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(Land Use / Cover Area Frame Survey)

Technical reference document

C4 - Quality Control Procedures

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DOCUMENT CHANGE RECORD			
ISSUE	DATE	CHANGE AUTHORITY	REASON FOR CHANGE AND AFFECTED ECTIONS
V0.1	2014.05.08	Eurostat E4/LUCAS	
V1.0	2015.02.27	Eurostat E4/LUCAS	Clarifications and changes after Project Managers training
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1 Scope

This document is part of a series of reference documents defining the framework of the Land Use / Cover Area frame statistical Survey (LUCAS). The LUCAS reference documents are continuously improved and adapted taking into account the lessons learnt from the implemented surveys and the requirements of the LUCAS data and users.

This document addresses one of the most important topics within LUCAS: data quality control. Below detailed information and descriptions are given on which data and the way how data will be controlled, and by whom.

2 Quality control: actors and roles

2.1 Role of the surveyor (SU)

The surveyor (survey contractor) his task is to carry out the field survey according to the LUCAS instructions. He fills in the field form and keeps it until the end of the survey respectively until handing it over to the regional/central office.

The surveyor has to:

- enter the data in the Data Management Tool (DMT),
- control the data,
- validate the data.

The surveyor controls all data for completeness, correctness and consistency during data collection at the point and during data entry, including GPS points and tracks, topsoil samples and the anonymization of the photos. The built-in controls of the DMT support the surveyor in this task. Any problem or inconsistency identified during data entry or data export needs to be verified with the original field form and other means at hand and corrected immediately.

If requested by the regional/central office, the surveyor corrects or completes the data. If necessary, the surveyor has to go back to the field and to survey the point again.

2.2 Role of the regional / central offices (RO/CO)

The regional/central office (survey contractor) receives the data from the surveyor, including photos, GPS points and tracks. The RO/CO receives the data via the DMT and initiates the quality control. Since there are many quality checks integrated in the DMT, data should be formally correct and complete when received from the surveyor. This means that RO/CO shall concentrate on the trueness or accuracy of the data content (e.g. LC corresponds to the reality shown on the crop photo etc.).

By use of the LUCAS DMT and of any additional suitable software, additional available data and GIS tools, the contractor is requested to apply a systematic internal quality check of **all** surveyed points and to correct them as necessary. This check should be done in the regional and/or central office(s). The following aspects of the data need to be checked and properly reported by the quality controllers of the regional and/or central offices, and sent to the surveyor for correction in case of need:

- Identification of the exact location and correct application of observation rules
- Logical consistency of the data (including change analysis)
- Land cover, land use and agro-environmental data on basis of the photos taken by the surveyors
- Inaccessibility of the points in case of the photo-interpretation in the field.
- Itinerary of the surveyors (using the GPS tracks)
- Photo quality
- Photo anonymization
- Place of collection of topsoil samples.

If any error is identified, RO/CO corrects the data directly if possible or returns the data to the surveyor requesting correction and/or clarification. The RO/CO shall give advice and guidance to the surveyors on how to avoid the type of identified errors in the future.

In case an error cannot be corrected, it is mandatory to add a remark clarifying the circumstances. If such remarks are missing, data will not pass the quality control carried out the external quality controller.

2.3 Role of the external quality controller (XQC)

2.3.1 External quality control

The external quality control done by the external quality control contractor (XQC) will have a similar role to play as the RO/CO: it anticipates formal correctness of data and assumes that data already went through RO/CO quality control. Almost identical cross checks as those specified for the RO/CO are done to assess correctness and completeness of the data. For new modules and elements of the LUCAS survey the goal of the quality control is to assess the plausibility of the data.

Check photo-interpreted points up to a maximum of 10,000
Points of the in-situ survey that where photointerpreted in the field (observation type 3) will be checked by the XQC contractorup to a maximum of 10,000 points. On this set of points, the contractor will do a full quality control, focusing especially on the reasons why the point has not been reached in the field. If the reasons don't comply with the instructions and rules, these points will be refused and sent back to the survey contractors for correction or re-visit. The survey contractor shall provide correction or further justification within 15 days. XQC contractor re-checks these points for approval or rejection. In case of a second rejection, the point will be classified as “rejected twice”.

Check 66,660 points that have been visited in the field
During the first weeks of the XQC contractor has to perform full quality checks on all points visited on the field by all the surveyors. This applies to points that were visited on the field (observation type 1 or 2) and that have passed DMT in-built checks and were validated by the CO. 20% of points coming from each surveyor will be checked. The remaining points will be selected by the Commission. The XQC contractor will perform the full quality checks as soon as those points are released by the Commission.

If any error in the submitted LUCAS data is detected by XQC, data are sent back once to the RO/CO for correction. The XQC accepts only one re-submission of data. If the XQC control still detects errors the point is classified as rejected twice. The point is send to the survey contractor only for comments, not corrections. After that the data is forwarded to the Commission (via the DMT) with a status indicating that the data contains errors.

Check on 25000 points from the Photointerpretation Campaign

The number of points that where photointerpreted in the office (observation type 7) and that have passed DMT in-built checks and were validated by the RO/CO, will be checked by the XQC contractor. On this set of points, the contractor will do a full quality control. If any error is detected by XQC, data are sent back once to the RO/CO for correction. The XQC accepts only one re-submission of data. If the XQC control still detects errors the point is classified as rejected twice. In this case, the point is send to the survey contractor only for comments, not corrections. After that the data is forwarded to the Commission (via the DMT) with a status indicating that the data contains errors.

2.3.2 Photo control

Photos will be checked by the contractor to assess whether:

- all mandatory pictures have been taken (e.g. landscape, point, crop/coverage, irrigation, soil – if any)
- the quality of photos is good
- the photo size is within the requested range and the proportions are correct
- the photo is taken in landscape mode
- whether any anonymization is necessary

Under the framework of LUCAS, anonymization is a procedure where individual recognizable elements (persons and/or vehicle identification plates) are identified and blurred in such a way that they are no longer recognizable. Photos containing any recognizable elements are not accepted. The survey contractors take strictly the responsibility that such recognizable elements are blurred before transmission to the Commission. As breaking this is considered a serious breach of the contract, the XQC contractor has to inform the Commission immediately when such a case is identified. If one of these features are found on the photos, the point is rejected and sent back to the survey contractor for blurring. In case one (or more) non anonymized picture is identified, the survey contractor will be requested to perform a complete verification of all photos for the relevant country and to correct as necessary.

Additional checks for picture anonymization

In addition to the checks that have to be performed to the pictures belonging to the points included in the quality control sample, an additional check of 20.000 points and landscape photos selected by the Commission will be performed by the XQC contractor, since all eventual personal information on the photos needs to be blurred before transmission to Commission. The survey contractor is responsible for anonymizing all images. The XQC contractor will check the above mentioned images to verify if all features (faces and vehicle identification plates) are properly anonymized. In case at least one non anonymized picture is identified, the survey contractor will be requested to perform a complete verification of all photos for the relevant country and correct as necessary. Non-compliance with the anonymization of all pictures is considered a breach of contract.

2.3.3 Control of GPS tracks

The contractor will use the GPS tracks, recorded by the surveyor when he/she was in the field, to overlay with relevant map products to control the following issues and to comparewith the ground documents:

- completeness of tracks (track from each working day available)

- compliance with declarations of surveyors
- compliance with general remarks

2.3.4 Control of panel points

Panel points are points that have been visited in two different LUCAS campaigns. Checks can be divided in 3 groups: checks on points with plausible changes, checks on points with unplausible changes and checks on points where no changes were identified. For example, a point where no change has occurred in the terrain should not be classified in a way that a change in land cover or land use is identified. Likewise a point where a change has occurred should be adequately classified in both campaigns.

2.3.5 Follow-up missions

In addition to the data control, experienced experts in land cover / use information & statistics will visit the survey contractors to supervise and assess the sound application of quality assurance measures. These so-called “follow-up missions” of 3-days per country will be organised in the early stage of the survey implementation to enable the detection of possible systematic errors due to misunderstanding of instructions or any other reason whatsoever. The expert will check the “office” phase as well as the survey implementation in the field. During the office phase of the mission, the set-up and the organisation of the survey at the central (or a regional) office of the relevant country will be subject of the assessment. A specified checklist will be executed. The in-situ survey implementation will be assessed based on a field trip accompanying a surveyor on a sample of points selected. The survey contractor is requested to provide any assistance the expert might need to carry out his task, including putting relevant documentation at disposal of the expert timely in advance of the visit. The report of the expert serves the Commission as input to their quality assessment of the survey implementation. In case deemed necessary, the Commission will request the survey contractor to assist to a second ad-hoc visit of the expert of the duration of one day.

2.4 Role of the Commission

Eurostat, on behalf of the Commission, supervises the whole quality control process and intervenes if systematic errors are detected at any step.

Eurostat also makes random checks to the data received from the XQC.

3 Controls prior to the start of the survey

3.1 Ground documents

3.1.1 Preparation of ground documents

While preparing the ground documents, special care has to be taken in coordinate conversions and the application of national projections to the images.

The panel approach of LUCAS, in which a large number of points are visited in different campaigns to assess changes in land cover and land use, depends heavily on the fact that the surveyor correctly identifies the location of a point on the orthorectified imagery. Any shifts that may occur in the apparent location of the point on the images from one campaign to the next will heavily impact the quality of the final results.

It is advisible to define a minimum scale for the orthophoto overview of 1:5000 with an area size coverage of at least 49 ha (700 m x 700 m).

3.1.2 Checking for shifts in ground documents

Role	Check
QC RO/CO	Compare a sample of ground documents of points that have been visited in previous campaigns with the documents prepared for the current campaign, so that an assessment of any existing shift can be made and possible corrective measures are taken before the final ground documents are printed. Selected points shall be very distant from each other in cardinal directions to detect changes due to projection conversion of the points; The Commission's approval of the ground document is dependent on the result of this assessment.

4 Data control procedures

Quality checks to be performed include, but are not restricted to, correctness of location, land cover and land use data and associated agro-environmental parameters, in the current year and in comparison with previous campaign data, existence of mandatory photos, evaluation of photo quality, cross check position with GPS tracks. Mistakes and problems found during this control will be duly reported in the appropriate fields of LUCAS DMT.

The quality control distinguishes between the control of information collected also in previous LUCAS surveys and the new modules and elements (extended grassland, landscape features and gully erosion). For the new modules and elements the controls are less strict and aim to assess the plausibility of the data, not the exactness.

See below more details on control procedures being applied. Please note that this is not an exhaustive list and other additional checks can and will be carried out.

4.1 Identification

4.1.1 Surveyor ID (field A)

To be defined by central offices. For each surveyor an individual ID should be assigned to enable tracing the surveyor and respective data.

4.1.2 Point_ID (field B)

Fixed through the sample design. Correctness is checked automatically by means of the GPS geographical coordinates and the “observation distance” entered by the surveyor.

4.1.3 Point Altittude (field C)

Pre-filled from LUCAS database.

4.1.4 Point is part of PI sample (field D)

Pre-filled. If "yes" skip the section on "Access to the point"

4.1.5 Point is ex-ante (field E)

Pre-filled. If "yes" skip the section on "Access to the point"

4.2 Access to point

4.2.1 Date (field 1)

Role	Check
QC SU	Check correctness
QC RO/CO	Cross check with creation date of photo file if questionable
QC XQC	Cross check with creation date of photo file if questionable

4.2.2 Start time and End time (fields 8, 9)

Role	Check
QC SU	Check if the survey time is within the average range: 15 min – 1h15. Give reasons for a shorter or greater time in the remarks (Field 14). Points where some soil sample and/or grassland or other modules takes place will usually need a longer survey time. This is expected and does not need to be added to the remarks. However if other causes determine a longer survey time a remark needs to be

	added (Field 14). Expected time for different parts of the survey are as follows: - 15 minutes for the basic assessment on land cover and land use, including the related environmental parameters and photos - 6 min for Copernicus - 30 - 60 min for the soil sample, depending on the types of sample to be taken - 15 min for the grassland survey - 2 – 5 min for extended grassland - 10 min for the Landscape Features (office PI + field survey)
QC RO/CO	Duration of survey/point < 15min or >1h15 min: check remarks and field documents and have a close look to the data.
QC XQC	Duration of survey/point < 15min or >1h15 min: check remarks and field documents and have a close look to the data. Add surveyor to the watch list in case of problems.

4.2.3 Car park latitude/longitude (fields 11-13)

Role	Check
QC SU	Check whether lat/long is given in decimal degrees, with six decimals.
QC RO/CO	Check whether lat/long is given in decimal degrees, with six decimals. Check with GPS tracks/way points on orthophotos. Add comments if needed.
QC XQC	Check whether lat/long is given in decimal degrees, with six decimals. Check with GPS tracks/way points on orthophotos. Add comments if needed.

4.2.4 GPS coordinate system (field 14), GPS precision (field 15), GPS elevation (field 16), Latitude/Longitude (fields 17, 18, 19), Distance to the point (fields 20-21)

Role	Check
QC SU	Check whether lat/long is given in decimal degrees, with six decimals. Check together with point ID and precision (field 8) if distance to the point, lat/ long, W/E are correct. Add comment if needed
QC RO/CO	Check whether lat/long is given in decimal degrees, with six decimals.

	Check whether observation position/location is reasonable in the given context: cross-check with distance to the point (field 13), precision (field 8), as well as with the field documents and orthophotos. Check with GPS tracks/waypoints and orthophotos. Check with previous LUCAS survey data. Check and add any comment if needed.
QC XQC	Check whether lat/long is given in decimal degrees, with six decimals. Checks whether observation position/location is reasonable in the given context, together with distance to the point (field 14), precision (field 13) as well as with the field documents and orthophotos. In case, check if photointerpretation is justified. Check with GPS tracks/waypoints and orthophotos. Check with previous LUCAS survey data. Check and add comments if needed.

4.3 Comments

4.3.1 Way to the point (field F)

Pre-filled field, with information relative to the description of the way to the point in a past campaign.

4.3.2 Description of the way to the point (field 500)

Role	Check
QC SU	Check that the comments are reasonable. Preference should be given to the use of standardised comments. If free text is used, English is mandatory. Special characters should be avoided. SU shall make sure that the comments are clearly understandable.
QC RO/CO	Check if free text can be transformed in standardised comments and do so.
QC XQC	Check whether comments are reasonable. Add comments if needed.

4.4 Point observation

4.4.1 Type of observation (field 24)

Role	Check
QC SU	If Type of observation is 2, 3 or 4, add a comment and provide photo If type of observation is 1 add a comment if the distance from point is >50m Take the point and landscape photos. Add comment if there is a problem with marker
QC RO/CO	If type of observation is 3, check if photointerpretation is justified. Check if needed photos and comments exist and are justified Add any comment if needed.
QC XQC	If type of observation is 3, check if photointerpretation is justified. Check if needed photos and comments exist and are justified. Add any comment if needed.

4.4.2 Direction of observation (Field 25), Homogeneous plot extended window, reason for changing direction

Role	Check
QC SU	Check adequacy against the ground document. Check with the landscape photos. Add remark and photo if needed.
QC RO/CO	Check with the landscape photos, ground document and remarks.
QC XQC	Check with the landscape photos, ground document and remarks.

4.4.3 Remarks about point observation (field 500)

Role	Check
QC SU	Check that the comments are reasonable. Preference should be given to the use of standardised comments. If free text is used, English is mandatory. Special

	characters should be avoided. SU shall make sure that the comments are clearly understandable.
QC RO/CO	Check if free text can be transformed in standardised comments and do so.
QC XQC	Check whether comments are reasonable. Add comments if needed.

4.5 Photointerpretation

4.5.1 Orthophoto conditions, Additional sources used, LC/LU assessment by using additional sources, only assessment on lower detail level possible (fields XX – XX*)

Role	Check
QC SU	Check if observation type is 3 or 7, evaluate orthophoto quality
QC RO/CO	Check orthophoto quality, in case of use of an additional source also check the source
QC XQC	Check orthophoto quality, in case of use of an additional source also check the source

*X = field number

4.6 Land cover and land use

4.6.1 LC1 (field X), LC2 (field X), plant species (fields XX), LU1 (field X), LU2 (field X), land use type (fields XX)

Role	Check
QC SU	Check LC1 and LC2 combination for consistency. Check LU and LC combination for consistency. Check if crop species and land use types are used when needed. Cross-check with LC/LU from the previous survey (if available) for consistency. Add a remark if necessary (e.g. different decision, real change).
QC RO/CO	Check all LC and LU against photos and ground document for accuracy. Check combinations of LC1xLC2 and LCxLU for consistency. Check consistency with previous data (if available), and justification if different decision or change exist. Add a remark if necessary.

QC XQC	Check all LC and LU against photos and ground document for accuracy. Check combinations of LC1xLC2 and LCxLU for consistency. Check consistency with previous data (if available), and justification if different decision or change exist. Add a remark if necessary.

4.6.2 Percentage of land coverage LC1, LC2, LU1 and LU2 (fields XX)

Role	Check
QC SU	Check with the ground documents, landscape photos and crop/cover photo.
QC RO/CO	Check with the ground documents, landscape photos and crop/cover photo.
QC XQC	Check with the ground documents, landscape photos and crop/cover photo.

4.6.3 Parcel area (field X)

Role	Check
QC SU	Check adequacy against the ground document. Check with the landscape photos. Add remark, if orthophoto differs from reality (e.g. outdated).
QC RO/CO	Check with the landscape photos, ground document and remarks.
QC XQC	Check with the landscape photos, ground document and remarks.

4.7 INSPIRE

4.7.1 INSPIRE pure land cover components (PLCC) (fields XX)

Role	Check
QC SU	Check if filled. Check if LC1, LC2 and respective percent land cover are compatible with the values entered.
QC RO	Check if filled. Check if LC1 and percent land cover are compatible with the values entered. Add remark if needed.
QC XQC	Check if filled. Check if LC1 and percent land cover are compatible with the values entered.

	Add remark if needed.

4.7.2 Point is in urban area (field X), unvegetated (field X)

Role	Check
QC SU	Check against the photos and ground document. If needed add additional photo(s). Add remark, if orthophoto differs from reality.
QC RO/CO	Check against ground document and photos. Check if remark exists, if orthophoto differs from reality. Add remark if needed
QC XQC	Check against ground document and photos. Check if remark exists, if orthophoto differs from reality. Add remark if needed.

4.8 FAO parameters

4.8.1 Height of trees at the moment of survey (field X)

Role	Check
QC SU	Check that it is filled in case needed (LC=CXX or D10 or E10 and for all points with crops in B70 or B80) Check against the photos and ground document.
QC RO/CO	Check that it is filled in case needed (LC=CXX or D10 or E10 and for all points with crops in B70 or B80) Check against the photos and ground document.
QC XQC	Check that it is filled in case needed (LC=CXX or D10 or E10 and for all points with crops in B70 or B80) Check against the photos and ground document.

4.8.2 Height of trees at maturity (field X)

Role	Check
QC SU	Check that it is filled in case needed (LC=CXX or D10 or E10 and for all points with crops in B70 or B80) Check against the photos and ground document.
QC RO/CO	Check that it is filled in case needed (LC=CXX or D10 or E10 and for all points with crops in B70 or B80) Check against the photos and orthophotos.
QC XQC	Check that it is filled in case needed (LC=CXX or D10 or E10 and for all points with crops in B70 or B80) Check against the photos and orthophotos.

4.8.3 Width of feature (field x)

Role	Check
QC SU	Check that it is filled in case needed (LC=CXX or D10 or E10 and for all points with crops in B70 or B80) Check against the ground document. Add remark if needed and if orthophoto differs from reality.
QC RO/CO	Check that it is filled in case needed (LC=CXX or D10 or E10 and for all points with crops in B70 or B80) Check against ground document, photos and remarks. Check if remark exists, if orthophoto differs from reality. Add remark if needed
QC XQC	Check that it is filled in case needed (LC=CXX or D10 or E10 and for all points with crops in B70 or B80) Check against ground document, photos and remarks. Check if remark exists, if orthophoto differs from reality. Add remark if needed.

4.9 Land management

4.9.1 Information on Stone walls (field x), hedgerows (field x), grass margins (field x), combine grass margin and hedgerow (field x), standing vegetation (fields x), crop residues (field x)

Role	Check
QC SU	Check that it the fields are filled in case needed (LC = BXX, CXX, DXX, EXX, FXX, HXX) Check against the photos and ground document. If needed add additional photo(s). Add remark if needed.
QC RO/CO	Check that it is filled in case needed (LC = BXX, CXX, DXX, EXX, FXX, HXX) Check against ground document and photos. Check if remark exists, in case orthophoto differs from reality. Add remark if needed.
QC XQC	Check that it is filled in case needed (LC = BXX, CXX, DXX, EXX, FXX, HXX) Check against ground document and photos. Check if remark exists, in case orthophoto differs from reality. Add remark if needed.

4.10 Special remarks

4.10.1 Signs of Grazing (field X), Special status (field X), special remarks (field X)

Role	Check
QC SU	Check if LC is in BXX, CXX, DXX, EXX, FXX, HXX. Check with crop/cover photo and landscape photos. If needed add also additional photo.
QC RO	Check if LC is in BXX, CXX, DXX, EXX, FXX, HXX. Check with crop/cover photo and landscape photos. Also with additional photos if existing.
QC XQC	Check if LC is in BXX, CXX, DXX, EXX, FXX, HXX. Check with crop/cover photo and landscape photos. Also with additional photos if existing.

4.11Gully Erosion

Plausibility check needed at XQC level.

4.11.1 Assess erosion on point

Erosion is assessed in all fields points.

4.11.2 Presence and type of gully erosion (fields XX and XX)

Role	Check
QC SU	Check against the photos and ground document. If needed add additional photo(s). Add remark if needed.
QC RO	Check against ground document and photos. Check if remark exists, if orthophoto differs from reality. Add remark if needed.
QC XQC	Check against ground document and photos. Check if remark exists, if orthophoto differs from reality. Add remark if needed.

If "Yes" all the section on gully erosion is to be filled. If "No" the remaining section on erosion can be skipped.

4.11.3 Signs of gully erosion (fields XX), details of the largest gully (fields XX)

Role	Check
QC SU	Check against the photos and ground document. If needed add photo(s) (if there are sign of erosion and/or orthophoto differs from reality).
QC RO	Check against ground document and photos. Add remark if needed.
QC XQC	Check against ground document and photos.

	Add remark if needed.

4.12Water management

4.12.1 Presence of water management (field X)

Role	Check
QC SU	Checked if filled when needed (LU=U111 or U112) Check that the irrigation photo has been taken, if needed.
QC RO	If relevant, check whether irrigation photo taken and water management is visible on the photo. Check if the code coincides with feature on the photo.
QC XQC	Ifrelevant, check whether irrigation photo taken and water management is visible on the photo. Check if the code coincides with the feature on photo.

4.12.2 Type of irrigation (field X), source (field X) delivery system (field X) and signs of use of reclaimed water (field X)

Role	Check
QC SU	If applicable, check that the irrigation photo has been taken. If relevant add additional photo.
QC RO	Check photos if relevant.
QC XQC	Check photos if relevant.

4.13 Copernicus

4.13.1 Point is part of Copernicus module

Pre-filled. If "No"skip section on COPERNICUS

4.13.2 Extension of LC in 4 cardinal directions (in m)

Role	Check
QC SU	Check if correctly filled in. Take Copernicus photo of the point, if needed add additional photo(s). Add remark, if orthophoto differs from reality and/or other remark if necessary.
QC RO/CO	Check against ground document and photos.

	If remarks exist check if there are justifiable, in case orthophoto differs from reality. Add remark if needed.
QC XQC	Check against ground document and photos. If remarks exist check if there are justifiable, in case orthophoto differs from reality. Add remark if needed.

4.14 Trees with secondary crops, meadow or pasture

4.14.1 Trees with secondary crops, meadow or pasture (field x)

Role	Check
QC SU	Check if filled for points with trees (permanent crops included). Check if compatible with LC1, LC2 and respective percent land cover values entered.
QC RO	Check if filled for points with trees (permanent crops included). Check if compatible with LC1, LC2 and respective percent land cover values entered. Add remark if needed.
QC XQC	Check if filled for points with trees (permanent crops included). Check if compatible with LC1, LC2 and respective percent land cover values entered. Check plausbility Add remark if needed.

4.14.2 Trees with secondary crops or grazing (structured comments/other (field 500)

Role	Check
QC SU	Check that the comments are reasonable. Preference should be given to the use of standardised comments. If free text is used, English is mandatory. Special characters should be avoided. SU shall make sure that the comments are clearly understandable.
QC RO/CO	Check if free text can be transformed in standardised comments and do so.

QC XQC	Check whether comments are reasonable. Add comments if needed.

4.15 Extended Grassland

4.15.1 Point is part of extended grassland module (Fields Letter and XX)

Pre-filled. If "No"skip section on extended grassland.

Role	Check
QC SU	Check if correctly filled in. Add remark, if extended grassland module cannot be done.
QC RO/CO	Check against ground document and photos. Check if remark exists and is justified. Add remark if needed.
QC XQC	Check against ground document and photos. Check if remark exists and is justified. Add remark if needed.

4.15.2 Grassland composition

QC (SU, RO/CO, XQC) Check completeness and plausibility.

4.15.3 Conditional Extended Grassland Parameters, (Vegetation Layers, Grassland type, Growth status, Grassland EUNIS Habitat Type)

To be done only if extended grassland point, “Can you do the extended grassland survey” is true AND if the point is NOT part of the grassland module.

QC (SU, RO/CO, XQC) Check completeness, plausibility and remarks when needed.

4.16 Grassland module

Skip grassland module if point is not part of grassland module.

Skip grassland module if Field 24 – Observation type is not 1.

Skip grassland module if grass cover < 30% Point is part of grassland module.

4.16.1 Grassland Site (enlarged transect), Grassland Fertilisation (enlarged type/field), Grassland Type (enlarged transect/field), Grassland Age (enlarged type/field)

Role	Check
QC SU	Check if all fields have been correctly completed. Add remark when needed.
QC RO	Check if all fields have been completed. Check and add remark if needed.
QC XQC	Check if all fields have been completed and are plausible Check and add remark if needed.

4.16.2 Grassland Transect (transect)

Role	Check
QC SU	Check against ground document and GPS. Check grass transect starting point, length, or if there is a possible shift. Check GPS coordinate system and GPS precision. Check whether lat/long is given in decimal degrees, with six decimals. Add remark if needed.
QC RO	Check that the grassland transect depicted is compatible with Ground document and/or GPS. Check GPS coordinate system and GPS precision. Check whether lat/long is given in decimal degrees, with six decimals. Check correcteness and remarks. Add remark if needed.
QC XQC	Check that the grassland transect depicted is compatible with Ground document and/or GPS. Check GPS coordinate system and GPS precision. Check whether lat/long is given in decimal degrees, with six decimals. Check correcteness and remarks. Add remark if needed.

4.16.3 Grassland Vegetation Layers, (Vigour of Vegetation, Grass-forb-ratio, Layer Components)

QC (SU, RO/CO, XQC) Check completeness, plausibility and remarks when needed.

4.16.4 Grassland Height, Grassland Flowers, Flower Colours, Grassland Key Species, Grassland Structural Characterisation, Grassland Legume Cover (Fields XX)

Role	Check
QC SU	Check that the fields are complete and correct. Check that photo(s) have been taken.
QC RO	Check all fields are complete, correct and coherent with the photos. Add remark if needed.
QC XQC	Check all fields are complete, plausible, correct and coherent with the photos. Add remark if needed.

4.17 Landscape Features

4.17.1 Point in Landscape Feature module (field x)

Pre-filled. If "No"skip section

4.17.2 Main Information to be collected for each point (fields xx), Additional information to be collected in field (fields xx)

Role	Check
QC SU	Check orthophoto/ground document. Check if 41 sub-points are correctly filled in. Confirm PI or edit changes Take photo and add remark, when it is necessary.
QC RO/CO	Check orthophoto/ground document. Check if sub-points were correctly filled in. In case of no assessment check if the relevant comments are justified. Check all other possible remarks and photos. Add remark if needed.
QC XQC	Check orthophoto/ground document. Check if sub-points were correctly filled in. In case of no assessment check if relevant comments are justified. Check all other possible remarks and photos. Add remark if needed.

4.18 Soil

4.18.1 Soil point (field K)

Pre-filled field, used to indicate whether a point is part of the soil sample and therefore has to be considered for collection of topsoil , bulk density, soil biodiversity).

If "Soil point" is "Yes" (field X), the section on “location of soil site”, “soil site”, "Standard soil sample" and the section on "land owner details" need to be filled in.

4.18.2 Bulk point (M, N, O)

Pre-filled. If "Yes" the section called "Soil bulk density" (fields XX) needs to be filled in.

4.18.3 BIO point (P)

Pre-filled. If "Yes" the section called "Soil biodiversity" (fields XX and relevant remarks) needs to be filled in.

If it is not possible to take any one of the above sub-modules a remark is needed

4.18.4 Location of Soil site (fields XX-XX)

Role	Check
QC SU	Check GPS coordinate system and GPS precision Check whether lat/long is given in decimal degrees, with six decimals. Add a remark if there are problems with the GPS signal
QC RO/CO	Check GPS coordinate system and GPS precision Check whether lat/long is given in decimal degrees, with six decimals. Check if comments exist Add any comment if needed.
QC XQC	Check GPS coordinate system and GPS precision Check whether lat/long is given in decimal degrees, with six decimals. Check if comments exist Add any comment if needed.

4.18.5 Soil site: percentage of stones

Role	Check
QC SU	Check if filled in appropriately. If relevant add additional photo.
QC RO	Check if value is coherent with photos.
QC XQC	Check if value is coherent with photos.

4.18.6 Soil biodiversity

Role	Check
QC SU	Cross-check label number on the form with the label number on the sample. If relevant add a remark and take photo. If sample not collected, or not collected according to standard procedure a remark is needed.
QC RO	Check if filled appropriately. Check that the label photo has been taken. Check if biodiversity expedition date according to rules. Check for remarks.
QC XQC	Check if filled appropriately. Check that the label photo has been taken. Check if biodiversity expedition date according to rules. Check for remarks.

4.18.7 Soil bulk density

Role	Check
QC SU	Cross-check label number on the form with the label number on the sample. If relevant add a remark and take photo. If sample not collected, or not collected according to standard procedure a remark is needed.
QC RO	Check if filled appropriately.

	Check that the label photo and the soil collection photo have been taken. Check for remarks.
QC XQC	Check if filled appropriately. Check that the label photo and the soil collection photo have been taken. Check for remarks.

4.18.8 Standard soil sample taken (field xx), soil label (field xx) and remarks on soil (field xx)

Role	Check
QC SU	Check if filled appropriately. Cross-check label number in the field form with the label on the sample. Check that the soil photos (bag and holes, label, additional photos in case of change in procedure, others as needed) have been taken. If relevant add additional photos. If sample not collected, or not collected according to standard procedure a remark is needed. If you have experience with problems in collecting soil samples a remark is also needed.
QC RO	Check soil sample photo and field form for label number. Check other photos (bag and holes, additional photos in case of change in procedure, others as needed) if relevant. Check for remarks.
QC XQC	Check soil sample photo and field form for label number. Check other photos (bag and holes, additional photos in case of change in procedure, others as needed) if relevant. Check for remarks.

4.18.9 Land owner details

Role	Check
QC SU	Check if filled appropriately.
QC RO	Check if filled appropriately.
QC XQC	Check if filled appropriately.

4.19 Photos

4.19.1 Photos (fields XX), additional photos (field X) and remarks on photos (field X)

Role	Check
QC SU	Check that all required photos are taken and of good quality. Rename the photos and take care that the photos are correctly assigned. Check whether photos need to be to be anonymised, and do so if necessary. Check the physical size of the photo and compress if necessary. Add remark if necessary.
QC RO/CO	Check completeness of photos, whether taken/not taken coincides with photos available. Check that the quality of the photos is good. Check whether photos have been correctly assigned to each category. Check whether not relevant fields are correctly ticked or whether photo should have been taken. Check whether photos are in correct format. Check the physical size of the photo and compress if necessary. Check whether photos have been multiplied/copied. It is not allowed to use the same photo in two different fields. Check whether photos that need to be anonymized have been checked and anonymized. Check for photos that were not anonymized, but should have been. Check for remarks and add if necessary.
QC XQC	Check completeness of photos, whether taken/not taken coincides with photos available. Check that the quality of the photos is good (focused, light conditions OK etc.). Check whether photos have been correctly assigned to each category (e.g. irrigation photo not marked as W landscape photo). Check whether not relevant fields are correctly ticked or if photo should have been taken. Check whether photos are in correct format. Check whether photos have been multiplied/copied. Check whether photos that need to be anonymized, have been checked and

	anonymized. Check for photos that were not anonymized, but should have been. Check for remarks and add if necessary.