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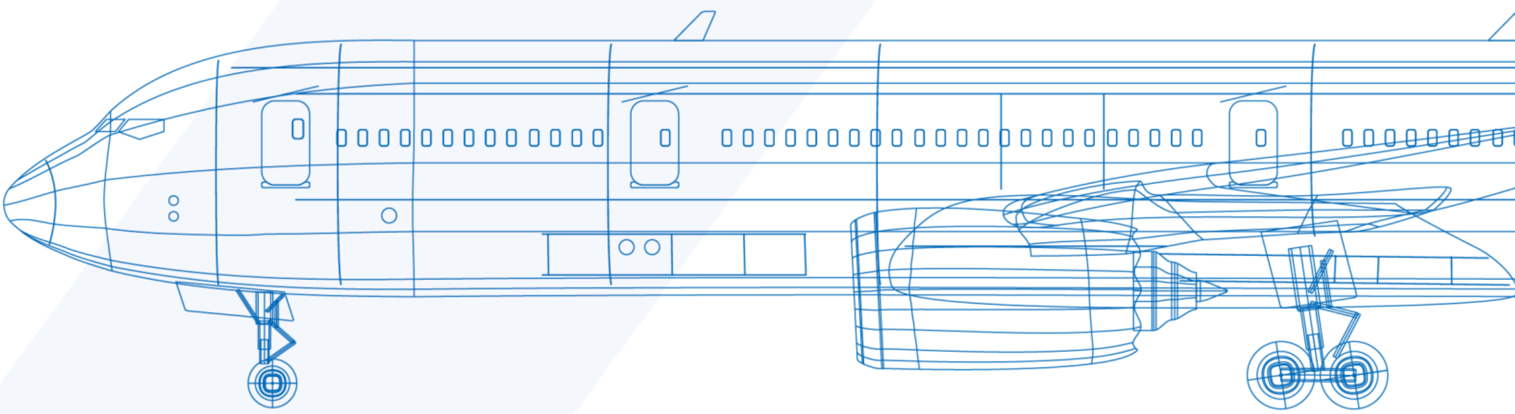
# ClassNK SCS

# APPENDIX 5

## Certification for CORSIA SAF

June 2024



# Revision History

| No. | Issue date | Details of revision |
|---|---|---|
| 0 | 2024.04.01 | Newly issued |
| 1 | 2024.06.06 | a) Clarification that Appendix 5. applies only to CORSIA SAF.<br>b) Addition of "5.2.1 Guideline: Criteria for the Unused Land approach". |

In case the requirements in ICAO-CORSIA documents are updated, and the ClassNK SCS manual has not been revised to reflect such updates yet, the updated requirements shall be applied during verification irrespective of the state of revision of the ClassNK SCS manual.

**APPENDIX 5. is applicable only for CORSIA SAF.**
**CORSIA LCAF is not applicable.**

# APPENDIX 5. Life Cycle Emissions Values

**Foreword**

An aeroplane operator that intends to claim for emissions reductions from the use of CORSIA SAF in a given year may use a Default Life Cycle emission value or an Actual Life Cycle Emission Value to compute these emission reductions.
To use an Actual Life Cycle Emissions value, an aeroplane operator will have to provide documentation to their State showing compliance with the methodologies defined in this document. An aeroplane operator will need to work with a CEF supplier to obtain this information.
An aeroplane operator may use an actual life cycle value as part of an accepted fuel sustainability certification process if a fuel producer(economic operator) can demonstrate lower life cycle emissions compared to the default life cycle values provided in the ICAO document entitled "CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels", or if a fuel producer has defined a new pathway that does not have a default life cycle value. If the aeroplane operator chooses to use an actual life cycle value, then the aeroplane operator will select an eligible Sustainability Certification Scheme from the ICAO document entitled "CORSIA Approved Sustainability Certification Schemes" to ensure the analysis is in accordance to the LCA methodology defined in this document. ClassNK SCS will ensure that the methodology is applied correctly and that relevant information on GHG emissions is transmitted through the chain of custody. ClassNK SCS will record detailed information about the calculation of actual values within their system and provide this information to ICAO on request. The functional unit for final $L_{CEF}$ results will be grams of CO2e per megajoule of fuel produced and combusted in an aircraft engine, in terms of lower heating value (gCO2e/MJ).

The Life Cycle Emissions value is calculated from the following equation:

$L_{CEF}$= core LCA value + ILUC - emission credits

# Contents

## 1. Default Life Cycle Emissions values

Should economic operators wish to use default Life Cycle Emissions values, then they should apply the relevant Life Cycle Emissions default value based on the associated feedstock, conversion process (pathway), ILUC region if applicable, and pathway specifications as specified in the ICAO document "CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels."
(Refer to the following Table 1 for example)

**Table 1. CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels produce with the Fischer-Tropsch Fuel Conversion Process**

| Region | Fuel Feedstock | Pathway Specifications | Core LCA Value | ILUC LCA Value | $L_{CEF}$ ($gCO_2e/MJ$) |
|---|---|---|---|---|---|
| Global | Agricultural residues | Residue removal does not necessitate additional nutrient replacement on the primary crop | 7.7 | 0.0 | 7.7 |
| | Forestry residues | | 8.3 | | 8.3 |
| | Municipal solid waste (MSW), 0% non-biogenic carbon (NBC)* | | 5.2 | | 5.2 |
| | Municipal solid waste (MSW) (NBC given as a percentage of the non-biogenic carbon content)* | | NBC*170.5 +5.2 | | NBC*170.5 + 5.2 |
| USA | Poplar (short-rotation woody crops) | | 12.2 | -5.2 | 7.0 |
| Global | Poplar (short-rotation woody crops) | | 12.2 | 8.6 | 20.8 |
| USA | Miscanthus (herbaceous energy crops) | | 10.4 | -32.9 | -22.5 |
| EU | Miscanthus (herbaceous energy crops) | | 10.4 | -22.0 | -11.6 |
| Global | Miscanthus (herbaceous energy crops) | | 10.4 | -12.6 | -2.2 |
| USA | Switchgrass (herbaceous energy crops) | | 10.4 | -3.8 | 6.6 |
| Global | Switchgrass (herbaceous energy crops) | | 10.4 | 5.3 | 15.7 |

## 2. Actual Life Cycle Emissions values

### 2.1 General Provision

Should economic operators wish to calculate GHG emissions using actual Life Cycle Emissions values, then they should accurately follow the ICAO document "CORSIA Methodology for Calculating Actual Life Cycle Emissions Values" when estimating the actual Life Cycle Emissions value in order to ensure that the calculation of the Life Cycle Emissions value is complete, accurate, and transparent.
When calculating actual Life Cycle Emissions values, the economic operators should use the most recent data available.
The final unit of the actual Life Cycle Emissions value should be expressed in gCO2e/MJ.

【Reference】EU-RED's method for the actual Life Cycle Emissions value calculation
EU-RED Ⅱ Directive(EU) 2018/2001 provides the following formula for calculating the actual Life Cycle Emissions value in Part C of Annex Ⅴ.

The actual Life Cycle Emissions value will be derived from the following formula:

$$E = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr}$$

where:
E = total emissions from the use of the fuel;
$e_{ec}$ = emissions from the extraction or cultivation of raw materials;
$e_l$ = annualized emissions from carbon stock changes caused by land-use change;
$e_p$ = emissions from processing;
$e_{td}$ = emissions from transport and distribution;
$e_u$ = emissions from the fuel in use;
$e_{sca}$ = emission savings from Soi Life Cycle Emissions in accumulation via improved agricultural management;
$e_{ccs}$ = emission savings from CO2 capture and geological storage; and
$e_{ccr}$ = emission savings from CO2 capture and replacement.

### 2.2 Actual core Life Cycle Emissions calculation – general provisions

The system boundary of the core Life Cycle Emissions value calculation will include the full supply chain of CEF production and use. As such, the core Life Cycle Emissions value will be obtained by summing up the emissions associated with the following life cycle stages of the CEF supply chain:

(1) production at source (e.g., feedstock cultivation);

(2) conditioning at source (e.g., feedstock harvesting, collection, and recovery);
(3) feedstock processing and extraction;
(4) feedstock transportation to processing and fuel production facilities;
(5) feedstock-to-fuel conversion processes;
(6) fuel transportation and distribution to the blend point;
(7) fuel transportation from the blending point to the aircraft uplift location; and
(8) fuel combustion in an aircraft engine.

For life cycle stages 1-7, carbon dioxide equivalent ($CO_2e$) emissions of $CH_4$, $N_2O$ and non-biogenic $CO_2$ from these activities will be calculated on the basis of a 100-year global warming potential (GWP). $CO_2e$ values for $CH_4$ and $N_2O$ will be based on the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (28 and 265, respectively).

For life cycle stage 7, the emissions associated to transportation downstream of the blender can be estimated by the economic operator (blender) according to the CORSIA Methodology for Calculating Actual Life Cycle Emissions Values, or be determined by the use of default values from the CORSIA Supporting Document "Life Cycle Assessment Methodology", both options being valid for the emissions accounting.

For life cycle stage 8 only non-biogenic $CO_2$ emissions from fuel combustion will be included in the calculation of $CO_2e$ emissions.

The core Life Cycle Emissions values will include upstream emissions associated with the material and utility inputs for operational activities, such as processing chemicals, electricity, and natural gas. Emissions generated during one-time construction or manufacturing activities (e.g., fuel production facility construction, equipment manufacturing) will not be included.

In many cases, the CEF supply chain of interest will result in the co-production of multiple commodities. Examples of co-products include non-CEF liquid fuels, chemicals, electricity, steam, hydrogen, and/or animal feed. Energy allocation will be used to assign emissions burdens to all co-products in proportion to their contribution to the total energy content (measured as lower heating value) of the products and co-products. $CO_2e$ emissions will not be allocated to waste, residues and by-products that result from the CEF supply chain of interest.

### 2.3 Actual core Life Cycle Emissions calculation – specific provisions for co-processed CORSIA SAF

For co-processing, a fuel producer will measure/estimate all inputs and outputs of the facility for scenarios both with and without co-processing operations. Refinery configuration changes will be limited to adding the co-processing facility to rule out other confounding values in emission changes. The inputs include crude oil, bio-feed, energy input by type (e.g., natural gas and electricity), and any materials. The outputs include fuel products and refinery emissions. Crude oil inputs are normalized (see Figure 11 of the CORSIA Supporting document "Life Cycle Emissions methodologies" for additional details on normalization). By subtracting the base (petroleum only) case from the co-processing case, the fuel producer calculates the changes in inputs and outputs. First, the changes in refinery emissions are allocated to the changes in fuel production (MJ). Since biogenic carbon emissions need to be carbon-neutral, carbon balance will be used to estimate biogenic carbon emissions from the refinery, which is then subtracted from the total refinery emissions. In order to calculate the upstream emissions associated with the changes in energy inputs, a Life Cycle Emissions tool (e.g., GREET) needs to be used. The upstream emissions of the energy inputs are then allocated to the changes in fuel production (MJ). Based on the calculated bio-feedstock input allocated to MJ fuel production, emissions associated with bio-feedstock production and transportation can be calculated using the Life Cycle Emissions tool. Similarly, downstream (fuel transportation/distribution and combustion) emissions can be calculated. Note that co-processed SAFs are considered to be biogenic, so CO2 emissions from fuel combustion are not accounted for. Sustainability certification schemes (SCS) may prescribe measurements techniques (including but not limited to C14 testing and mass balance) and protocol (based on energy allocation as described in Section 2.2 to assign biogenic carbon content among the product and co-products, in proportion to their contribution to the total energy content), as a means to verify the modelled changes in inputs and outputs.

### 2.4 Actual core Life Cycle Emissions calculation – specific provisions for CORSIA SAFs based on Waste, residue, and by-product feedstocks

Waste, residue, and by-product feedstocks as defined in Section 4 ("Positive List") in the ICAO document "CORSIA Methodology for Calculating Actual Life Cycle Emissions Values" are assumed to incur zero emissions during the feedstock production, i.e., life cycle stage 1 described in Section 2.2. Emissions generated during the collection, recovery, extraction, and processing of these wastes, residues, and by-products, however, will be included (life cycle stages 2-8 described in Section 2.2).

## 3. TECHNICAL REPORT REQUIREMENTS

### 3.1 Reporting requirements

The ClassNK SCS will require economic operators to document all relevant data appropriately in a Technical Report, which is verified by an accredited certification body. Upon request, the economic operator will submit the Technical Report to the ClassNK SCS and on request, the ClassNK SCS will submit the report to ICAO.

Relevant data include:

a) GHG emissions by life cycle step within the scope of certification, broken out by GHG emission species and aggregated in $CO_2e$ (100 year GWP). The system boundary of the core Life Cycle Emissions value calculation will include the full supply chain of CEF production and use. As such, emissions associated with the life cycle stages of the CEF supply chain listed in Section 2.2 will be accounted for.

b) The Life Cycle Emissions inventory data by life cycle step within the scope of certification, including all energy and material inputs. For life cycle steps 1-4, the inventory data are to be provided per mass of feedstock, for the other steps per total fuel energy yield (MJ of fuel).

c) Emission factors used for calculating GHG emissions associated with energy and material inputs, including information about the source for the emission factors.

d) All relevant feedstock characteristics within the scope of certification, such as, for example, agricultural yield, lower heating value, moisture content, the content of sugar, starch, cellulose, hemicellulose, lignin, vegetable oil, or any other energy carrier (as applicable to feedstock of interest).

e) Quantities for all final and intermediate products, per total energy yield.

f) If Municipal Solid Waste is being used as a feedstock, then all relevant data required for the calculation of landfill emissions credits and recycling emissions credit will be disclosed to the ClassNK SCS according to the MSW crediting methodology in Section 6 on "Emissions Credits", on an annual basis.

g) In case a low LUC risk practice is being used, all relevant data required for the calculation and certification will be disclosed according to the Low LUC Risk Practices methodology.

The ClassNK SCS will report evidence that the certification body has verified that the economic operator has accurately followed the methodology specified in this document to calculate its actual Life Cycle Emissions value using the most recent and scientifically rigorous data available, and that the Life Cycle Emissions value calculation is complete, accurate and transparent.
The ClassNK SCS will report information on chain of custody system employed.
Data will be recorded and reported to ICAO upon request in a format conducive to re-calculation and verification, for example as a spreadsheet in .csv or .txt file format.

### 3.2 Flow of information along the supply chain for actual Life Cycle Emissions values

Each economic operator along the supply chain will implement a robust and transparent system to track the flow of data outlined in Section 2.2, along the supply chain ("chain of custody system"). Tracking will occur each time the feedstock or fuel passes through an internal processing step or changes ownership along the supply chain.
The ClassNK SCS will implement procedures in Appendix 4 that allow verification that the economic operator has used an appropriate chain of custody system.

## 4. Feedstock Categories

**Primary** and **co-products** are the main products of a production process. These products have significant economic value and elastic supply, (i.e., there is evidence that there is a causal link between feedstock prices and the quantity of feedstock being produced).

**By-products** are secondary products with inelastic supply and economic value.

**Wastes** are materials with inelastic supply and no economic value. A waste is any substance or object which the holder discards or intends or is required to discard. Raw materials or substances that have been intentionally modified or contaminated to meet this definition are not covered by this definition.

**Residues** are secondary materials with inelastic supply and little economic value. Residues include:
a) Agricultural, aquaculture, fisheries and forestry residues: Residues directly deriving from or generated by agriculture, aquaculture, fisheries and forestry.

b) Processing residues: A substance that is not the end product that a production process directly seeks to produce; the production of the residue or substance is not the primary aim of the production process and the process has not been deliberately modified to produce it.

**Positive List**

The positive list provided in the following Table 1 and Figure 1 of the ICAO document "CORSIA Methodology for Calculating Actual Life Cycle Emissions Values" includes feedstocks that have been classified as by-product, wastes and residues. It has been arrived at considering a broad range of publicly-available regulatory and voluntary approaches. The definitions of feedstocks in positive list of Table 1 are determined by ClassNK SCS based on ICAO Guidance, or (in the absence of ICAO Guidance) definitions and guidance from individual countries or their public sectors where feedstocks are produced.

The positive list is non-exhaustive. It includes materials currently in use or in discussion to be used for sustainable aviation fuel.

The classification of specific feedstocks as by-products is subject to later revisions as part of the regular CORSIA review process in case there is strong scientific evidence showing that significant indirect effects could be associated to these feedstocks.

**Table 1. Positive list of materials classified as co-products, residues, wastes or by-products**

| Residues | Wastes | By-products | Co-products |
|---|---|---|---|
| *Agricultural residues:* | Municipal solid waste* | *Palm Fatty Acid Distillate* | Molasses |
| Baggasse | Used cooking oil | Beef Tallow | |
| Cobs | Waste gases | Technical corn oil | |
| Stover | | Non-standard coconuts** | |
| Husks | | Poultry fat | |
| Manure | | Lard fat | |
| Nut shells | | Mixed Animals Fat | |
| Stalks | | | |
| Straw | | | |
| *Forestry residues:* | | | |
| Bark | | | |
| Branches | | | |
| Cutter shavings | | | |
| Leaves | | | |
| Needles | | | |
| Pre- commercial thinnings | | | |
| Slash | | | |
| Tree tops | | | |
| *Processing residues:* | | | |
| Crude glycerine | | | |
| Forestry processing residues | | | |
| Empty palm fruit bunches | | | |
| Palm oil mill effluent | | | |
| Sewage sludge | | | |
| Crude Tall Oil | | | |
| Tall oil pitch | | | |

*Note: as of the current version of this document, plastics are not included in the list of wastes, residues, or by-products approved by ICAO to produce SAF and claim emissions reductions under

CORSIA. Under MSW, plastics will be considered as non-biogenic content.

**"Non-standard coconuts" are inedible coconuts unintentionally obtained in coconut farms, collection centers or edible coconut oil industry, which meet any of the following criteria:

A) Too small; Too small coconuts are produced due to immaturity by nature. They cause inefficiencies for production processes in edible coconut product industries. Small size can be identified by weight or diameter of coconuts.

B) Sprouted; Coconuts sprout due to precocious development, or to exposure to moisture after harvest. They do not have enough nutrients for human consumption. Sprouts can be detected visually.

C) Cracked; Coconuts are cracked when they are damaged during de-husking, delivery, or storing processes, or when they are discarded by edible coconut product industries. Cracked coconuts become rotten and unsuitable for human consumption. Cracks can be detected visually.

D) Rotten; Coconuts deteriorate and rot when they are unharvested, cracked, or precocious, or when they are discarded by edible coconut product industries. They contain harmful substances to human health. Rottenness can be identified visually by the outer shell color (turned in black) and/or the molds.

The positive list is an open list. The ICAO Council can add materials to it, according to the definitions of feedstocks above and using the process shown in Figure 1 as a guide:

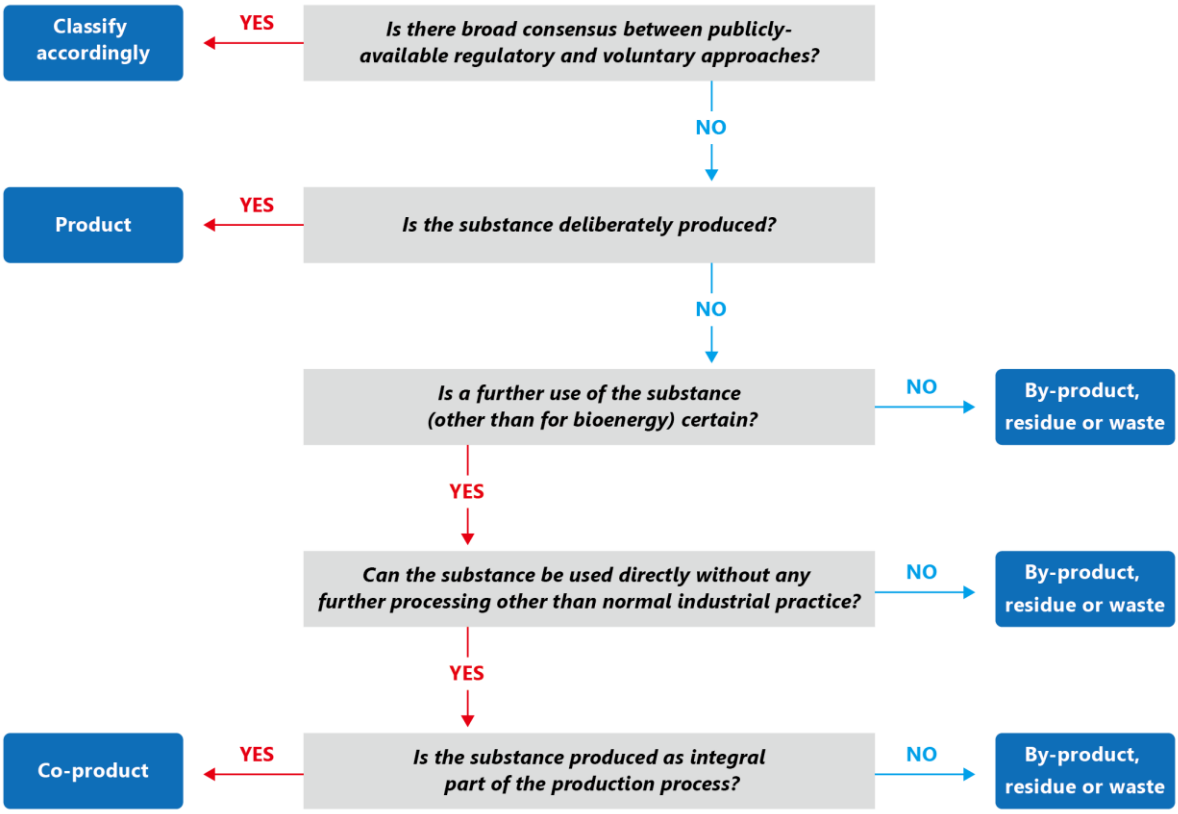



**Figure 1. Guidance for inclusion of additional materials in positive list**

## 5. Low Land Use Change (LUC) Risk Practices

Feedstocks that are "low risk" for land use change have been identified and assigned as having zero emissions from land use change. The low land use change risk feedstock list includes:

(1) feedstocks that do not result in expansion of global agricultural land use for their production.

(2) wastes, residues, and by-products

(3) feedstocks that have yields per surface unit significantly higher than terrestrial crops (~ one order of magnitude higher) such as some algal feedstocks.
The feedstocks in these three categories will all receive an ILUC value of zero.

Feedstocks designated under the Low LUC Risk Practices approach are designated as such until 2030, subject to periodic audits to ensure ongoing compliance with the original requirements when the feedstocks were certified by the ClassNK SCS.

ClassNK SCS will ensure that Low LUC claims are correctly tracked through the Chain of Custody and implement appropriate measures to ensure that no double-claiming of low LUC risk certified feedstocks and CEF occurs. This requires, among other measures, reviewing the CEF supply chain with the respective economic operators, including the mass balances and claims made not related to CORSIA.

The measures implemented will comply with the CORSIA sustainability criteria to account for, amongst other examples, situations where the low LUC risk practices may otherwise have a negative impact on environmental and social services of the land and resources used, or negatively affect the uses or productivity of resources in other places.

In all cases, this methodology considers that, for a specific project to be eligible for recognition as a low LUC risk practice, the practice will be verified as a net enhancement in SAF feedstock available per unit of land.

The two approaches for low LUC risk SAF feedstock production are:

a. Yield increase approach (Section 5.1)

b. Unused land approach (Section 5.2)

Low LUC risk practices implemented on or after 1 January 2016 could be eligible. The feedstock producer needs to provide credible and verifiable evidence of the nature of the new land management practice, timing of its implementation and level of additional feedstock production. Exceptionally, practices implemented between 1 January 2013 to 31 December 2015 may be accepted where it can be demonstrated that low LUC risk practices were implemented primarily as a result of demand for biofuels. This would have to be demonstrated on a project-specific basis.

5.1 Yield increase approach

The Yield Increase approach applies to any situation where feedstock producers are able to increase the amount of available feedstock out of a fixed area of land (i.e. without expanding the surface of the land). An increase in the harvested feedstock may be the result of:

a. An improvement in agricultural practices, (practices that increase yields through means such as increased organic matter content, reduced soil compaction/erosion, decreased pests, post-harvest loss reduction, etc.);

b. Intercropping, (i.e. the combination of two or more crops that grow simultaneously, for example as hedges or through an agroforestry system);

c. Sequential cropping, (i.e. the combination of two or more crops that grow at different periods of the year); and/or

d. Improvements in post-harvest losses, (i.e. losses that occur at cultivation and transport up to but not including the first conversion unit in the supply chain)

If there is a decrease of the available feedstock for the food or feed market at the project level resulting from the land management practice (e.g., reduced yield from the main crop) this will be accounted for in calculating the volume of low LUC risk SAF feedstock (i.e., the volume of low LUC risk SAF feedstock represents the net increase in feedstock after accounting for any reduction in production of the primary food/feed crop that had been grown historically).
The calculation will be based on appropriate units of measurement (e.g. energetic value).
For annual crops, measurements of yield increases and post-harvest loss reduction relative to a baseline are calculated based on historical practices using the annual yield per unit of land based on data from the preceding five years before the land management practice measure takes effect

from similar producers within the same region for the duration of the land management practice (LMP) measure.
For perennial crops, yield increase is calculated based on a standard growth curve of the same perennial crop from similar producers within the same region, as found in FAO and/or peer-reviewed data sources. Using a standard growth curve, the producer calculates its individual growth curve as a baseline and accounts for the additional yield achieved beyond this baseline after the implementation of the yield increase measure.

The amount of additional feedstock available and considered eligible for low LUC risk feedstock is calculated as follows:

1) For annual crops, the average amount of feedstock available historically, from the same or similar producers within the same region, is calculated based on actual net feedstock production (i.e., amount harvested less post- harvest losses) in the five years before the LMP measure takes effect. For perennial crops, the average amount of feedstock available historically is calculated based on a standard growth curve of the crop from the same or similar producers within the same region. Similar producers can be defined as producers growing the same (or equivalent) crops and using a similar management model (e.g., smallholder, small or large-scale plantation). For producers to be considered in the same region, the SCS must determine that the relevant location and site factors (e.g. soil, water and climate factors) are comparable and sufficiently representative.

2) The amount of feedstock available as a consequence of the LMP is calculated based on the current/new net feedstock production (amount harvested less post-harvest losses) that is attributable to the adoption of the new LMP measure.

3) The additional low LUC risk feedstock represents the difference between the values calculated via the two previous steps.

5.2 Unused land approach

Eligible lands for the unused land approach could include, among others, marginal lands, underused lands, unused lands, degraded pasture lands, and lands in need of remediation. Remote sensing data (when available) and other detective measures combined with auditing techniques such as interviews with local stakeholders may be needed to provide reliable results in the determination of land history and land status to verify “unused land” status.

For a land to be eligible for the unused land approach, it needs to meet one of the following criteria:

a. Land was not considered to be arable land or used for crop production during the five years preceding the reference date.

b. Land is identified as severely degraded land or undergoing a severe degradation process for at least three years, according to section 5.2.1.

For a land to be eligible for the unused land approach, it also needs to have little risk for displacement of provisioning services from that land onto different and equivalent amounts of land elsewhere. Provisioning services refer to products obtained from ecosystems such as food, animal feed, or bioenergy feedstocks. It can be assumed that the risk for displacement of provisioning services is little if the land was not used for provisioning of services in the three preceding years prior to the start of the LMP measure.
The amount of feedstock considered eligible for low LUC risk feedstock is equal to the amount of feedstock harvested for SAF production.

5.2.1 Guideline: Criteria for the Unused Land approach

1. Identification as Severely Degraded Land:
The land must be identified as "severely degraded," which means it has experienced significant deterioration in soil quality or other environmental conditions. This degradation should be serious enough to impede sustainable land use, such as major decreases in agricultural productivity, loss of vegetation, or deterioration in water quality.

2. Degradation Process for at Least Three Years:
The land must have been undergoing the degradation process for a minimum of three years. This duration helps ensure that the problem is persistent and not a temporary issue.
This long-term degradation signifies that the land requires substantial intervention for recovery.

The applicants that use the Unused Land approach will be required to submit a report to ClassNK SCS proving that they meet the criteria specified in 5.2.1 guideline including scientific evidence as specified in the following Table.5-1.
The ClassNK SCS will review this report based on internationally recognized indicators of UNCCD Land Degradation Neutrality(LDN) , such as land productivity, soil carbon stocks, land cover.

| Data Type | Purpose | Method | Example Parameters |
| --- | --- | --- | --- |
| **Soil Samples** | Assess soil quality and nutrient balance | Collect from multiple locations at specific depths | Organic carbon, nutrients, pH |
| **Vegetation Samples** | Evaluate vegetation types, biomass, carbon storage | Inventory plant species, measure tree dimensions | Biomass, carbon content, species diversity |
| **Remote Sensing Data** | Monitor land use changes | Use satellite images, drone, photography | Land cover changes, deforestation extent |
| **GIS** (Geographic Information System) **Data** | Detailed land use mapping and analysis | Utilize GIS for visualization | Land use classification, topography, infrastructure |
| **Documents and Records** | Review land use history and plans | Analyze land use plans, harvest records | Land use changes, management plans |
| **Community and Stakeholder Interviews** | Understand social impacts and perceptions | Conduct interviews and surveys | Perceptions of impacts, social benefits, issues |

Table.5-1 Example Verification Data for the Unused Land Approach

### 6. Emissions credits

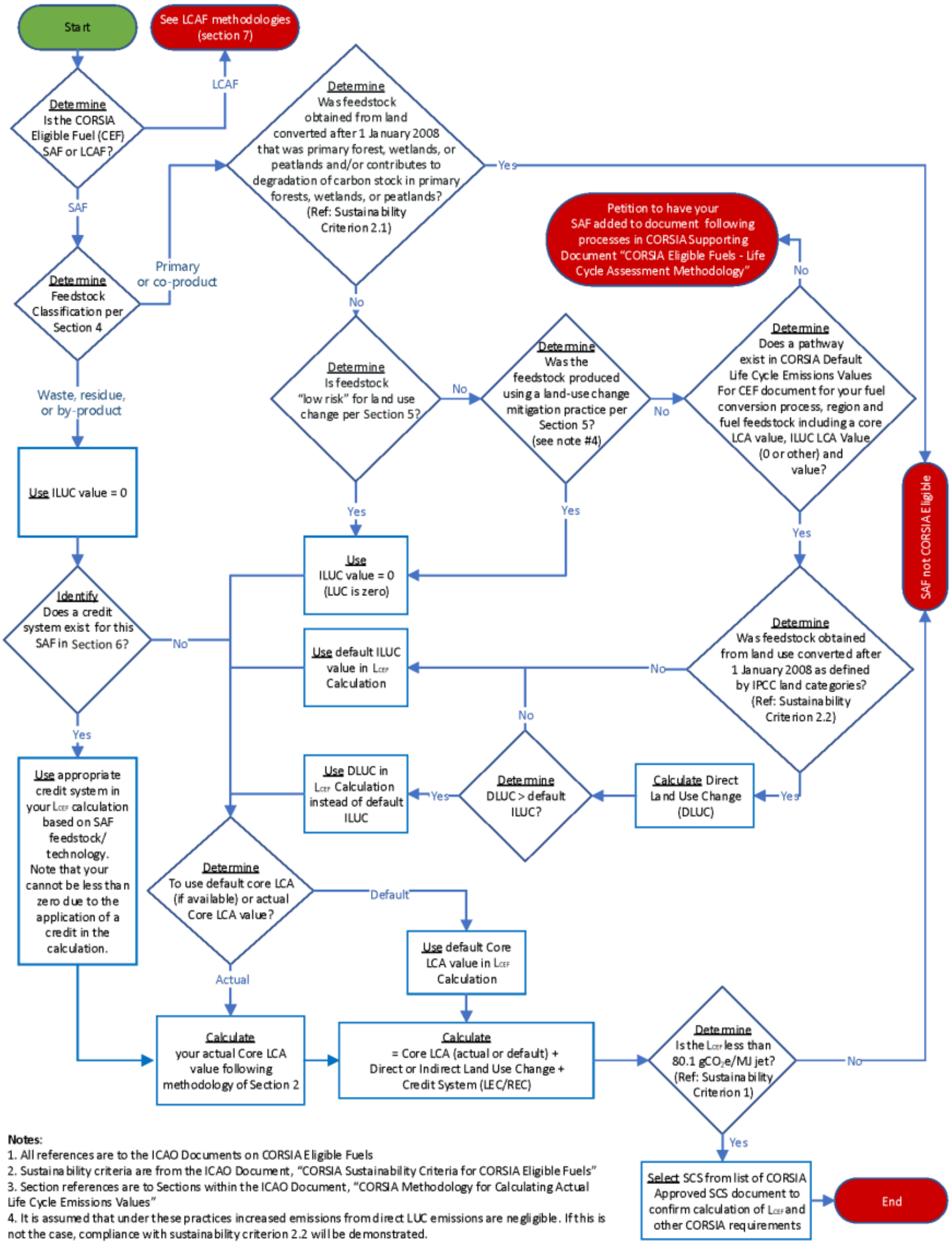
Should economic operators wish to calculate credits from landfills or recycling, then the emissions credits used to calculate the actual Life Cycle Emissions value by the economic operator must be accurate, be calculated in accordance with the relevant CORSIA emissions credit methodologies, and satisfy all other requirements for emissions crediting, as specified in "Section 6" of the ICAO document "CORSIA Methodology for Calculating Actual Life Cycle Emissions Values".

## 7. Direct Land Use Change (DLUC) emissions

This section describes the methodology for calculating Direct Land Use Change (DLUC) emissions for an economic operator aiming at producing a feedstock for CORSIA Sustainable Aviation Fuel (SAF). It applies in the event where feedstocks were sourced from land obtained through land use conversion after 1 January 2008. The methodology first outlines the required data and then defines the steps to calculate DLUC. as specified in "Section 8" of the ICAO document "CORSIA Methodology for Calculating Actual Life Cycle Emissions Values".

## 8. Process to determine $L_{CEF}$

The following flowchart which is specified in Section 9 of the ICAO document "CORSIA Methodology for Calculating Actual Life Cycle Emissions Values" describes the process for obtaining $L_{CEF}$ for a given CORSIA SAF.




**Notes:**
1. All references are to the ICAO Documents on CORSIA Eligible Fuels
2. Sustainability criteria are from the ICAO Document, "CORSIA Sustainability Criteria for CORSIA Eligible Fuels"
3. Section references are to Sections within the ICAO Document, "CORSIA Methodology for Calculating Actual Life Cycle Emissions Values"
4. It is assumed that under these practices increased emissions from direct LUC emissions are negligible. If this is not the case, compliance with sustainability criterion 2.2 will be demonstrated.

ClassNK SCS

Certification for CORSIA SAF

APPENDIX 5 Life Cycle Emission Value

June 2024

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