecting further parcels in the quota. As such, the inspection effort can stop for this holding-level eligibility condition.

10.3.2 Flagging of non-compliant and/or ineligible areas

Whenever ineligible areas or non-compliant areas are visually-noted during the AMS quality assessment inspection effort, then – as indicated in Section 5.2.2 – these shall be “flagged” to the GSA quality assessment as follows:

In the ideal case, the flagging may be a mere signalling to the GSA quality assessment inspection effort that there is a need for area measurements on specific parts of a parcel. If so, then it is understood that the quantification of the ineligible or non-compliant area is performed by the GSA quality assessment inspection effort while the evidence is still available. Depending on the definition of the eligibility condition in question, this may imply that corresponding area measurements will have to be carried out in parallel or shortly after the inspection effort of the AMS quality assessment to ensure that relevant evidence is still visible on the concerned parcel(s). Where such a dynamic approach to the GSA quality assessment inspection is not feasible, or where there is a risk that the evidence will no longer be visible when the GSA quality assessment inspection is carried out at a later stage, then the AMS quality assessment inspection effort shall make use of one of the following means to flag the affected parts of the concerned parcels to the GSA quality assessment effort for quantification:

- 1) Where an eligibility condition is monitored with the AMS and the AMS analysis is capable of identifying non-eligible conditions at pixel-level within a parcel, this information may be used by the Member State to flag ineligible and/or non-compliant areas to the GSA quality assessment.

Where Member States choose to do so, an expert operator – capable of assessing the actual situation on the ground based on the available Sentinel data – may manually delineate the ineligible and/or non-compliant area. The thus resulting delineation of ineligible and/or non-compliant areas should be smooth, continuous, and carried out in a conservative manner, that is, by extending it beyond those Sentinel pixels having a red AMS colour status. Such an effort must account also for “unlikely gaps” in the cluster of red Sentinel pixels (e.g., isolated non-red Sentinel pixels completely surrounded by pixels with a red AMS colour status) as well as for “border areas” (i.e., areas not covered by the AMS analysis but falling just within the delineated perimeter of the concerned parcel) if these are likely to be an extension of the ineligible and/or non-compliant areas visible in Sentinel pixels. As a rule of thumb all border areas that were not included in the AMS analysis and that are immediately adjacent to Sentinel pixels identified as ineligible and/or non-compliant by the expert operator, should be included in the delineation. An example of this is shown in the left-hand panel of Figure 9.

- 2) Where [Member States](#) have access to remote sensing imagery with better spatial resolution than those from the Sentinel satellites (including from drones or LPIS update efforts), and where this imagery allows for a reliable evaluation of the actual situation on the ground, then an expert operator may make use of this imagery to proceed with the flagging of ineligible and/or non-compliant areas following the conservative delineation approach described in item 1.
- 3) Where [Member States](#) have access to geotagged photos (e.g., acquired by operators performing the AMS quality assessment inspection in the field), and where this information allows to reliably locate and quantify ineligible or non-

compliant areas, then expert operators may use the acquisition location and contextual content of these geo-located photos in their effort to delineate the said ineligible and/or non-compliant areas on ortho-rectified VHR imagery following the conservative delineation approach described in item 1.

- 4) Where **Member States** have the means to equip field inspectors with digital tools (such as tablets or laptops) allowing them to reliably record the location and extent of visually-noted ineligible and/or non-compliant areas directly onto relevant ortho-rectified imagery during *in situ* visits, then these may be used to delineate and flag the said ineligible and/or non-compliant areas to the GSA quality assessment following the conservative delineation approach described in item 1.

The means used by Member States to quantify and flag ineligible areas may differ from that used for the delineation and flagging of non-compliant areas. Whatever the approach chosen to flag such errors to the GSA quality assessment, a conservative delineation approach shall be used.

10.3.3 Assessing compliance of holding-level eligibility conditions defined in terms of area criteria

Holding-level eligibility conditions are often expressed in terms of a maximum/minimum area share or density-per-hectare criterion for a given target quantity. A reliable assessment of compliance with such holding-level eligibility conditions may not always be feasible based on a visual inspection of the quota of at least 50% of relevant parcels in a holding. In that case, Member States shall find quantitative means to conclude on compliance. Among these:

- Member States may quantify eligible areas by analogy to the means described in Section 10.3.2 for the flagging of ineligible and/or non-compliant areas. If so, then a conservative delineation shall be applied so as to not overestimate the eligible area. This approach may be particularly relevant for eligibility conditions requiring that a specific area share within each one of the declared parcels is reached to be compliant.
- Member States may use the declared areas of relevant parcels to conclude on compliance if they deem the magnitude of any ineligible areas and/or non-compliant parts of parcels (noticed during the AMS quality assessment inspection effort) as too small to affect the reliability of their decision on compliance. An example of such a case could be the assessment of hectares in a holding having a specific crop type and the declared areas exceed the required percentage by a large margin (with non-eligible areas being minor).
- Member States may decide to wait for the findings of the GSA quality assessment inspection prior to deciding on compliance if the magnitude of any ineligible areas and/or non-compliant parts of parcels (noticed during the AMS quality assessment inspection effort and flagged to the GSA quality assessment using one of the means described in Section 10.3.2) is deemed large enough to affect the decision on compliance.

A further solution may be needed, when Member States opt to communicate incorrect decisions, that were detected via the AMS quality assessment inspection and that relate to AMS-monitored holding-level eligibility conditions, to the concerned beneficiaries in time for possible GSA amendments. In such a scenario, it may be that the results of the area measurement part of the GSA quality assessment are not available in time (assuming that compliance cannot be established on the basis of a visual inspection of the sample of at least 50% of parcels in a holding). If so, then the following conservative approach may be used to assess compliance with an AMS-monitored holding-level eligibility condition featuring an area share criterion:

- 1) For the selected holding, start by setting the quota-level eligible area equal to zero.
- 2) For each parcel in the quota of at least 50% of relevant parcels in the holding:
 - Compute the union of all delineated areas that were flagged as being ineligible and/or non-compliant during the AMS quality assessment inspection effort of the concerned parcel (see Section 10.4.1).
 - Deduct the union of flagged (ineligible/non-compliant) areas from the declared area for this parcel to obtain the eligible area within the GSA-declared parcel for the unit amount concerned.

Focusing on Sentinel pixels that overlap fully or partially with the eligible area contained within the GSA-declared parcel, compute the number of such Sentinel pixels that 1) are fully inside the GSA-declared parcel ($N_{p_{inside}}$) and 2) are partially overlapping with an inner or outer border of the GSA-declared parcel ($N_{p_{border}}$).

Compute the factor $f_{AMS} = N_{p_{inside}} / (N_{p_{inside}} + 0.5N_{p_{border}})$ as a proxy for the area share of the parcel that was covered by the AMS analysis.

Scale the eligible area within the GSA-declared parcel by the factor f_{AMS} so as to exclude border areas (i.e., areas that fall outside of the parcel area analysed by the AMS) from the assessment of compliance.

Add the parcel's scaled eligible area (obtained via the previous step) to the quota-level eligible area.
- 3) Divide the final quota-level eligible area by the declared area of all the parcels in the quota of at least 50% of relevant parcels in the holding to obtain a conservative estimate of the area share. Use this quota-level estimate of the area share to assess compliance with the holding-level eligibility condition.

Where a non-compliance with an eligibility condition leads to an incorrect decision (see Section 5.1.3), then this incorrect decision shall contribute toward the check for triggering remedial actions as described in Section 5.2.6.

10.4 Specificities regarding GSA quality assessment inspection principles

The inspection effort described in Section 6.1 shall cover all holdings in the quality assessment sample. Inspecting holding-specific quotas of parcels the GSA (area) quality assessment will provide information relevant to:

- enable the AMS quality assessment to decide on compliance with holding-level eligibility conditions where this cannot be done visually (as described in Section 10.3.3).
- decide on the need for triggering remedial actions by verifying whether the area error arising from ineligible and/or non-compliant areas exceeds 2% for a given unit amount (as described in Section 10.4.2).
- quantify the typical area error rate inherent to specific unit amounts (as described in Section 10.5.1).

For unit amounts where compliance would make all of the (relevant) parcels in a holding eligible for payment, it is the whole (relevant) area declared by the holding that becomes the basic area element to assess (and to consider when deciding on the need for remedial actions as well as when estimating the area error for indicator reporting).

As was the case in Section 6.1.2, all areas shall be expressed in hectares with 4 decimal places.

To quantify unit amount specific area errors at holding-level requires to compare – for every parcel in the quota of parcels for a given holding – the GSA-declared area of the parcel with its actual eligible area. This process may be complicated by the fact that insufficient ortho-rectified VHR imagery is available to measure the area of all the parcels in a holding's quota of parcels. In addition, ineligible and/or non-compliant areas flagged via the AMS quality assessment at different times of the year and by different means may have to be combined (among themselves and/or with area measurements acquired as described in Section 6.1.2) to determine the overall ineligible and/or non-compliant areas within a GSA-declared parcel. The next sections will describe how this is to be done.

10.4.1 Accounting for ineligible/non-compliant areas flagged via AMS quality assessment

Ineligible and non-compliant areas within a parcel, that were noticed during an AMS quality assessment inspection effort as a result of visually detectable mismatches between the GSA declaration and reality, shall be flagged to the GSA quality assessment inspection effort. This is particularly relevant when the evidence concerning a (partial) non-compliance with a given eligibility condition is transient, that is, where such evidence will not remain visible for long afterwards. If in such a case, if it is *a priori* known that a responsive GSA area measurement is not possible, then the ineligible and/or non-compliant parts within the affected GSA-declared parcel(s) may be recorded directly by the AMS quality assessment effort using one of the quantitative means described in Section 10.3.3.

The following two sections will describe how such flagged area quantifications may be used to estimate area errors relevant for assessing the need to trigger remedial actions. Note that if a Member State chooses to perform area measurements – as described in Section 6.1.2 – whenever a non-compliant and/or ineligible area is detected via the AMS quality assessment inspection effort [or where such non-compliant and/or ineligible areas can be quantified in one single effort/visit via the GSA quality assessment](#), then these delineation and quantification errors shall be used in the following, instead of area errors flagged by the AMS quality inspection process itself.

10.4.1.1 Quantifying area errors due to ineligible features and non-compliant parts of parcels

Since different eligibility conditions may have to be inspected at different times of the year, it is possible that more than one flagging of ineligible or non-compliant areas may result for any given parcel inspected via the AMS quality assessment. In order to obtain a final estimate of the eligible area that exists within a GSA-declared parcel for a specific (group of) unit amount(s), the results of the GSA quality assessment area measurement process (whether carried out *in situ* or with ortho-rectified VHR imagery as described in Section 6.1.2) shall be combined with any operator-generated delineations that the AMS quality assessment process may have flagged to the GSA quality assessment. Specifically, this is to be done by combining any thus acquired delineations of ineligible and/or non-compliant parcel areas onto a single datum, and to compute the union of all thus identified ineligible and/or non-compliant areas that fall within the GSA-declared parcel.

Mathematically, the overall area error within a given GSA-declared parcel can be defined as the union of all ineligible and/or non-compliant area delineations detected at different times within that parcel:

$$\Delta E_h^i = \bigcup_{t=t_0}^{t=t_L} A_{0,h,t}^i \quad (21)$$

where ΔE_h^i is the overall area error – within the bounds of the GSA-declared parcel i of holding h – that was detected during the claim year for the unit amount under inspection. $A_{0,h,t}^i$ is an ineligible/non-compliant area (A_0) delineated within the GSA-declared parcel i of holding h at some time t occurring between the first (t_0) and last (t_L) GSA or AMS quality assessment inspection dates for that parcel. Equation (21) accounts for the most complex situations that can be expected to occur. In practice, it may not often be the case that evidence concerning non-compliant parts of parcels is highly transient. Hence, where unit amounts do not feature eligibility conditions that require evaluations at different moments in time, or where the evidence regarding

compliance with all eligibility conditions is still visible when the GSA quality assessment inspection is carried out (say at a single time t_{GSA} after the last date for GSA amendments), then equation (21) will simplify to $\Delta E_h^i = A_{0,h,t_{GSA}}^i$.

When the magnitude of the above (combined) ineligible and/or non-compliant areas (ΔE_h^i) is deducted from the GSA-declared parcel area ($A_{d,h}^i$) then one obtains the eligible area within the GSA-declared parcel i of holding h for the unit amount under inspection:

$$A_{e,h}^i = A_{d,h}^i - \Delta E_h^i. \quad (22)$$

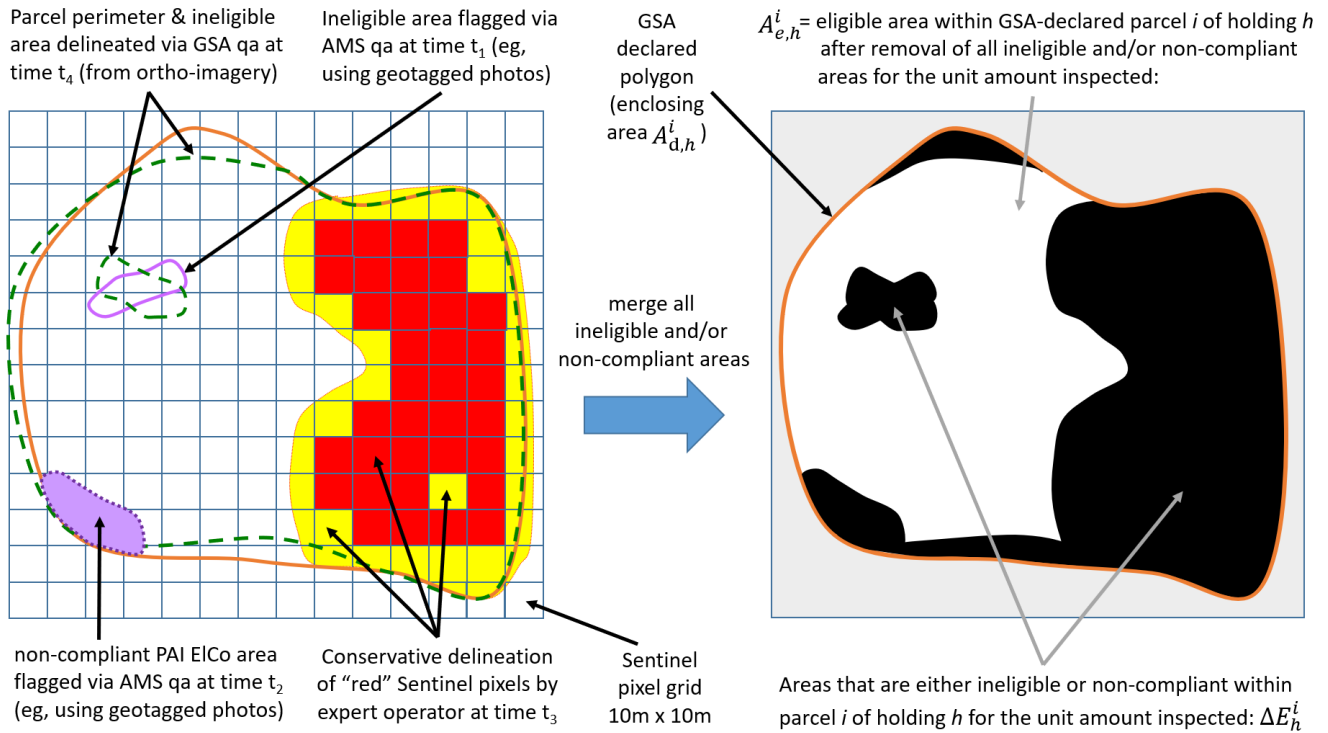


Figure 9: Estimation of non-eligible area including both ineligible areas and/or non-compliant areas within the GSA-declared area of an inspected parcel. Left Panel: Examples of delineations of ineligible and/or non-compliant areas observed at different times and/or by different means during the AMS and GSA quality assessment inspection efforts within a given GSA-declared parcel and for the unit amount under inspection. The complexity of the depicted situation is not likely to be the norm. It serves merely to explain the concepts behind the use of Equation (21). Right panel: Binary map of eligible (white) and non-eligible (black) areas within the GSA-declared parcel as a result of taking the union of the various ineligible and/or non-compliant area delineations depicted in the left panel. The fact that the union of the ineligible area delineated at times t_1 and t_4 was taken implies that the difference in the extent/shape of the ineligible areas between times t_1 and t_4 is due to real changes rather than the precision/accuracy of the measurement methods/tools.

Figure 9 shows a schematic example of how a parcel's ineligible and/or non-compliant areas, that were detected by various means of inspection, may be combined as indicated by Eq. (21). Please note that the complex situation depicted in Figure 9 is for illustration purposes only and that such a case is not likely to be the norm.

Specifically, the left panel in Figure 9 depicts the GSA-declared polygon of a parcel (orange line) overlaid onto the Sentinel 1 or 2 pixel grid (blue mesh) together with delineations obtained at four different moments in time (t_1 to t_4) from GSA and AMS quality assessment inspection efforts. At time t_1 the AMS quality assessment identified an ineligible area in the upper left side of the parcel (delineated as a solid magenta line). At some time t_2 , the inspection effort of the AMS quality assessment noted a non-compliant area in the lower left-hand side of the parcel (area filled in mauve). At time t_3 , the AMS analysis flagged a series of Sentinel pixels with a red colour status (shown as red squares on right side of the declared parcel) that were subsequently delineated by an expert operator in a conservative manner (yellow area). Note that this yellow area includes all red Sentinel pixels as well as the "unlikely" gap existing within that cluster.

The example depicted in the left panel of Figure 9 implicitly assumes that the evidence of the non-compliant areas detected at times t_2 and t_3 is transient, i.e., that it is no longer present at time t_4 when the Member State chose to perform the GSA quality assessment inspection. During the inspection at time t_4 both the perimeter of the parcel and an ineligible area (green dashed line) were delineated. The latter showcases a situation where the extent of two partially overlapping ineligible areas differs between two inspection dates (i.e., t_1 and t_4 in the left panel of Figure 9). In such a case there are two ways to proceed:

- where the difference in the extent/shape of the ineligible areas is only due to the use of delineation tools and methodologies having different levels of precision and/or accuracy, i.e., where the extent of the ineligible area can be assumed to be invariant in time, then only that delineation which was obtained with the methodology having the highest accuracy/precision shall be retained.
- where the difference in the extent/shape of the ineligible areas is due to real changes happening to the ineligible area in between the various inspection dates, then the union of the various ineligible areas quantified during these inspection dates shall be taken. This scenario was chosen in Figure 9, where the union between the ineligible areas delineated at times t_1 and t_4 was taken when going from the left panel to the right panel.

The right panel in Figure 9 depicts (in black) the union of all ineligible and/or non-compliant areas that fall within the GSA-declared parcel (i.e., ΔE_h^i) as well as the remainder of the GSA-declared parcel area (in white) which therefore is deemed to be the eligible area for this unit amount, parcel and claim year (i.e. $A_{e,h}^i$).

10.4.1.2 Quantifying area errors only due to non-compliant parts of parcels

For reasons that will become clearer in Section 10.4.2, it may be necessary to estimate only the non-compliant area in a holding, that is, those area errors which were caused by non-compliance with an eligibility condition of type 2 in Section 5.1.1. At parcel-level, non-compliant areas typically arise when a required agricultural activity or practice is not implemented across the full area of the GSA-declared parcel. Different non-compliant areas may occur for each eligibility condition labelled as type 2 in Section 5.1.1.

Where eligibility conditions must be evaluated/inspected at different moments in time, then – by analogy with Eq. (21) – the non-compliant areas inside the GSA-declared parcel i of holding h can be estimated from the union of thus delineated areas:

$$\Delta E_h^{PAI,i} = \bigcup_{t=t_0}^{t=t_L} A_{0,h,t}^{PAI,i} \quad (23)$$

where $\Delta E_h^{PAI,i}$ is the overall area error within the bounds of the GSA-declared parcel i of holding h that is due to non-compliances with eligibility conditions labelled as type 2 in Section 5.1.1 (PAI stands for partial area impact). $A_{0,h,t}^{PAI,i}$ is a non-compliant area (A_0) that was delineated within the GSA-declared boundaries of parcel i in holding h at some time t occurring between the first (t_0) and last (t_L) quality assessment inspection dates for that parcel. For any given eligibility condition we thus have $0 \leq A_{0,h,t}^{PAI,i} \leq A_{d,h}^i$. Where unit amounts do not feature eligibility conditions that require evaluations at different moments in time, then the above equation will simplify to $\Delta E_h^{PAI,i} = A_{0,h,t_{qa}}^{PAI,i}$ where t_{qa} is the one moment in time when the quality assessment inspection effort is carried out. Note that t_{qa} could be an AMS or a GSA quality assessment inspection effort depending on the choices of Member States.

Figure 10 shows a schematic example of how multiple non-compliant areas – previously detected via AMS quality assessment inspection efforts – shall be combined to estimate $\Delta E_h^{PAI,i}$. In Figure 10, it is assumed that the evidence for these non-compliant areas is highly transient and that no non-compliant areas were detected during the GSA quality assessment inspection effort of that parcel. Please note also, that the complexity of the situation depicted in Figure 10 is for illustration purposes only and that such a case is not likely to be the norm.

Specifically, the left panel in Figure 10 depicts the GSA-declared polygon of a parcel (orange line) overlaid onto the Sentinel 1 or 2 pixel grid (blue mesh) together with delineations obtained at three different moments in time (t_1 to t_3) on the basis of AMS quality assessment inspection efforts. At time t_1 the AMS quality assessment identified an ineligible area in the upper left side of the parcel (delineated as a solid magenta line). At some time t_2 , the inspection effort of the AMS quality assessment noted a non-compliant area in the lower left-hand side of the parcel (area filled in mauve). At time t_3 , the AMS analysis flagged a series of Sentinel pixels with a red colour status (shown as red squares in right side of parcel) that were subsequently delineated by an expert operator in a conservative manner (yellow area surrounding the red pixels).

The right panel in Figure 10 shows the union of those non-compliant areas that fall within the GSA-declared parcel polygon (in black). Note that the ineligible area (shown as a solid mauve outline in the upper left part of the GSA-declared polygon in the left panel) was not considered for the computation of the overall area error due to non-compliances with PAI eligibility conditions, i.e., $\Delta E_h^{PAI,i}$.

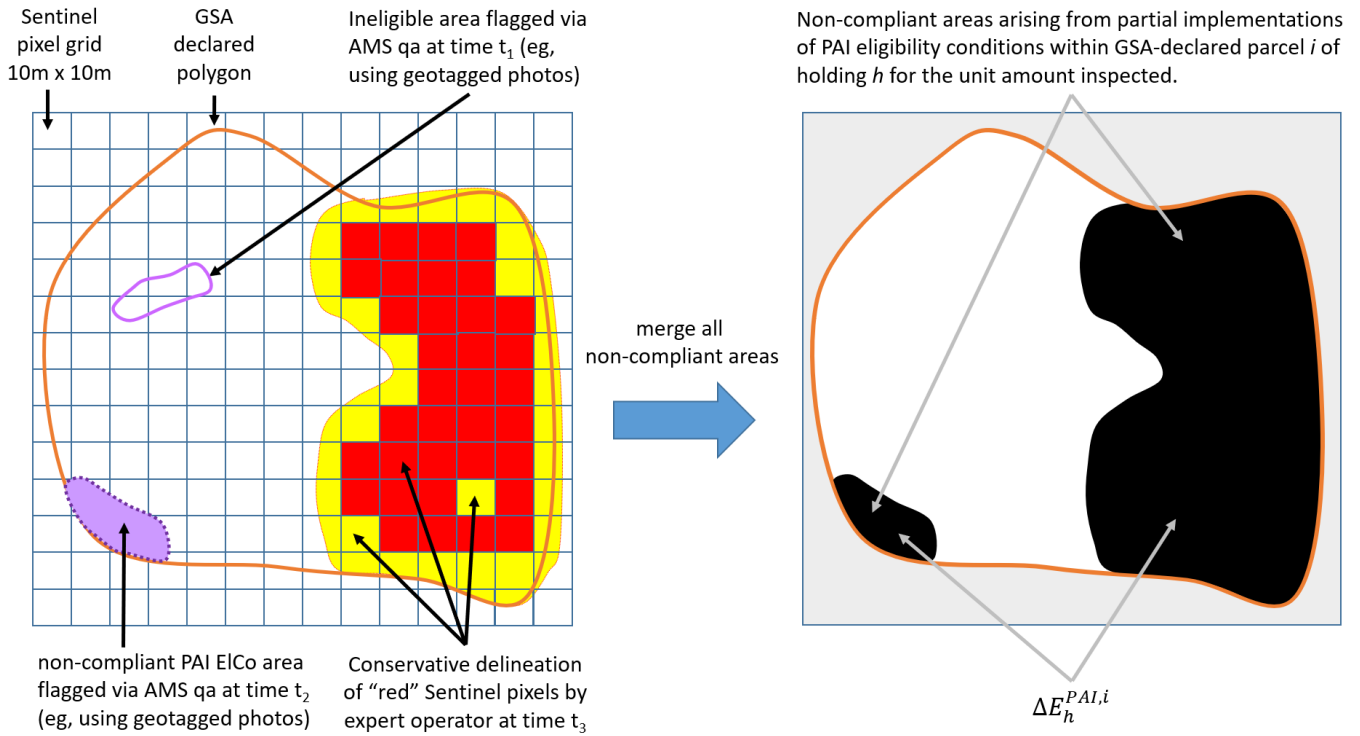


Figure 10: Estimation of non-compliant areas caused by partial implementations of required agricultural activities – and linked to partial area impact (PAI) eligibility conditions – within the GSA-declared area of an inspected parcel. Left Panel: Examples of delineations of ineligible and/or non-compliant areas observed at different times and/or by different means during the AMS quality assessment inspection efforts of a given parcel and unit amount. The complexity of the depicted situation is not likely to be the norm. Right panel: Map of the resulting non-compliant (black) areas within that GSA-declared parcel as a result of taking the union of the various non-compliant areas depicted in the left panel. It is assumed here that there were no PAI area errors detected via the GSA quality assessment.

10.4.2 Determine the need for remedial actions

In accordance with Section 6.1.4, the criteria for the triggering of remedial actions shall be an *overestimation area error* that exceeds 2% when expressed as a percentage of the declared area. To compute this overestimation area error rate, one can distinguish between two cases for unit amounts with holding-level eligibility conditions:

1. When compliance with all of the eligibility conditions for a claimed unit amount would make only the primary parcel eligible for payment, then the procedure described in Section 6.1.4 shall be followed using as eligible area that of the primary parcel of the holding (provided that the inspection of the sample of at least 50% of parcels in the holding found that all of the holding-level eligibility condition were complied with). If at least one of the holding-level eligibility condition was not complied with then the eligible area of the primary parcel shall be set equal to zero when using the procedure described in Section 6.1.4. This applies also when the holding-level eligibility condition is failed due to parcels other than the primary parcel.
2. When compliance with all of the eligibility conditions for a claimed unit amount would make all of the (relevant) parcels in the holding eligible for payment, then the whole of the concerned area declared at the holding-level becomes the basic area element to be considered for the triggering of remedial actions. This case will be discussed in the remainder of this section.

To assess whether (or not) remedial actions shall be triggered for case 2 above, requires a holding-level analysis to be carried out on the basis of a quota of parcels selected according to the approach discussed in Section 10.2. The results obtained by (GSA quality assessment) inspecting this quota of parcels shall then be extrapolated to yield the positive area error at the level of the holding (as will be described later on).

For unit amounts with holding-level eligibility condition that fall under case 2, the total overestimated area (OEA) shall be computed by analogy to Eq. (14) as the sum of the positive area errors established for each holding in the quality assessment sample:

$$OEA = \sum_{h=0}^{n-1} \Delta E_h \quad (24)$$

where ΔE_h is the positive area error within holding h (rather than within parcel i as was the case in Section 6.1.4) and n is the number of holdings in the quality assessment sample for this (group of) unit amount(s). Please note that the magnitude of ΔE_h may change from one (group of) unit amount(s) to another.

To assess whether remedial actions shall be triggered requires one to compute the overestimation area error rate (OAR). The OAR shall be computed by analogy to Eq. (15) and is equal to the OEA normalised with respect to the total area that was declared for this (group of) unit amount(s) in all of the n holdings constituting the quality assessment sample for this (group of) unit amount(s):

$$OAR = \frac{OEA}{\sum_{h=0}^{n-1} A_{d,h}}. \quad (25)$$

with $A_{d,h}$ being the area declared for all of the parcels relevant for the (group of) unit amount(s) under consideration in holding h . A remedial action is triggered if $OAR > 2\%$.

To assess the need for remedial actions thus requires first to compute the positive area error for each holding in the sample (i.e. ΔE_h). The process to do so differs somewhat from the procedure established in Section 6.1.4. First, the inspection will be performed on the quota referred to in Section 10.2 for GSA (area) quality assessment and hence any thus derived error quantities will have to be up-scaled to the holding.

Second, to properly estimate the area error within the quota of parcels in a holding requires one to have access to (useable) ortho-rectified VHR imagery for a sample of at least 50% of relevant parcels in a holding (unless Member States opt for *in situ* measurements). Given that cloud-free or otherwise useable ortho-rectified VHR images may not always be available for all of the parcels in the quota of a given holding, two pathways to compute the positive area error at holding level (i.e., ΔE_h) are provided below. For each holding in the quality assessment sample of the concerned (group of) unit amount(s), Member States shall first assess whether sufficient (useable) ortho-rectified VHR imagery is available to measure all parcels in the quota of the holding and then adapt the computation of ΔE_h accordingly.

10.4.2.1 VHR imagery is available to measure all parcels in the quota of a holding

When sufficient ortho-rectified VHR images are available to measure all parcels in the quota for the GSA (area) quality assessment of a given holding, then the computational logic defined in Section 6.1.4 can be adopted to estimate the positive area error per holding.

Specifically, for each holding in the quality assessment sample, a holding-size-specific quota of parcels has been defined for the GSA (area) quality assessment (see Section 10.2). On the basis of this *quota*, it is possible to compute for each holding h the positive area error within all of the parcels inspected per holding:

$$\Delta E_{h,quota} = \sum_{i=0}^{quota-1} \Delta E_h^i \quad (26)$$

where ΔE_h^i is the area error identified for a given GSA-declared parcel i of holding h and is derived using Eq.(21). $\Delta E_{h,quota}$ is the corresponding area error area found for all of the parcels in the quota of holding h . As such, Eq. (26) is defined by analogy to (12), which was however related to single parcels.

Finally, the positive area error for all of the relevant parcels in a single holding (ΔE_h) is estimated through a scaling operation that is carried out with respect to the overall area declared for that (group of) unit amount(s) in the holding ($A_{d,h}$) and the declared area of the parcels in the quota of inspected parcels for this holding ($A_{d,h,quota}$):

$$\Delta E_h = \Delta E_{h,quota} \frac{A_{d,h}}{A_{d,h,quota}} \quad (27)$$

Once ΔE_h is determined for a holding, it can be used in Eqs. (24) and (25) to compute the total OEA and OAR, respectively, on the basis of the quality assessment sample for the concerned (group of) unit amount(s).

10.4.2.2 VHR imagery is not available to measure all parcels in the quota of a holding

When not all parcels in the quota for the GSA (area) quality assessment of a holding are covered with (useable) ortho-rectified VHR images, and assuming that *in situ* area measurement are not possible for the concerned parcels, then it becomes necessary to decouple the errors due to non-compliant areas (i.e., ΔE_h^{PAI}) from the area errors due to delineation issues and/or nondeclared ineligible areas (i.e., ΔE_h^{del}) when estimating ΔE_h . Mathematically:

$$\Delta E_h = \Delta E_h^{del} + \Delta E_h^{PAI}. \quad (28)$$

In such a case the following 5 step procedure shall be adopted:

1) Estimation of area errors due to partially implemented eligibility conditions:

For each one of the parcels in the quota for the GSA (area) quality assessment of the holding, quantify the non-compliant areas that are due to PAI eligibility conditions. For this task, the approach outlined in Section 10.4.1 (Eq.(23)) can be used. Next, add up these parcel-specific non-compliant areas over all parcels in the quota, to yield:

$$\Delta E_{h,quota}^{PAI} = \sum_{i=0}^{quota-1} \Delta E_h^{PAI,i} \quad (29)$$

where $\Delta E_h^{PAI,i}$ is the non-compliant area – due to partially implemented eligibility conditions – within the GSA-declared parcel i of holding h and $\Delta E_{h,quota}^{PAI}$ is the total non-compliant area within the overall quota of parcels inspected for holding h .

2) Scaling of PAI area errors from the quota of parcels inspected to the holding level:

The non-compliant areas caused by a partial implementation of eligibility conditions and derived in Eq. (29) is then scaled from the level of the quota of inspected parcels to the level of all the relevant parcels in the holding using the ratio of areas declared for the concerned parcels:

$$\Delta E_h^{PAI} = \Delta E_{h,quota}^{PAI} \left(\frac{A_{d,h}}{A_{d,h,quota}} \right) \quad (30)$$

where ΔE_h^{PAI} is the area error due to eligibility conditions – where failure to comply with leads to partial area impacts (PAI) – at the holding level. $A_{d,h}$ is the area declared for all parcels relevant for the unit amount under consideration in holding h , and $A_{d,h,quota}$ is the declared area of all the parcels in the quota of parcels inspected in holding h for the unit amount under consideration.

3) Determination of the Delineation Area Error Rate (DAER):

Since not all parcels in the quota for the GSA (area) quality assessment of the holding are covered with (useable) ortho-rectified images, competent authorities shall screen the ranked list described in Section 4.2 for parcels – outside of the quota – that are also claimed for the concerned unit amount by the same holding and for which (useable) ortho-rectified VHR imagery is available. The aim is to identify as many parcels with (useable) ortho-rectified VHR imagery as in the quota of parcels selected for this unit amount and holding. Where not even one parcel in the quota is covered with (useable) ortho-rectified VHR imagery then the holding shall be skipped from the quality assessment sample.

In the best of cases, (useable) ortho-rectified VHR imagery thus will be available for a number of parcels equal to the quota for the GSA (area) quality assessment in the holding. Some of these parcels are part of the initially selected quota of for the GSA (area) quality assessment of this holding (and thus may have been inspected as part of the AMS quality assessment) while others were not part of this initial quota (and hence will only have the ortho-rectified VHR imagery to contribute to the GSA quality assessment inspection effort). Concerning the former type of parcels: Any ineligible area that was identified during the AMS quality assessment inspection effort and that was subsequently flagged to the GSA quality assessment, shall be accounted (as described in the two bullet points at the end of Section 10.4.1.1) for when determining the Delineation Area Error Rate (DAER), which will be defined below. Where no such evidence is available the derivation of the DAER shall be based solely on the available (useable) ortho-rectified VHR imagery.

The computation of the DAER requires first to quantify the magnitude of the ineligible area – caused by delineation issues and/or not registered ineligible features – within the GSA-declared parcel polygons for each one of the parcels in the list of parcels with (useable) ortho-rectified VHR imagery. The derivation of this area error is schematically depicted in Figure 11 for the case where the parcel is not part of the quota initially selected for AMS quality assessment inspection in the holding concerned.

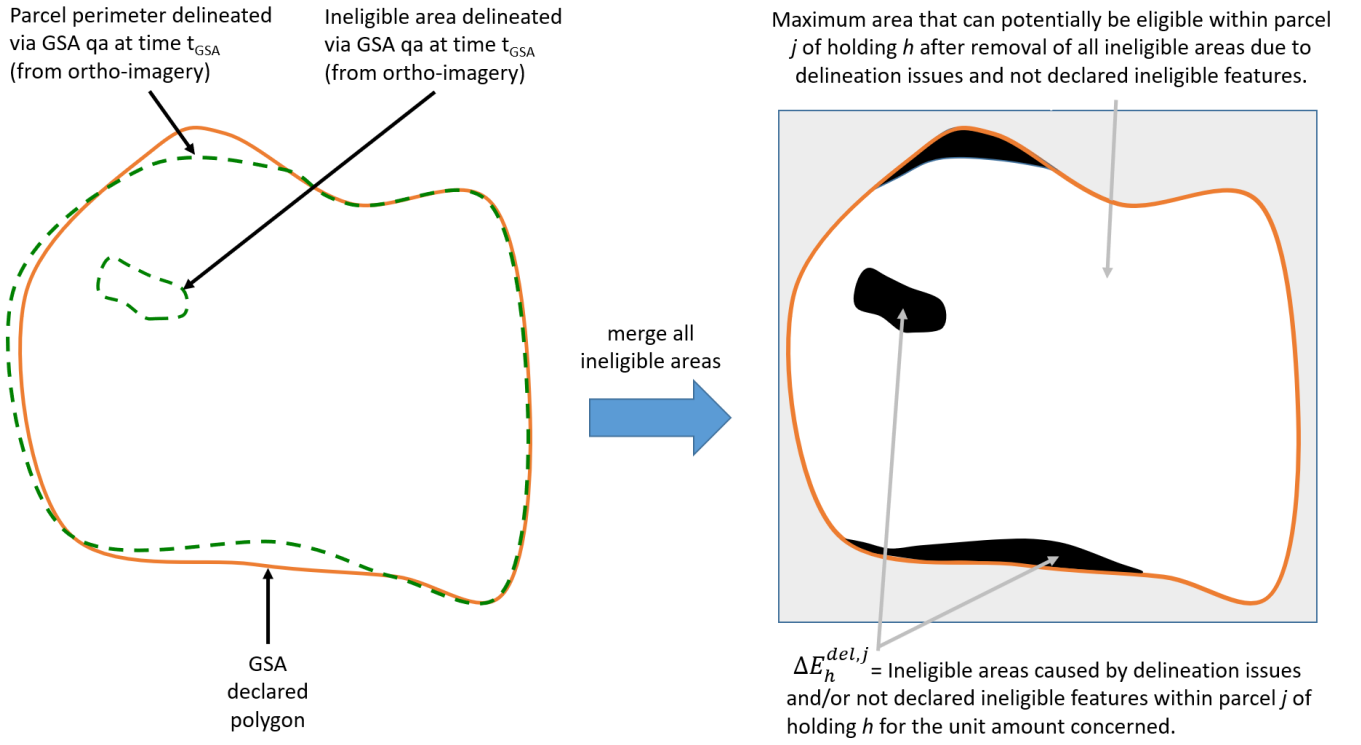


Figure 11: Schema to derive ineligible areas within a GSA-declared parcel that are due to delineation issues and/or incorrectly declared ineligible features for a parcel where ortho-rectified VHR imagery is available but that was not part of the quota of parcels initially selected for inspection by the AMS quality assessment for the concerned unit amount (hence there are no ineligible areas detected and flagged via the AMS quality assessment inspection effort that need to be accounted for). The black area in the right panel denotes ineligible areas within the GSA-declared polygon obtained by comparing the GSA-declared polygon (orange line) with the delineations obtained via the GSA quality assessment inspection effort (and marked as dashed green lines in left panel).

By denoting the area error due to delineation issues and/or undeclared ineligible features within any given parcel j in holding h as $\Delta E_h^{del,j}$ and by using the notation $A_{d,h}^j$ for the declared area of parcel j in holding h , one can define the DAER as:

$$DAER_h = \frac{\sum_{j=0}^{v-1} \Delta E_h^{del,j}}{\sum_{j=0}^{v-1} A_{d,h}^j} \quad (31)$$

where v denotes the number of parcels in the holding that were selected because (useable) ortho-rectified VHR imagery is available for them. Ideally, v is equal to the number of parcels in the quota identified in Section 10.2 for the GSA (area) quality assessment of the holding. The label j is used here (instead of i) to indicate that the set of parcels with (useable) ortho-rectified VHR imagery differs from that in the quota originally selected for GSA quality assessment.

The numerator in Eq. (31) is equal to the sum of the parcel-based ineligible areas – derived via the process depicted in Figure 11 – for all of the parcels with (useable) ortho-rectified VHR imagery that were selected previously. The denominator is the sum of the GSA-declared areas of these same parcels. Since all quantities in Eq. (31) are non-negative the minimum value of $DAER_h$ is zero.

4) Calculation of the residual delineation area error:

The area error due to delineation issues and/or nondeclared ineligible areas occurring within the part of the declared area that was not affected by partial non-compliances (i.e., ΔE_h^{del}) shall be computed as:

$$\Delta E_h^{del} = (A_{d,h} - \Delta E_h^{PAI}) \cdot DAER_h \quad (32)$$

where $A_{d,h}$ is the area declared by the holding for the unit amount concerned. ΔE_h^{PAI} was computed in step 2 above and is the area error at the holding level due to eligibility conditions where failure to comply with leads to partial area impacts (PAIs). The difference between these two terms (i.e., $A_{d,h} - \Delta E_h^{PAI}$) thus is equal to the declared area at the holding level that is no longer affected by partial non-compliances but that may still be affected by delineation issues. To quantify the latter area error (i.e., ΔE_h^{del}) requires multiplication with the $DAER_h$ which is the Delineation Area Error Rate estimated in step 3.

5) Calculation of the overall area error at the level of the holding:

ΔE_h may be estimated on the basis of the area declared by the holding (for the unit amount concerned), the PAI area error at the level of the holding (from step 2), and the Delineation Area Error Rate (DAER) estimated in step 3.

From Eq.(28), the overall ineligible area for holding h shall be determined as:

$$\Delta E_h = (A_{d,h} - \Delta E_h^{PAI}) \cdot DAER_h + \Delta E_h^{PAI}. \quad (33)$$

This estimate of ΔE_h is likely to be conservative– at least for those parcels in the quota for which (useable) ortho-rectified VHR images are available and an AMS quality assessment inspection took place – because some of the ineligible border areas may be included both in the PAI area error estimate and in the DAER estimate.

Once ΔE_h is determined, it can be used to compute the total OEA and OAR following the procedure outlined in the previous section (see Eqs. (24) and (25)).

10.5 Specificities regarding area errors in performance indicators

The following may have to be adapted with respect to the procedures described in Section 9.

10.5.1 Estimating the Area Error Rate

The Area Error rate (AER) is a key variable for estimating the area error within the hectares declared under a given (group of) unit amount(s) – as described in Section 9.1 – as well as for estimating the area error within the hectares provided by Member States for area-based indicators in the annual performance reporting.

To compute the AER for unit amounts with holding-level eligibility conditions, two cases must be distinguished:

- 1) When compliance with all of the eligibility conditions for a claimed unit amount would make only the primary parcel eligible for payment, then the procedure described in Section 9.1 shall be followed using as eligible area that of the primary parcel of the holding (provided that the inspection of the sample of at least 50% of parcels in the holding found that all of the holding-level eligibility conditions were complied with). However, if at least one of the holding-level eligibility conditions was not complied with then the eligible area of the primary parcel shall be set equal to zero when using the procedure described in Section 9.1. This applies also when the holding-level eligibility condition was failed due to parcels other than the primary parcel.
- 2) When compliance with all of the eligibility conditions for a claimed unit amount would make all of the (relevant) parcels in the holding eligible for payment, then the whole area declared at the holding-level becomes the basic area element to be considered for the quality assessment. Hence, the positive area error ΔE_h (together with the area error due to eligibility conditions which are of a type that always affect the entirety of the claimed area when not complied with), will have to be evaluated at the holding level.

Specifically, ΔE_h shall be calculated using the approaches outlined in Section 10.4.2. For the case where sufficient (useable) ortho-rectified VHR imagery is available Eq. (27) shall be used, while for the case where VHR imagery is not sufficient to cover all parcels in the holding quotas then Eq. (33) shall be used to compute ΔE_h .

Subsequently, the total area error of all the holdings in the quality assessment sample can be derived as:

$$a_{er,s} = \sum_{h=0}^{n-1} [1_{el}(h)\Delta E_h + (1 - 1_{el}(h))A_{d,h}], \quad (34)$$

where the summation is performed with respect to the number of holdings in the quality assessment sample (n). The indicator function, $1_{el}(h)$, determines if a holding is deemed fully ineligible or not. In other words, if at least one holding-level eligibility condition is failed that is of type 1 in Section 5.1.1, that is, the failure to comply will always impact the totality of the (relevant) area in the holding, then $1_{el}(h) = 0$. Eq. (34) thus is equivalent to Eq. (17) and allows one to compute the area error rate (AER) by analogy to Eq. (19) as:

$$AER = \frac{a_{er,s}}{\sum_{h=0}^{n-1} A_{d,h}}, \quad (35)$$

where $A_{d,h}$ is the area declared for the concerned unit amount by the h -th holding.

Once computed, the AER is used according to the methodology described in Section 9.

11 Quality assessment results and reporting

On 15 February 2024, Member States shall transmit to the European Commission the annual quality assessment reports of the LPIS, GSA and AMS (Articles 68(3), 69(6) and 70(2) of Regulation (EU) 2021/2116) for the claim year 2023.

The reports will document the work carried out under the quality assessments, detecting the deficiencies and providing diagnostic information on their potential root causes. The content of the reports should allow assessing the quality and reliability of the information generated by the integrated system in respect to the output and result indicators of area-based interventions included in the performance reports.

Member States will submit the reports through a web portal currently under development by the European Commission as an evolution of the former LPIS QA portal, adapted to the new requirements and technological advancements.

The reports will provide disaggregated data at parcel level for the three quality assessments, in particular, with respect to the results of the *in situ* visits and/or the analysis of images used as reliable and conclusive information, and quantify the deficiencies detected by the respective quality assessment. The disaggregated data reported will cover all information collected during the quality assessment at parcel level, not only that used for testing the need for remedial actions (e.g., measurements of false red, underestimated areas). In addition to the disaggregated tabular data, the reports will include a document based on a specific layout (i.e., a set of sections with defined content) with aggregated figures of the quality assessments and the result of the GSA IT testing. The document will also address the combination of the GSA and AMS quality assessment errors to quantify the total error in the number of hectares or share of areas reported in the APR. In case of deficiencies, Member State shall also indicate the remedial actions addressing those deficiencies. The raw data used for the analysis (e.g., geotagged pictures, satellite imagery and derived statistics) will not be submitted but should be kept by Member States and made available on request of the European Commission.

This section is currently under development and will be included in due time.

12 Timeline of actions in claim year 2023

The timeline of actions by the European Commission and Member States for the quality assessment exercise in claim year 2023, and of the actions for claim year 2024 to be carried out in 2023, is schematically illustrated in Figure 12.

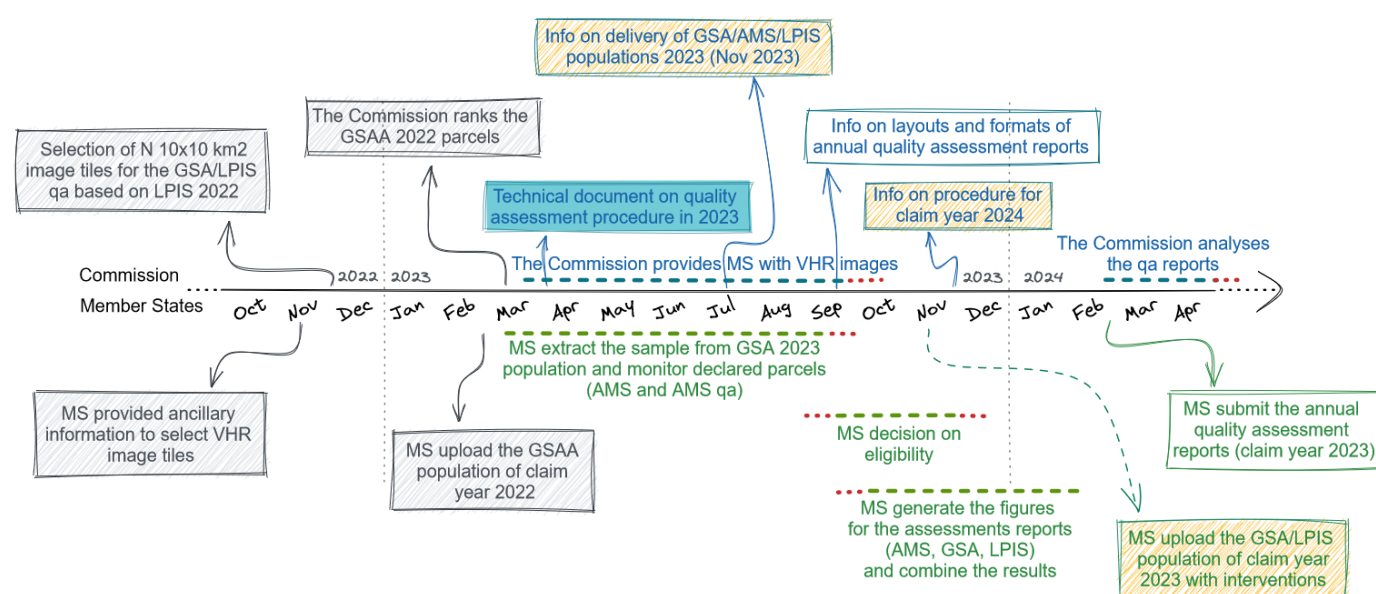


Figure 12: Timeline of expected European Commission and Member States actions.

The first steps have already been completed. In November 2022, Member States submitted the LPIS 2022 populations and other ancillary information (national imagery available in 2023, LPIS update plan, and an estimate of the spatial distribution of interventions). The European Commission used this information to select a set of VHR images to acquire, and their optimal temporal window, this latter based on the experience gained in the past LPIS Quality Assurance exercises. In February 2023, Member States submitted the GSAA 2022 (or GSA 2023, if available) elementary data (id of each parcel, coordinates of a point inside the parcel polygon, area). In March 2023, the European Commission shared with Member States the list with all parcels randomly ranked for the extraction of the samples to quality assess, prioritising parcels covered by VHR images. The .csv file with the ranked list were complemented by a shapefile with the areas of the VHR images.

At this stage (from March 2023), Member States are expected to start both the AMS and the AMS quality assessment on the selected parcels. Individual VHR images will be provided to Member States as soon as they are available.

In the third quarter of 2023, the European Commission will communicate to Member States the format and content of the annual quality assessment reports that shall be submitted by 15th February 2024 (for claim year 2023) through a dedicated web portal.

During 2023, some actions are also planned for the claim year 2024. At the beginning of the third quarter of 2023 the European Commission will provide the description of the data that Member States will deliver on 1st November 2023 (LPIS and GSA populations of claim year 2023 with interventions declared in each parcel) through a web portal.

References

European Commission, *Guidance document on the On-The-Spot Checks and Area Measurement according to Articles 24, 25, 26, 27, 30, 31, 33a, 34, 35, 36, 37, 38, 39, 40, 41 of Regulation (EU) 809/2014 as amended by Regulation (EU) 2015/2333 and Regulation (EU) 2018/7462, claim year 2018*. <https://circabc.europa.eu/sd/a/806c0dc7-3379-4a4f-9db6-3f55f520fe98/DS-CDP-2018-10%20TSC%20guidelines%202018-clean.pdf>

European Commission, Update of LPIS ETS guidelines, Brussels, 2023.

ISO 2859-2:2020, *Sampling procedures for inspection by attributes — Part 2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection*

List of abbreviations

Ac	Acceptance number
AMS	Area Monitoring System
ANCs	Areas of natural or other specific constraints
APR	Annual Performance Report
BISS	Basic Income Support for Sustainability
CIS	Coupled Income Support
CR	Consumer Risk
DAER	Delineation Area Error Rate
ElCo	Eligibility Condition
ETS	Executable Test Suite
EU	European Union
FAI	Full Area Impact
GSA	Geo-Spatial Application System (Current CAP, 2023-2027)
GSAA	Geo-Spatial Aid Application system (old CAP)
GSD	Ground Sampling Distance
IACS	Integrated Administration and Control System
JRC	Joint Research Centre
LPIS	Land Parcel Identification System
LQ	Limiting Quality
MS	Member States
NAI	No Area Impact
OAR	Overestimated area error rate
OEA	Overestimation area error
OTSC	On-The-Spot Checks
PAI	Partial Area Impact
qa	quality assessment
QA	Quality Assurance
QE	Quality Element
RP	Reference Parcel
SP	Strategic Plan
UA	Unit Amount
UAA	Utilised Agricultural Area
VHR	Very-High Resolution

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Figure 7: Schematics depicting what parcels in a holding to inspect in the context of the GSA (area) quality assessment (qa) inspection of a unit amount where the area relevant for reporting equals to the eligible area of all GSA-declared parcels for which the eligibility conditions were found to be met. The examples refer to a holding featuring 15 parcels overall. Left Panel: All parcels of the holding are part of the set of relevant parcels (deep orange coloured squares) and thus would be reported if the eligibility conditions are met. The same set of relevant parcels applies for all of the holding-level eligibility conditions (H-ElCo) defined for the concerned unit amount. As such, the same set of 8 parcels – assuming a parcel inspection rate (PIR) of 50% – will feature in the inspection quotas of the AMS quality assessment (light orange coloured squares) and GSA (area) quality assessment (blue coloured squares). Right Panel: The set of relevant parcels (dark orange coloured squares) as well as the set of parcels to inspect (light orange coloured squares) during the AMS quality assessment effort of Holding-Level eligibility condition 1 (H-ElCo-1) differ from those of Holding-Level eligibility condition 2 (H-ElCo-2). In this case, the eligible area of the union of the two sets of (8 and 7) relevant parcels would be reported if all eligibility conditions are met with. Similarly, the union of the two sets of 4 parcels in the AMS quality assessment quotas – assuming a parcel inspection rate of 50% – would form the quota of parcels to inspect during the GSA (area) quality assessment effort (blue coloured squares).40

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Figure 9: Estimation of non-eligible area including both ineligible areas and/or non-compliant areas within the GSA-declared area of an inspected parcel. Left Panel: Examples of delineations of ineligible and/or non-compliant areas observed at different times and/or by different means during the AMS and GSA quality assessment inspection efforts within a given GSA-declared parcel and for the unit amount under inspection. The complexity of the depicted situation is not likely to be the norm. It serves merely to explain the concepts behind the use of Equation (21). Right panel: Binary map of eligible (white) and non-eligible (black) areas within the GSA-declared parcel as a result of taking the union of the various ineligible and/or non-compliant area delineations depicted in the left panel. The fact that the union of the ineligible area delineated at times t_1 and t_4 was taken implies that the difference in the extent/shape of the ineligible areas between times t_1 and t_4 is due to real changes rather than the precision/accuracy of the measurement methods/tools.45

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quality assessment inspection efforts of a given parcel and unit amount. The complexity of the depicted situation is not likely to be the norm. Right panel: Map of the resulting non-compliant (black) areas within that GSA-declared parcel as a result of taking the union of the various non-compliant areas depicted in the left panel. It is assumed here that there were no PAI area errors detected via the GSA quality assessment.47

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Annexes

Annex 1. Example of AMS quality assessment inspection workflow

This annex provides an example of the AMS quality assessment inspection workflow. In particular, Figure 13 displays an example of flowchart to detect incorrect decisions at eligibility condition level for the parcels that undergo the AMS quality assessment inspection process for a specific unit amount. Within Figure 13 reference is made to three separate panels outlining the workflows for i) monitored eligibility conditions where the stable AMS result is red (i.e., Panel B that is displayed in Figure 14), ii) monitored eligibility conditions where the stable AMS result is not red (i.e., Panel C that is displayed in Figure 15) and iii) non-monitored eligibility conditions (i.e., Panel D that is displayed in Figure 16). Figure 13 also contains two anchor points (i.e., step 1 and step 2) to which Panels B, C and D point.

The flowchart examples focus on a single unit amount and assume that:

- GSA amendments do not change the unit amount concerned.
- Member States do not communicate *false red* AMS results prior to the deadline for GSA amendments.
- Member States wishing to communicate incorrect decisions for monitorable eligibility conditions, do so on a single date, defined in the flowchart as “deadline for communicating AMS quality assessment errors to beneficiaries in time for GSA amendment”.
- Member States have decided upfront that all *yellow* AMS results will be accepted as being compliant.

Within the context of the above assumptions, the flowchart examples indicate how and when incorrect decisions are triggered, and when the skipping of parcels and/or unit amounts is required, as well as the various types of AMS quality assessment inspection outcomes that can be found when assessing individual eligibility conditions. These outcomes are relevant for the quality assessment reports (see Section 11) and are summarised in the [last](#) column of Table 11. Given that the implementation choices in Member States may differ from those underlying the various flowcharts shown in this Annex, it is clear that the palette of possible AMS quality assessment inspection outcomes may have to be extended/adapted so as to reflect the actual decision-making process in the Member States.

Table 11: Overview of AMS quality assessment inspection outcomes (last column) as depicted in the flowchart examples in this Annex.

Does declaration differ from reality for the EICo?	What AMS colour status has the EICo?	Is the Elco relevant for the APR?	AMS quality assessment inspection outcome
yes	red	yes	true red with APR area relevance
		no	true red with no APR area relevance
	green	yes	false green with APR area relevance
		no	false green with no APR area relevance
	yellow	yes	false* yellow with APR area relevance
		no	false* yellow with no APR area relevance
	none (non-monitored)	yes	false non-monitored EICo with APR area relevance
		no	false non-monitored EICo with no APR area relevance
no	red	yes	false red with APR area relevance
		no	false red with no APR area relevance
	green	yes	true green with APR area relevance
		no	true green with no APR area relevance
	yellow	yes	true* yellow with APR area relevance
		no	true* yellow with no APR area relevance
	none (non-monitored)	yes	true non-monitored EICo with APR area relevance
		no	true non-monitored EICo with no APR area relevance

* the false/true status with respect to reality arises here because Member States, in this example, have decided upfront that all yellow AMS results will be accepted as being compliant

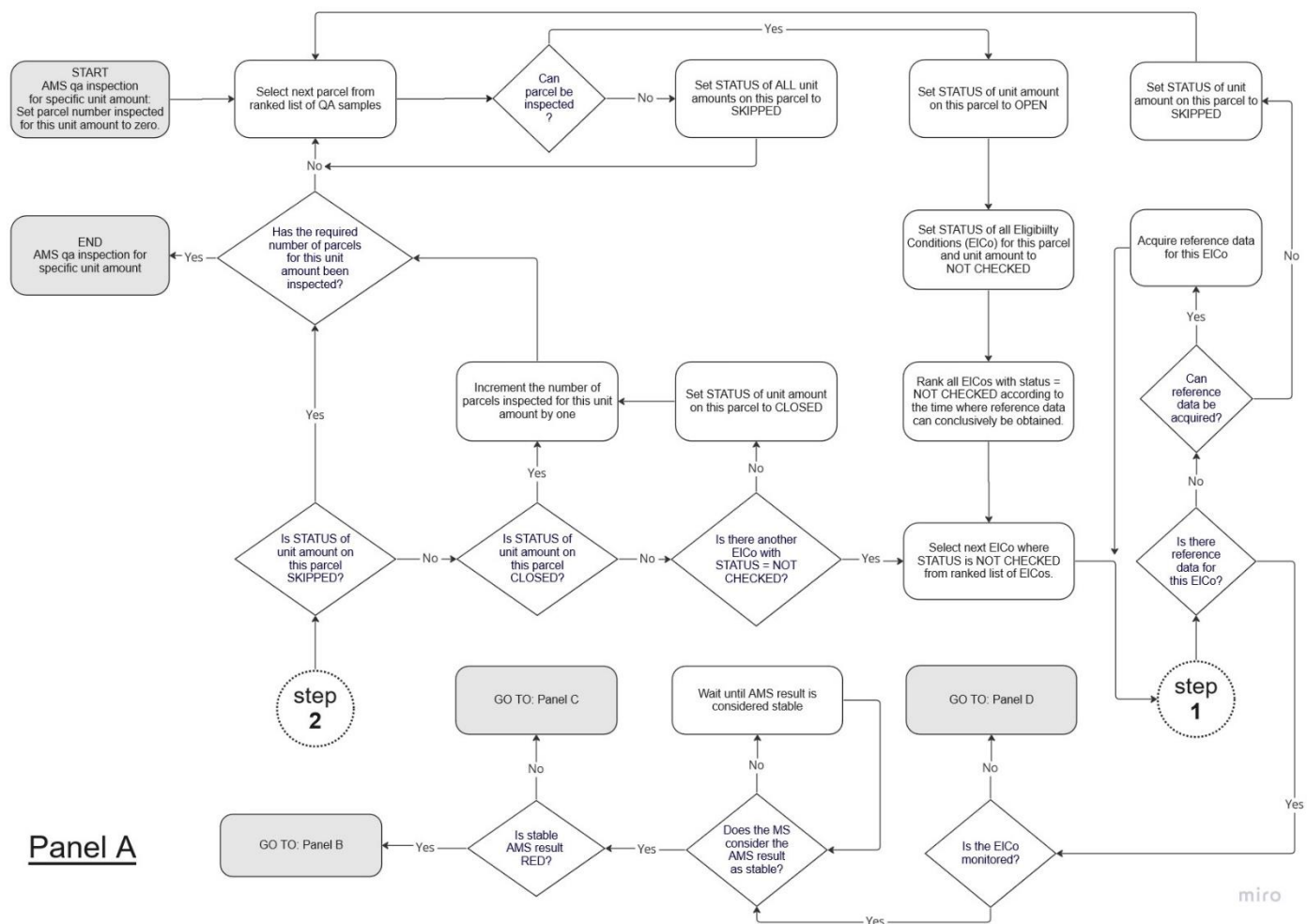


Figure 13: Example of a flowchart (Panel A) to detect incorrect decisions for parcels selected for a specific unit amount. Reference is made to Panel B (see Figure 14) for AMS results that are *red*, to Panel C (see Figure 15) for AMS results that are not *red*, and to Panel D (see Figure 16) for non-monitored eligibility conditions. Step 1 and Step 2 are anchor points to return to from Panels B, C and D.

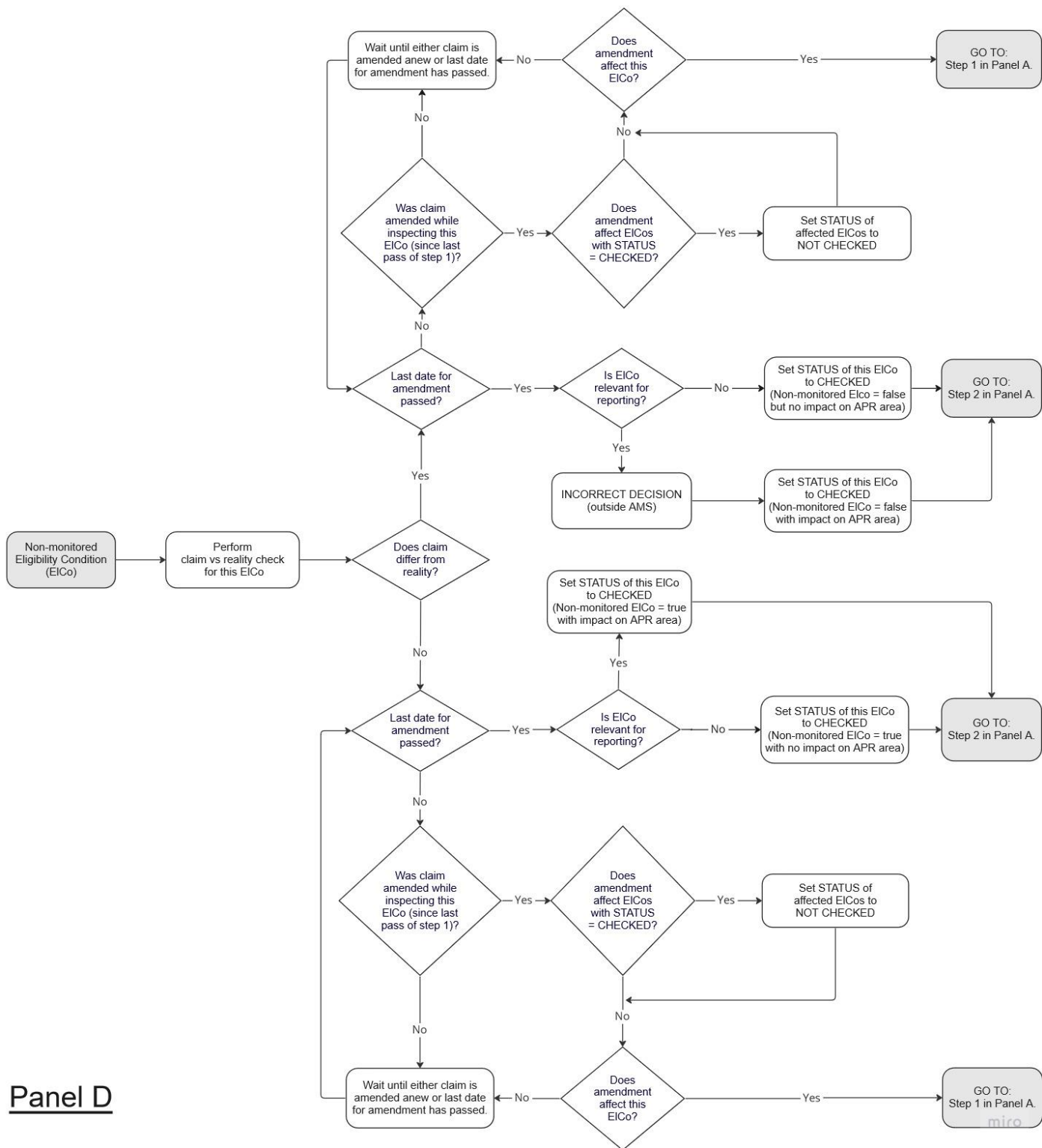


Figure 16: Example of a flowchart (Panel D) for scenarios encountered when the eligibility condition is non-monitored. Panel D is entered via Panel A (see Figure 13) and also returns to the anchor points (Step 1, Step 2).

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