Bonsucro EU-RED Standard for compliance with the EU Renewable Energy Directive 2 requirements

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Contents

1.Introduction

The *'Bonsucro EU-RED Standard for Compliance with the EU Renewable Energy Directive Requirements'* (also referred to as *Bonsucro EU-RED Standard*) has been designed as a voluntary add-on to the Bonsucro standards. The Bonsucro EU-RED Standard defines how, under certain conditions, sugar cane millers and their supplying area as well as supply chain operators are able to comply with the requirements in the EU Directive 2018/2001/EC on the promotion of the use of energy from renewable sources (recast). This Directive (commonly referred to as 'EU-RED2' or 'REDII') specifies sustainability requirements for biofuels, bioliquids and biomass fuels in the European Union.

The Bonsucro EU-RED scheme was first recognised by the European Commission in 2011. This recognition was prolonged for a period of 5 years in 2017 (Commission decision of 21 March 2017).

This document details updated requirements reflecting the changes in EU-RED since 2017. As opposed to previous versions of the Bonsucro EU-RED scheme, specific REDII requirements are no longer included in the Bonsucro Production Standard, the Bonsucro Chain of Custody Protocol and the Certification Protocol but in this separate Bonsucro EU-RED Standard. The Bonsucro EU-RED standard is a voluntary add-on to the other Bonsucro standards and shall always be used in conjunction.

1.1 Structure of the Bonsucro EU-RED Standard

Chapter 2 presents the definitions used in the Bonsucro EU-RED Standard. Chapter 3 outlines general Bonsucro EU-RED requirements, applicable to both mills and supply chain operators. Chapter 4 elaborates on requirements specifically for mills, Chapter 5 elaborates the requirements specifically for supply chain operators. Chapter 6 details requirements for certification bodies and the certification process. The final Chapter 7 outlines REDII requirements for Bonsucro as voluntary scheme manager.

Annex 1, entitled *'Bonsucro EU-RED Greenhouse gas methodology'* specifies in detail REDII requirements for the greenhouse criterion.

2.Definitions and clarifications

Biomass: the biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, from forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin.

Agricultural biomass: biomass produced from agriculture.

Agricultural residues: in the context of sugarcane production, agriculture residues include any feedstock other than harvested cane, i.e. leaves, thrashes, tops, stumps, roots, etc.. They do not include residues from related industries or processing, e.g.sugarcane bagasse,.

Biomass fuels: gaseous and solid fuels produced from biomass.

Bioliquid: liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass.

Biofuels: liquid fuel for transport produced from biomass.

Continuously forested area: land with more than one hectare of area with trees higher than five metres and a canopy cover of more than 30%, OR trees able to reach those thresholds in situ. This criterion includes forests according to the respective national legal definition but excludes land that is predominantly under agricultural land use.

Degraded: means characterised by long-term loss of biodiversity due to for instance overgrazing, mechanical damage to the vegetation, soil erosion or loss of soil quality (definition following Regulation (EU) No 1307/2014).

EU-RED *(or REDII or EU-RED2): recast* of the European Union Directive on the promotion of the use of energy from renewable sources (Renewable Energy Directive, 2018/2001/CE).

Facility (site)**:** a single functional unit of an organisation or a combination of units situated at one locality, which is geographically distinct from other units.

GHG: greenhouse gas(es).

Grasslands**:** terrestrial ecosystems dominated by herbaceous or shrub vegetation for at least 5 continuous years. It includes meadows or pasture that are cropped for hay but excludes land cultivated for other crop production and cropland lying temporarily fallow. It further excludes continuously forested areas as defined in this Chapter unless these are agroforestry systems which include land use systems where trees are managed together with crops or animal production systems in agricultural settings. The dominance of herbaceous or shrub vegetation means that their combined ground cover is larger than the canopy cover of trees (definition following Regulation (EU) No 1307/2014).

Highly biodiverse forest and other wooded land: forest and other wooded land which is species-rich and not degraded, or has been identified as being highly biodiverse by the relevant competent authority, unless evidence is provided that the production of that raw material did not interfere with those nature protection purposes;

- Where ***species rich***, means it is:
    (i) a habitat of significant importance to critically endangered, endangered or vulnerable species as classified by the International Union for the Conservation of Nature Red List of Threatened Species or other lists with a similar purpose for species or habitats laid down in national legislation or recognised by a competent national authority in the country of origin of the raw material; or
    (ii) a habitat of significant importance to endemic or restricted-range species; or
    (iii) a habitat of significant importance to intra-species genetic diversity; or
    (iv) a habitat of significant importance to globally significant concentrations of migratory species or congregatory species; or
    (v) regionally or nationally significant or highly threatened or unique ecosystem.

(definition following Regulation (EU) No 1307/2014)

Human intervention: in the context of the grasslands definition in this document means managed grazing, mowing, cutting, harvesting or burning (definition following Regulation (EU) No 1307/2014).

Installation: Any processing installation used in the production process that was in operation on or before 5 October 2015. It does not include production facilities that have been intentionally added to the production chain to qualify for the exemption set out in Directive 2009/28/EC, Article 17.2.

Ligno-cellulosic material: material composed of lignin, cellulose and hemicellulose such as biomass sourced from forests, woody energy crops and forest-based industries' residues and wastes.

Natural highly biodiverse grassland: grassland that would remain grassland in the absence of human intervention and that maintains a natural species composition and the ecological characteristics and processes (definition following Regulation (EU) No 1307/2014).

Non-food cellulosic material: raw materials mainly composed of cellulose and hemicellulose, and having a lower lignin content than ligno-cellulosic material; it includes food and feed crop residues such as straw, stover, husks and shells); grassy energy crops with a low starch content such as ryegrass, switchgrass, miscanthus, giant cane; cover crops before and after main crops; ley crops; industrial residues, including from food and feed crops after vegetal oils, sugars, starches and protein have been extracted, and material from bio-waste, where ley and cover crops are understood to be temporary, short-term sown pastures comprising grass-legume mixture with a low starch content to obtain fodder for livestock and improve soil fertility for obtaining higher yields of arable main crops.

Non-natural highly biodiverse grassland means grassland that

- would cease to be grassland in the absence of human intervention; and
- which is species-rich and not degraded and has been identified as being highly biodiverse by the relevant competent authority, unless evidence is provided that the harvesting of the raw material is necessary to preserve its grassland status.

- Where ***species rich***, means it is:
    (i) a habitat of significant importance to critically endangered, endangered or vulnerable species as classified by the International Union for the Conservation of Nature Red List of Threatened Species or other lists with a similar purpose for species or habitats laid down in national legislation or recognised by a competent national authority in the country of origin of the raw material; or
    (ii) a habitat of significant importance to endemic or restricted-range species; or
    (iii) a habitat of significant importance to intra-species genetic diversity; or

(iv) a habitat of significant importance to globally significant concentrations of migratory species or congregatory species; or
(v) regionally or nationally significant or highly threatened or unique ecosystem.
(definition following Regulation (EU) No 1307/2014)

Other wooded land: land not defined as 'forest', spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use (definition from FAO Global Forest Resource Assessment Definitions, version 2015).

Peatland soils: are soils with horizons of organic material (peat substrate) of a cumulative thickness of at least 30 cm at a depth of down to 60 cm. The organic matter contains at least 20 mass percent of organic carbon in the fine soil.

Primary forest: naturally regenerated forest of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.
Some key characteristics of primary forests are:

a. they show natural forest dynamics, such as natural tree species composition, occurrence of dead wood, natural age structure and natural regeneration processes;
b. the area is large enough to maintain its natural characteristics;
c. there has been no known significant human intervention or the last significant human intervention was long enough ago to have allowed the natural species composition and processes to have become re-established (definition from FAO Global Forest Resource Assessment Definitions, version 2015).

(Processing) Residues: a substance that is not the end product(s) that a production process directly seeks to produce; it is not the primary aim of the production process and the process has not been deliberately modified to produce it.

Residues from agriculture, aquaculture, fisheries and forestry: residues directly generated by agriculture, aquaculture, fisheries and forestry, and that do not include residues from related industries or processing.

Bonsucro EU-RED Standard: refers to *the Bonsucro EU-RED Standard for Compliance with the EU Renewable Energy Directive Requirements'*, which comprise of a voluntary add-on to the Bonsucro standards, and allow producers and processors under certain conditions to comply with requirements in EU Directive 2018/2001/EC on the promotion of the use of energy from renewable sources.

Site: a geographical location with precise boundaries within which products can be mixed.

Waste: a 'waste' can be understood as 'any substance or object which the Waste' shall be defined as in Article 3 (1) of the Waste Framework Directive 2008/98/EC. According to this definition 'it is something the holder discards, intends to, 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. This means that substances which are intentionally produced or modified to count as waste (e.g. by adding waste material to a material that was not waste) do not qualify as waste. The concept of 'discarding' a material according to the WFD requires a consideration of all relevant circumstances at the point of origin of a material.

Wetlands: land that is covered with or saturated by water permanently or for a significant part of the year (REDII definition).

3.General Bonsucro EU-RED requirements

This chapter explains the scope of the Bonsucro EU-RED Standard and the relation between the Bonsucro EU-RED Standard and other Bonsucro Standards. It also specifies Bonsucro EU-RED requirements applicable to all operators which are or wish to become Bonsucro EU-RED certified (mills and supply chain operators).

3.1 Scope of the Bonsucro EU-RED standard

The Bonsucro EU-RED Standard covers the cultivation and processing of sugarcane to produce biofuels, bioliquids and biomass fuels for use in the EU, including all related processing, transportation and storage activities.

More specifically, it covers the cultivation and processing of sugarcane to produce:

1. first-generation ethanol (1G ethanol) produced by fermentation of sugarcane juice;
2. first-generation ethanol (1G ethanol) produced from molasses;
3. second-generation ethanol (2G ethanol) produced from bagasse;
4. (solid) biomass fuels produced from bagasse.

The Bonsucro EU-RED Standard applies globally.

Agricultural residues from sugarcane cultivation are not in the scope of Bonsucro EU-RED. Processing waste and processing residues are not in the scope of Bonsucro EU-RED, with the exception of bagasse which is included in the scope.

3.2 Relationship between the Bonsucro Standards and the Bonsucro EU-RED Standard

The Bonsucro EU-RED Standard shall be used in conjunction with the actual valid version of the *Bonsucro Production Standard, the Bonsucro Chain of Custody Standard* and *the Bonsucro Certification Protocol'*. Audits of mills and supply chain operators against Bonsucro EU-RED requirements may only be carried out as an ***add-on*** to the generic Bonsucro requirements. This means that under the Bonsucro EU-RED Standard, all requirements of the other Bonsucro standards apply and must be met.

If an economic operator is not already Bonsucro certified the Bonsucro and Bonsucro EU-RED audit process may occur simultaneously.

It is not possible to have operations certified against the Bonsucro EU-RED Standard without having a valid Bonsucro certificate in place that covers at least that same operation. Should the Bonsucro certification lapse for any reason the Bonsucro EU-RED certification shall also lapse at the same time, with the same rules in place about selling material produced while the certification was valid as in the appropriate standard (Bonsucro Production Standard or the Bonsucro Chain of Custody Standard).

3.3 Audits before participation in the Bonsucro EU-RED scheme

All mills and supply chain operators physically handling sugarcane and derived products **and** taking legal ownership shall be certified against the Bonsucro EU-RED Standard before being allowed to purchase, sell and/or claim in the Bonsucro EU-RED scheme. Economic operators seeking to prolonguetheir Bonsucro EU-RED certification shall undergo recertification prior to the expiry of the Bonsucro EU-RED certificate.

The validity of a Bonsucro EU-RED certificate is three years, with annual surveillance audits after the first and the second year. After three years, a full re-certification audit is required.

3.4 Unit of certification for mills

In the Bonsucro Production Standard, the unit of certification is the mill and its cane supplying area. It includes all relevant activities on the farms, mill site, including residue production and power export.

The cane supply area included in the area of certification comprises the farms/estates supplying cane in conformity with the Bonsucro and Bonsucro EU-RED standards. This may be 100% of the farms/estates supplying cane to the mill, or a lesser number. In the latter case only a respective percentage of the mill's production would be considered as Bonsucro or Bonsucro EU-RED certified.

Cane supply area which is Bonsucro certified can also be Bonsucro EU-RED certified provided it meets the relevant requirements laid down in this Bonsucro EU-RED Standard. Cane supply area which is not Bonsucro certified cannot be Bonsucro EU-RED certified. Also refer to Chapter 5 (Bonsucro EU-RED Chain of Custody requirements).

The definition of the scope of the certification for Bonsucro EU-RED shall clearly identify what portion of the supply base is certified. Mass balance accounting shall ensure that no more Bonsucro EU-RED compliant material is claimed than has been produced by the Bonsucro EU-RED certified part of the supply base.

3.5 Document management system

All operators wishing to comply with Bonsucro EU-RED requirements, shall have a document management system.

The auditable system shall, at a minimum, contain all necessary documentation/evidence in relation to the claims they make or rely on regarding Bonsucro EU-RED. Documentation/evidence must ensure a comprehensive link between products and documentation including but not limited to the following:

- Records of all incoming and outgoing Bonsucro EU-RED certified products, and related sustainability information;
- Records of internal processing of Bonsucro EU-RED certified products;
- Mass balance records for Bonsucro EU-RED certified material;
- Contracts related to Bonsucro EU-RED certified products;
- Copies of Bonsucro EU-RED certificates from all suppliers of Bonsucro EU-RED certified material;
- Records of internal audits.

The documentation/evidence shall be kept for a minimum of 5 years. Operators shall make the evidence in the system available for review (auditing).

The auditable system should be a quality system drawing on points 2 and 5.2 of Module D1 ('Quality assurance of the production process') of Annex II of the *'Decision on a common framework for the marketing of products'*[1] or justified equivalent.

[1] Decision No 768/2008/EC of the European Parliament and of the Council of 9 July 2008 on a common framework for the marketing of products, and repealing Council Decision 93/465/EEC

Note:
This requirement is an elaboration and further specification of the requirements for document management laid down in the Bonsucro Production Standard and the Bonsucro Chain of Custody Standard.

3.6 Claims on Bonsucro EU-RED compliance

Claims shall only be made about compliance with Bonsucro EU-RED Standard if the operator has been successfully assessed against the Bonsucro EU-RED requirements laid down in this Standard, and if the sugarcane derived feedstocks or products have been received from economic operators who had a valid Bonsucro EU-RED chain-of-custody certificate at the time of the transaction, or, if the operator buys directly from a mill, the mill held a valid Bonsucro EU-RED producer certificate at the time of the transaction.

4.Additional Bonsucro EU-RED requirements for mills

4.1 General

This chapter specifies Bonsucro EU-RED requirements for mills. These requirements are additional to the generic requirements for mills laid down in the Bonsucro Production Standard.

The additional EU-RED requirements for mills specified in this chapter relate to:

1. Greenhouse gas emissions savings: the use and production of biofuels, bioliquids and biomass fuels should lead to reductions in greenhouse gas emissions compared to fossil fuels (Article 29(10) of REDII);
2. Conservation of biodiversity: Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land with high biodiversity value (Article 29(3) of REDII);
3. Conservation of carbon stocks: Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land with high carbon stock (Article 29(4) of REDII);
4. Conservation of peatlands: Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from peatland (Article 29(5) of REDII).

If there is a conflict between the requirements in this Bonsucro EU-RED Standard and requirements in the Bonsucro Production Standard, the Bonsucro EU-RED requirements shall take precedence.

Note:
Principle 6 of the Bonsucro Production Standard V4.2 includes 'additional mandatory requirements for biofuels under the EU Renewable Energy Directive (2009/28/EC) and revised Fuel Quality Directive (2009/30/EC)'. The requirements specified in this chapter take precedence over the requirements laid down in Principle 6 of the Bonsucro Production Standard V4.2, meaning that the latter requirements are no longer valid. In the new version of the Bonsucro Production Standard, requirements under Principle 6 will be removed. When the text in this chapter or in other chapters of this document makes reference to the 'Bonsucro EU-RED requirements for producers', it means the requirements specified in this chapter, and not in the Bonsucro Production Standard V4.2.

4.2 Greenhouse gas emission savings: the use and production of biofuels, bioliquids and biomass fuels should lead to reductions in greenhouse gas emissions compared to fossil fuels (requirements for mills)

Indicator EU 1.1: Options for the greenhouse gas criterion for biofuels, bioliquids and biomass fuels (mills)

Mills shall use one of the following options for the greenhouse gas criterion for biofuels, bioliquids and biomass fuels:

a. Use of a default value for greenhouse gas emission saving if the production pathway is laid down in Part A or B of Annex V of REDII for biofuels and bioliquids and in Part A of Annex VI of REDII for biomass fuels. Default values can only be applied if the el value for those biofuels or bioliquids calculated in accordance with point 7 of Part C of Annex V of REDII and for those biomass fuels calculated in accordance with point 7 of Part B of Annex VI of REDII is equal or less than zero;

b. Use of actual greenhouse gas values to calculate total greenhouse gas savings according to the EU-RED methodology and specified in Part C of Annex V of REDII for biofuels and bioliquids and in Part B of Annex VI of REDII for biomass fuels;
c. For biofuels and bioliquids, use of a value calculated as the sum of the formulas referred to in point 1 of Part C of Annex V of REDII, where disaggregated default values in Part D or E or Annex V of REDII may be used for some factors and actual value, calculated in accordance with the methodology laid down in Part C of Annex V of REDII, are used for all other factors;
d. For biomass fuels, use of a value calculated as the sum of the formulas referred to in point 1 of Part B of Annex VI of REDII, where disaggregated default values in Part C of Annex VI of REDII may be used for some factors, and actual values, calculated in accordance with the methodology laid down in Part B of Annex VI of REDII, are used for all other factors.

Detailed requirements and guidance on the use of default values and actual values have been elaborated in Annex 1 of this Standard.

4.3 Conservation of biodiversity: Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land with high biodiversity value

Indicator EU 2.1: Primary forest or other wooded land
Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land that was primary forest or other wooded land in or after January 2008, whether or not the land continues to have that status.

Primary forest and other wooded land is defined as forest and other wooded land of native species, where there is no clearly visible indication of human activity and the ecological processes are not significantly disturbed.

Indicator EU 2.2: Highly biodiverse forest or other wooded land
Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land that was highly biodiverse or other wooded land in or after January 2008, whether or not the land continues to have that status.

Highly biodiverse forest and other wooded land is defined forest and other wooded land which is species-rich and not degraded, or has been identified as being highly biodiverse by the relevant competent authority, unless evidence is provided that the production of that raw material did not interfere with those nature protection purposes.

The definitions of ‘degraded’ and ‘species-rich’ included in Commission Regulation (EU) No 1307/2014 shall be applied in the context of this indicator.

Indicator EU 2.3: Protected areas
Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land that was a protected area in or after January 2008, whether or not the land continues to have that status.

This includes areas designated:
i) by law or by the relevant competent authority for nature protection purposes; or

ii) for the protection of rare, threatened or endangered ecosystems or species recognised by international agreements or included in lists drawn up by intergovernmental organisations or the International Union for the Conservation of Nature, subject to their recognition in accordance with the second subparagraph of Article 30(4) of REDII .

An exception is possible if evidence is provided that the production of that raw material did not interfere with those nature protection purposes.

Indicator EU 2.4: Highly biodiverse grassland

Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land that was highly biodiverse grassland spanning more than one hectare in or after January 2008, whether or not the land continues to have that status.

Highly biodiverse grassland is defined as:

i) natural, namely grassland that would remain grassland in the absence of human intervention and which maintains the natural species composition and ecological characteristics and processes; or

ii) non-natural, namely grassland that would cease to be grassland in the absence of human intervention and which is species-rich and not degraded and has been identified as being highly biodiverse by the relevant competent authority, unless evidence is provided that the harvesting of the raw material is necessary to preserve its grassland status.

In the context of this requirement the definitions in Chapter 2 for 'grassland', 'human intervention', 'degraded' and 'species rich' apply. These are the definitions laid down in Regulation (EU) No 1307/2014.

The following approach must be taken when determining whether land is (or in the case of conversion was) natural highly biodiverse grassland:

- The lead auditor must judge whether an assessment of highly biodiverse grassland is necessary.
- If an assessment is necessary, it must be conducted by a qualified independent specialist who may be additional to the audit team. The assessment and result must then be reviewed as part of the audit. Refer to Chapter 6 for auditor requirements.

4.4 Conservation of carbon stocks: Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land with high carbon stock

Indicator EU 3.1: Wetlands

Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land that was wetland in January 2008 and no longer has that status.

A wetland is land that is covered with or saturated by water permanently or for a significant part of the year. Evidence of verification should reflect seasonal changes within a year.

These provisions shall not apply if, at the time the raw material was obtained, the land had the same status as it had in January 2008.

Indicator EU 3.2: Continuously forested areas

Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land that was continuously forested in January 2008 and no longer has that status.

Continuously forested areas are defined as land spanning more than one hectare with trees higher than five metres and a canopy cover of more than 30%, or trees able to reach those thresholds in situ.
Continuously forested areas do not include land that is predominantly under agricultural or urban land use. In this context, agricultural land use refers to tree stands in agricultural production systems, such as fruit tree plantations, oil palm plantations and agroforestry systems when crops are grown under tree cover.

These provisions shall not apply if, at the time the raw material was obtained, the land had the same status as it had in January 2008.

Indicator EU 3.3: Forested land with 10-30% canopy cover
Biofuels, bioliquids and biomass fuels shall not be made from raw material obtained from land that was forested with 10-30% canopy cover in January 2008 and no longer has that status.

Forested areas with 10-30% canopy cover are defined as land spanning more than one hectare with trees higher than five metres and a canopy cover of between 10% and 30%, or trees able to reach those thresholds in situ, unless evidence is provided that the carbon stock of the area before and after conversion is such that, when the methodology laid down in part C of Annex V of REDII is applied, the greenhouse gas threshold as specified in Section 1 of Annex I would still be fulfilled.

These provisions shall not apply if, at the time the raw material was obtained, the land had the same status as it had in January 2008.

4.5 Conservation of peatlands: Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from peatland

Indicator EU 4.1: Peatland
Biofuels, bioliquids and biomass fuels produced from agricultural biomass shall not be made from raw material obtained from land that was peatland in January 2008.

An exception is possible if evidence is provided that the cultivation and harvesting of that raw material does not involve drainage of previously undrained soil. For peatland that was partially drained in January 2008, a subsequent deeper drainage, affecting soil that was not fully drained, would constitute a breach of the criterion.

5.Additional Bonsucro EU-RED requirements for the supply chain

5.1 General

This chapter specifies Bonsucro EU-RED requirements for the supply chain. These requirements are additional to the generic requirements for the supply chain laid down in the Bonsucro Chain of Custody.

The additional EU-RED requirements for the supply chain specified in this chapter relate to:

- General EU-RED mass balance requirements (5.2);
- Validating and reconciling Bonsucro EU-RED data (5.3);
- Greenhouse gas requirements (5.4).

If there is a conflict between the specific Bonsucro EU-RED requirements specified in this chapter and the requirements laid down in the Bonsucro Chain of Custody Standard, the Bonsucro EU-RED requirements shall take precedence.

Note:
Bonsucro EU-RED requirements for the supply chain are currently specified in a separate Bonsucro EU-RED Mass Balance Chain of Custody Standard (Version 5.1) document. The requirements specified in this chapter take precedence over the requirements laid down in that document, meaning that the latter requirements are no longer valid. As soon as this Bonsucro EU-RED Standard has been formally approved by the European Commission, the document will be archived by Bonsucro. When the text in this chapter or in other chapters of this document makes reference to the 'Bonsucro EU-RED ChoC requirements', it means the requirements specified in this chapter, and not in the previous separate Bonsucro EU-RED Mass Balance Chain of Custody Standard (Version 5.1) document.

5.2 General mass balance requirements

Bonsucro follows a mass balance approach for tracing Bonsucro EU-RED certified material in the supply chain, ensuring that at every point in the supply chain volumes of Bonsucro EU-RED certified outputs match volumes of Bonsucro EU-RED certified inputs.
In mass balance the volume of Bonsucro EU-RED certified output is balanced with a physical volume of Bonsucro EU-RED certified input. This allows the tracing of Bonsucro EU-RED certified material along the entire supply chain from field to mill (including transportation), through various steps of production (for example conversion processing, manufacturing, transformation) to warehousing, transportation and trade up to and including the end product manufacturer.

More specifically, the Bonsucro EU-RED mass balance system follows the definition and the requirements as specified in Article 30(1) of REDII, i.e. a mass balance system which:

(a) Allows consignments of raw materials or fuels with differing sustainability and greenhouse gas emission saving characteristics to be mixed for instance in a container, processing or logistical facility or site;
(b) Allows consignments of raw material with differing energy content to be mixed for the purposes of further processing, provided that the size of consignments is adjusted according to their energy content;
(c) Requires information about the sustainability and greenhouse gas emissions saving characteristics and sizes of the consignments referred to in point (a) to remain assigned to the mixture; and
(d) Provides for the sum of all consignments withdrawn from the mixture to be described as having the same sustainability characteristics, in the same quantities, as the sum of all

consignments added to the mixture and requires that this balance be achieved over an appropriate period of time.

For mass balance the Bonsucro EU-RED chain of custody (EU-RED ChoC) requirements laid down in this chapter shall apply to every economic operator throughout the supply chain that:

- takes legal ownership, and
- physically handles Bonsucro certified products at a location under the control of an economic operator including outsourced contractors.

After the end product manufacturer, when the product has been put in its final form and package there is no further requirement for chain of custody certification. This means that retailers and distributors of finished products do not need chain of custody certification.

The Bonsucro EU-RED ChoC requirements do not allow credit trading of EU-RED compliant material.

Indicator EU 5.1: Overall management responsibility

The economic operator shall establish and document its commitment to implement and maintain the Bonsucro EU-RED ChoC requirements. The commitment of the economic operator shall be made available to its personnel, suppliers, clients and other stakeholders.

Indicator EU 5.2: Procedures

The economic operator shall have written procedures and/or work instructions or equivalent to ensure the implementation of all elements of the Bonsucro EU-RED ChoC requirements. This shall include at minimum the following:

- Complete and up to date procedures covering the implementation of all the elements of the supply chain model requirements.
- Complete and up to date records and reports that demonstrate compliance with the supply chain model requirements (including training records).
- Identification of the role of the person(s) having overall responsibility for and authority over the implementation of these requirements and compliance with all applicable requirements. This person(s) shall be able to demonstrate awareness of the economic operator's procedures for the implementation of this standard.

Indicator EU 5.3: Record keeping and reporting to EC

The economic operator shall maintain accurate, complete, up-to-date and accessible records and reports covering all aspects of the Bonsucro EU-RED ChoC requirements. Retention times for all records and reports shall be a minimum of five (5) years.

This includes e.g. but is not limited to purchase and sales documents, production records and volume summaries, records of internal procedures and changes thereof, records on training of personnel, records of internal audits. The system for recording data and documents (e.g. software) shall be adequate to the complexity of the economic operator.

Economic operators shall enter all requested information in the Union database as soon as the database starts operation (refer to Section 7.5).

Indicator EU 5.4: Training
The economic operator shall have a training plan covering Bonsucro EU-RED ChoC requirements, which is subject to on-going or at least annual review. Appropriate training shall be provided by the economic operator for personnel carrying out the tasks critical to the effective implementation of the EU-RED ChoC requirements. Training shall be specific and relevant to the task(s) performed. Records of participants and content shall be maintained.

Indicator EU 5.5: Internal audits
The economic operator shall conduct an annual internal audit to determine whether the organization:

- Conforms to the requirements in the Bonsucro EU-RED ChoC Standard.
- Effectively implements and maintains the standard requirements within its organisation. Any non-conformities found as part of the internal audit shall direct corrective actions to be taken. The outcomes of the internal audits and all actions taken to correct nonconformities shall be subject to management review at least annually. The economic operator shall maintain the internal audit records and reports.
- Corrective actions taken as a result of any nonconformities identified in the internal audit shall be documented, including dates and descriptions of actions taken to resolve them.

The procedure for the annual internal audit process shall be documented.

Indicator EU 5.6: Defining the unit of certification
Under Bonsucro EU-RED ChoC an economic operator has two options for its chosen unit of certification. These are:

1. Single site: a single functional part of an economic operator's operations or a combination of parts situated at one locality, e.g. sugarcane mill, terminal, food processing, storage, tanks.

2. Multi-site: More than one location either within a single legal entity or across legal entities that are related via an ownerships structure (e.g. common holding company). The following conditions apply:
    a. Each site in a multi-site certificate shall maintain its own mass balance calculations and records. Mass Balance volumes shall not be transferred between sites.
    b. Multi-site as a unit of certification for facilities that do any processing or transformation is not permitted.
    c. Multi-site auditing for storage/tanks or any other holding facility is permitted, provided that the sites follow a common Internal Control System (ICS) and that the Central Office is always subject to audit.
    d. One site shall be designated as responsible for maintaining the central administration of the ChoC requirements including the individual site mass balance accounting using an Internal Control System (ICS). This site is designated as the Central Office.

The economic operator shall define and document its unit(s) of certification.

If more than one legal entity operates on a site then each legal entity shall operate its own mass balance and comply with all Bonsucro EU-RED ChoC requirements.

In the case of multi-site certification, the economic operator shall define and document the legal entities and sites covered by the multi-site Bonsucro EU-RED ChoC certificate, including details on the site designated as the Central Office for administering Bonsucro EU-RED ChoC data. The relationship

between the sites shall be described and documented. The economic operator shall document any changes that may occur in the scope of the unit(s) of certification, and notify its certification body at least one week before the change goes into effect.

All operators wishing to use multi-site certification under Bonsucro EU-RED requirements, shall be subject to the following sampling formula for the minimum number of site visits required for initial assessment audits:

Square root of the total number of sites, rounded up to a whole number for each set of assessments (audits), plus Central Office.

The applicable multi-site sampling formulas shall be used as a minimum, and may be increased depending on the complexity and risk associated with the operations (depending on the auditor's professional judgement).

Indicator EU 5.7: Outsourcing activities
In cases where a Bonsucro EU-RED ChoC certified economic operator outsources activities to independent third parties (e.g. subcontractors for storage, transport or other outsourced activities), the certified economic operator shall ensure that the independent third party complies with the Bonsucro EU-RED ChoC requirements. It is not required to list the contractors performing outsourced activities on the certificate of the Bonsucro certified economic operator.

This requirement is not applicable to outsourced storage facilities where the management of the Bonsucro certified product(s) and instructions for tank movements are controlled by the certified economic operator (not the tank farm manager).

A Bonsucro EU-RED certified economic operator which includes outsourcing within the scope of their Bonsucro EU-RED ChoC certificate shall ensure the following:

- The certified economic operator has legal ownership of all input material to be included in outsourced processes;
- The certified economic operator has an agreement or contract covering the outsourced process with each contractor through a signed and enforceable agreement with the contractor. The certified economic operator shall ensure that its certification body has access to the outsourcing contractor or operation if an audit is deemed necessary, including all necessary documentation. If this is not possible, the outsourced contractor shall obtain a Bonsucro EU -RED ChoC certificate independently.
- The economic operator has a documented control system with explicit procedures for the outsourced process which is communicated to the relevant contractor.
- The economic operator shall record the names and contact details of all contractors used for the processing or physical handling of Bonsucro EU-RED certified products. An up to date record shall be made available to the economic operators certification body at its next audit.

5.3 Validating and reconciling Bonsucro EU-RED data

Indicator EU 6.1: Verification of Bonsucro EU-RED status of the supplier
The receiving economic operator shall verify the current Bonsucro EU-RED status of the supplier at the time of the purchase. No incoming material certified under other schemes can be considered as Bonsucro EU-RED compliant. Incoming material which does not comply with the Bonsucro EU-RED

Standard and/or is from a supplier that is not Bonsucro EU-RED certified shall not be considered as Bonsucro EU-RED compliant.

This requirement includes checking the validity of the supplier's Bonsucro EU-RED ChoC certificate. All Bonsucro EU-RED certified entities and certificate numbers are displayed on the Bonsucro website. In cases of uncertainty, the Bonsucro secretariat must be contacted for clarification. No incoming material certified under other schemes can be considered as Bonsucro EU-RED compliant.

Indicator EU 6.2: Verification of data of the incoming Bonsucro EU-RED certified product
The receiving economic operator shall verify that the supplier contract, invoice and/or supporting documentation, including associated sustainability characteristics of consignments of Bonsucro EU-RED certified products meet the following requirements:

- Specification of original raw material or intermediary product: Sugarcane, Sugarcane juice, Sugarcane molasses, Sugarcane bagasse.
- The mass (kg or tonnes) or volume (litres or m^3).
- Specification of sugar (sugar content in % sucrose), molasses for fermentation (% Brix), or specification of ethanol (alcohol content in % v/v) or for any other derived products the appropriate measure of purity.
- Evidence showing compliance with the Bonsucro EU-RED requirements, meaning that the supplier holds a valid Bonsucro EU-RED certificate.
- Buyer and seller contact information.
- Country of origin, i.e. the country where the sugar cane was grown.
- Date when biofuel, bioliquid or biomass fuel installation started operations. This refers to the date on which the installation that produces the biofuels, bioliquids of biomass fuels first became operational. The term 'installation' includes any processing installation used in the sugar, sugarcane, ethanol or bagasse biomass fuel production process. This does not include production facilities that might have been intentionally added to the production chain only to qualify for the exemption foreseen in this provision.
- Whenever actual GHG values are used, the actual GHG values in kg $CO_{2\text{-eq}}$ per dry tons (sugarcane, sugar, molasses, bagasse and other intermediary products) or g $CO_{2\text{-eq}}$ per MJ (biofuel or biomass fuel: bioethanol, bagasse pellets) calculated according to the Annex V of REDII (biofuels) or annex VI of REDII (biomass fuels). See also Annex I of this Standard for more details.
- Accurate data on all relevant elements of the GHG emission calculation formula (i.e. e_{ec}, e_l, e_p and e_{td}) See also Annex 1 for more details.
- If at any point in the chain of custody emissions have occurred and are not recorded, so that the calculation of an actual value is no longer feasible for operators downstream in the chain of custody, this must be clearly indicated in the delivery notes.
- Whenever default GHG values are used, the mention of the words 'default value', with the exception of bioethanol producer, who shall indicate the default value as per REDII Annex V or REDII Annex VI and the corresponding GHG savings, compared to the fossil reference.
- Information on support which has been received for the production of the material including details on the type of support scheme (only relevant if support has been received).

All the data shall be entered into the receiving economic operator's administrative system within one month of taking ownership.

In case of discrepancies between the documentation and the material received, the receiving economic operator shall contact its supplier and require for data correction. Corrected data shall be

received and entered into the receiving economic operator's administrative system before sustainability data is passed on to the next economic operator.

Multiple receipts with common supplier and with identical Bonsucro EU-RED sustainability characteristics may administratively be combined as one batch for reporting purposes.

Indicator EU 6.3: Conversion rates

A conversion rate describes the change in quantity of a specific material that occurs due to processing of the respective material at a specific site. Conversion rates and the resulting changes of quantities shall be site-specific and specific for a defined feedstock/product conversion. Conversion rates shall be based on actual data (e.g. processing or production data). The output weight or volume after conversion shall be expressed as 100% sucrose or ethanol equivalents.

Conversion rates used shall be documented and are subject to verification during the audit.

Conversion rates shall be provided by any economic operator that modifies its inputs in any way. This applies to all the elements of the chain of custody each time such a change in quantity occurs.

In the case of multi-site certificates the designated Central Office shall keep records of conversion rates realized at each site included in the multi-site certificate and for all products processed on those sites.

Indicator EU 6.4: Mixing of Bonsucro certified products with products fungible with sugarcane-derived products

In every case where a batch of Bonsucro EU-RED certified product was physically mixed with other products which are fungible with sugarcane-derived products, the Bonsucro EU-RED data may be allocated to any physical consignment taken from that batch, provided that input and output of Bonsucro EU-RED data match (no overclaiming of Bonsucro EU-RED data).
(For example: ethanol from corn is fungible with ethanol from sugarcane, as these products can be mixed without losing their original characteristics. For example biodiesel is not fungible with sugarcane ethanol.)

Indicator EU 6.5: Supply of Bonsucro EU-RED certified product

The economic operator shall ensure that the delivery contract, invoice and/or supporting documentation, including associated sustainability characteristics of consignments of Bonsucro EU-RED certified products meet the following requirements:

- Specification of original raw material or intermediary product: Sugarcane, Sugarcane juice, Sugarcane molasses, Sugarcane bagasse, Sugarcane straw, Sugarcane thrashes (tops, leaves, roots).
- The mass (kg or tonnes) or volume (litres or m^3).
- Specification of sugar (sugar content in % sucrose), molasses for fermentation (% Brix), or specification of ethanol (alcohol content in % v/v) or for any other derived products the appropriate measure of purity.
- Evidence showing compliance with the Bonsucro EU-RED requirements, meaning that the supplier holds a valid Bonsucro EU-RED certificate.
- Buyer and seller contact information.
- Country of origin, i.e. the country where the sugar cane was grown.

- Date when biofuel, bioliquid or biomass fuel installation started operations. This refers to the date on which the installation that produces the biofuels, bioliquids of biomass fuels first became operational. The term 'installation' includes any processing installation used in the sugar, sugarcane, ethanol or bagasse biomass fuel production process. This does not include production facilities that might have been intentionally added to the production chain only to qualify for the exemption foreseen in this provision.
- Whenever actual GHG values are used, the actual GHG values in kg $CO_{2\text{-}eq}$ per dry tons (sugarcane, sugar, molasses, bagasse and other intermediary products) or g $CO_{2\text{-}eq}$ per MJ (biofuel or biomass fuel: bioethanol, bagasse pellets) calculated according to the Annex V of REDII (biofuels) or Annex VI of REDII (biomass fuels). See also Annex I of this Standard for more details.
- Accurate data on all relevant elements of the GHG emission calculation formula (i.e. e_{ec}, e_l, e_p, e_{td} and e_{sca}). See also Annex 1 for more details.
- If at any point in the chain of custody emissions have occurred and are not recorded, so that the calculation of an actual value is no longer feasible for operators downstream in the chain of custody, this must be clearly indicated in the delivery notes.
- Whenever default GHG values are used, the mention of the words 'default value', with the exception of bioethanol producer, who shall indicate the default value as per REDII Annex V or REDII Annex VI and the corresponding GHG savings, compared to the fossil reference.
- Information on support which has been received for the production of the material including details on the type of support scheme (only relevant if support has been received).

If the consignment was processed by the supplier, the supplier shall adjust the sustainability and greenhouse gas emissions saving characteristics of the consignment and
assign these to the output consignment in accordance with the following rules:

a. when the processing of a consignment of raw material yields only one output that is intended for the production of biofuels, bioliquids or biomass fuels, the size of the consignment and the related quantities of sustainability and greenhouse gas emissions saving characteristics shall be adjusted applying a conversion factor representing the ratio between the mass of the output that is intended for such production and the mass of the raw material entering the process;
b. when the processing of a consignment of raw material yields more than one output that is intended for the production of biofuels, bioliquids or biomass fuels, for each output a separate conversion factor shall be applied and a separate mass balance shall be used.

All the data shall be entered into the supplier's administrative system within one month of transfer of ownership.

Indicator EU 6.6: Inventory periods

The economic operator shall undertake inventories of the input/output balance of the Bonsucro EU-RED certified product at fixed regular intervals, for each operation site, with the intervals not exceeding three months.

Fixed inventory periods shall be continuous in time, i.e. gaps between inventory periods shall not occur. During any periods without movement of Bonsucro EU-RED certified material mass balances shall be kept.

The inventory periods for the certification period shall be clearly documented at the beginning of the certification term by the economic operator and shall be verified during the audit. For each inventory period a mass balance calculation including sustainability data transfer to the next period (carry over) must be documented and provided during the audit. The inventory shall be undertaken at individual site level.

Indicator EU 6.7: Balancing Bonsucro EU-RED volumes during and between inventory periods
The volume of Bonsucro EU-RED certified product received shall be greater than or equal to the volume of Bonsucro EU-RED certified product supplied to clients over a fixed inventory period of maximum three months.

Where the balance of inputs and outputs is positive at the end of economic operator's inventory period, sustainability data for the positive balance may be carried into the next inventory period. This is called carry over. Carry over is only possible from one inventory period to the next if at least the equivalent amount of physical material is in stock, as registered in the sustainability data stated in the bookkeeping records. This means it is not possible to have more carry over into the next inventory period than the quantity that is physically in stock at the end of any inventory period.

N.B. The Bonsucro ChoC Standard allows to carry over more sustainability data than there is physical material in stock at the end of any given inventory period. This is not allowed under Bonsucro EU-RED requirements.

Indicator EU 6.8: Expiration of Bonsucro sustainability data
Bonsucro EU-RED sustainability data entered into an economic operator's mass balance system shall no longer be attached to outgoing consignments after one year from the date of entry into the system. Carryover is to be adjusted downward to reflect any expiring date of the material.
If the economic operator's Bonsucro EU-RED ChoC certificate is no longer valid, any remaining sustainability data in the economic operator's administrative system becomes invalid.

Indicator EU 6.9: Attribution of Bonsucro EU-RED sustainability characteristics
Whenever multiple sugarcane-derived products are produced at a given step in the sugarcane supply chain (e.g. mill), Bonsucro EU-RED sustainability characteristics shall be attributed to all materials equally with the exception of GHG emissions which shall be allocated on an energy basis (refer to Annex 1).

All the sugarcane-derived products produced at a given step shall carry the same sustainability characteristics, in line with the mass balance of entering Bonsucro or Bonsucro EU-RED compliant product (i.e. percentage of Bonsucro/Bonsucro EU-RED entering material + conversion factors). Examples of multiple products include, juice and bagasse following the crushing of sugarcane, sugar and molasses following the processing of sugarcane juice and ethanol and vinasse following the fermentation of molasses or cane juice.

Indicator EU 6.10: Carry over volumes of Bonsucro EU-RED ChoC certified product as Bonsucro CHoC certified
Volumes of Bonsucro EU-RED certified product can only be carried over to the next inventory period if the equivalent physical volume is in stock (refer to indicator EU 7.7). This requirement is absent in the Bonsucro ChoC Standard where volumes can be carried over even if there is no equivalent physical volume in stock (indicator 2.1.7. of the Bonsucro ChoC Standard). Therefore, if a Bonsucro EU-RED ChoC certified company ends an inventory period with available volumes in their account system but no more physical stock, that company cannot carry over their volumes as Bonsucro EU-

RED ChoC certified but can carry over the volumes as Bonsucro ChoC certified. This ability to transfer volumes from Bonsucro EU-RED ChoC compliant to Bonsucro ChoC compliant provides flexibility and opportunities to Bonsucro EU-RED certified companies. The opposite is strictly forbidden, i.e. transferring Bonsucro Choc certified material to Bonsucro EU-RED ChoC certified if the equivalent amount is in stock.
Bonsucro EU-RED ChoC certified volumes can only be traded in the physical market. Bonsucro ChoC certified volumes can either be traded as certified volumes in the physical market and/or as Bonsucro Credits via Credit Trading Platform.

5.4 Greenhouse gas emission savings: the use and production of biofuels, bioliquids and biomass fuels should lead to reductions in greenhouse gas emissions compared to fossil fuels (requirements for supply chain operators)

Indicator 7.1: Options for the greenhouse gas criterion for biofuels, bioliquids and biomass fuels (supply chain operators)
Supply chain operators shall use one of the following options for the greenhouse gas criterion for biofuels, bioliquids and biomass fuels:

a. Use of a default value for greenhouse gas emission saving if the production pathway is laid down in Part A or B of Annex V of REDII for biofuels and bioliquids and in Part A of Annex VI of REDII for biomass fuels. Default values can only be applied if the el value for those biofuels or bioliquids calculated in accordance with point 7 of Part C of Annex V of REDII and for those biomass fuels calculated in accordance with point 7 of Part B of Annex VI of REDII is equal or less than zero;
b. Use of actual greenhouse gas values to calculate total greenhouse gas savings according to the REDII methodology and specified in Part C of Annex V of REDII for biofuels and bioliquids and in Part B of Annex VI of REDII for biomass fuels;
c. For biofuels and bioliquids, use of a value calculated as the sum of the formulas referred to in point 1 of Part C of Annex V of REDII, where disaggregated default values in Part D or E of Annex V of REDII may be used for some factors and actual value, calculated in accordance with the methodology laid down in Part C of Annex V of REDII, are used for all other factors;
d. For biomass fuels, use of a value calculated as the sum of the formulas referred to in point 1 of Part B of Annex VI of REDII, where disaggregated default values in Part C of Annex VI of REDII may be used for some factors, and actual values, calculated in accordance with the methodology laid down in Part B of Annex VI of REDII, are used for all other factors.

Detailed requirements and guidance on the use of default values and actual values have been elaborated in Annex 1 of this Standard.

6. Requirements for the certification bodies and for the Bonsucro EU-RED certification process

6.1 General

This chapter specifies requirements for certification bodies and auditors that perform Bonsucro EU-RED audits. It also specifies requirements for the Bonsucro EU-RED certification process and for audit reporting.

The requirements laid down in this chapter are additional to the generic requirements laid down in the Bonsucro Certification Protocol, the Bonsucro Additional Requirements – certificate, and the Bonsucro Accreditation and Oversight Procedures. If there is a conflict between the specific Bonsucro EU-RED requirements in this chapter and the requirements laid down in the Bonsucro Certification Protocol, the Bonsucro Additional Requirements - certificate and/or the Bonsucro Accreditation and Oversight Procedures, the Bonsucro EU-RED requirements shall take precedence.

Note:
The Bonsucro Certification Protocol V5.1 includes references to additional mandatory requirements for biofuels under the EU Renewable Energy Directive (2009/28/EC) and revised Fuel Quality Directive (2009/30/EC)', in particular in Part B and Part C of the Protocol. The requirements specified in this chapter take precedence over the EU-RED requirements laid down in the Certification Protocol V5.1, meaning that the latter requirements are no longer valid. In the new version of the Bonsucro Certification Protocol, specific EU-RED requirements will be removed.

6.2 Accreditation of certification bodies

6.2.1 RED2 accreditation

The certification body office performing the Bonsucro EU-RED audit shall be accredited to ISO 17021 or ISO 17065. Accreditation to ISO 17021 or 17065 shall be to the scope of the RED recast, or alternatively to the scope to another RED2 approved voluntary scheme for a scope that as is similar to the scope of Bonsucro EU-RED, or alternatively to Bonsucro EU-RED.

Certification bodies performing Bonsucro EU-RED audits shall be accredited by:

- An accreditation body referred to in Article 4 of Regulation (EC) No 765/2008; or
- An accreditation body having a bilateral agreement with the European Cooperation for Accreditation; or
- A national accreditation body affiliated to the International Accreditation Forum (IAF).

6.2.2 Accreditation to Bonsucro EU-RED scheme

In addition to the mandatory accreditation requirements specified in 6.2.1 the certification body office shall also be accredited to Bonsucro EU-RED scheme by Bonsucro (Full Member of ISEAL) upon recommendation by an assessing / oversight body contracted by Bonsucro. The assessing / oversight body contracted by Bonsucro shall deliver all accreditation and oversight assessments, follow up on corrective actions and recommend accreditation decision to Bonsucro (grant, maintain, suspend or withdraw accreditation.
The assessing / oversight body can be:

- An accreditation body referred to in Article 4 of Regulation (EC) No 765/2008; or

- An accreditation body having a bilateral agreement with the European Cooperation for Accreditation; or
- A national accreditation body affiliated to the International Accreditation Forum (IAF).
- Full or Associate Member of ISEAL.

Upon request from EU competent authorities, certification bodies performing Bonsucro EU-RED audits shall make relevant information available within the limits of the confidentiality agreement signed with the economic operators they audit.

The Bonsucro website lists certification bodies accredited to perform Bonsucro EU-RED audits. This also includes the entity or national public authority that recognised the certification body and is monitoring it.

6.3 Supervision of operation of certification bodies by EU Member Sates

Certification bodies shall submit to competent authorities in EU Member States, upon their request , all relevant information necessary to supervise the operation including the exact date, time, and location of audits (as per Article 30(9) of REDII).

This requirement shall be included in contractual arrangement between certification bodies and the economic operators they audit.

6.4 Documentation management of certification bodies

Certification bodies performing audits against the Bonsucro EU-RED Standard shall have a documentation management system that addresses each of the following elements:

i) General management system documentation (e.g. manual, policies, definition of responsibilities);
ii) control of documents; control of records;
iii) management review of management system;
iv) internal audit;
v) procedures for identification and management of non-conformities during internal audits; and
vi) procedures for taking preventive actions to eliminate the causes of potential non-conformities.

Documentation shall be kept for a minimum of 5 years, or longer if required by the relevant national authority.

6.5 Training of certification bodies

Bonsucro holds regular online training courses for certification bodies via the Bonsucro Academy.

Bonsucro requires lead auditors shall undergo the Bonsucro qualification exam. Other auditors included in an audit team shall be trained by the certification body.

The Bonsucro Certification Protocol requires the certification body to witness the auditors' performance. Bonsucro checks that the certification body does monitor their auditors during the annual head office and witness assessments.

Lead auditors shall undergo refresher training and requalification exam every 3 years. In case a new version of a Bonsucro Standard or Protocol is published, an additional training and exam is required.

Bonsucro keeps a register of qualified certification body staff, including lead auditors, auditors and technical managers. The monitoring of qualification is the primary responsibility of the certification body technical manager (as per Bonsucro Certification Protocol). Bonsucro checks that the certification body monitors its staff qualification during the annual head office and witness assessments.

Bonsucro will provide guidance to certification bodies, as required, on aspects that are relevant to the certification process. This can e.g. include guidance on the assessment of specific Bonsucro EU-RED sustainability requirements for mills and/or the supply chain (greenhouse gas data assessments & calculations, land use criteria, etc.), guidance on the auditing process and on reporting requirements (audit report requirements, reporting requirements to EC, etc.).

Bonsucro may take the initiative to provide guidance to all certification bodies performing Bonsucro and/or Bonsucro EU-RED audits. Alternatively, a certification body can bring a specific case to Bonsucro and check their interpretation of the requirements with Bonsucro. Depending on the case, Bonsucro might redirect the certification body to the correct document (standard, protocol, guidance, external documents from the EC..), or release an interpretation note regarding a specific point of the Bonsucro standards, certification protocol, or related scheme documents.

6.6 Audit team competencies

The certification body shall have a process for selecting and appointing the audit team set out in ISO 19011, taking into account the competence needed to achieve the objectives of the audit. This process shall ensure that auditors are independent of the activity being audited and free from conflict of interest.The Bonsucro Certification Protocol details how this shall be done.

The audit team shall have the appropriate specific skills necessary for conducting the audit related to the requirements of Bonsucro EU-RED scheme, and in accordance with the audit scope. If there is only one auditor, the auditor shall have the competence to perform the duties of an audit team leader applicable for that audit. The audit team may be supplemented by technical experts, as required, who shall operate under the direction of an auditor. The certification body shall also ensure that the certification decision is taken by a technical reviewer that was not part of the audit team.

6.7 Auditor competencies for audits related to the Bonsucro EU-RED Standard

Auditors shall have the appropriate specific skills necessary for conducting the audit related to the Bonsucro EU-RED Standard, namely:

1. Land use criteria: Experience in agriculture, agronomy, ecology, natural science, forestry, silviculture or similar. Note that verifying compliance with the highly biodiverse grasslands criterion partially requires technical knowledge that goes beyond the competences that can be expected from the auditors verifying the claims made by market operators (e.g. assessing whether a grassland would remain grassland in the absence of human intervention and maintains the natural species composition and ecological characteristics and processes).
2. Greenhouse gas criteria: A minimum of two years' experience in biofuels lifecycle assessment, and specific experience in auditing greenhouse gas emission calculations

following the REDII calculation methodology. Relevant experience is depending on the type of audits to be conducted by the individual auditor. Note that verifying soil organic carbon levels for the purpose of applying the emission saving credit for soil carbon accumulation (esca) requires specific technical knowledge (e.g. soil science).

3. Chain of Custody criteria: Experience in mass balance systems, supply chain logistics, book keeping, traceability, data handling or similar.

6.8 Management of the audit

Audits against the Bonsucro EU-RED Standard shall be in line with ISO 19011 or justified equivalent

The audit against the Bonsucro EU-RED Standard shall include:

a. Identification of the activities undertaken by the economic operator which are relevant to the scope of the Bonsucro EU-RED Standard and its requirements;
b. Identification of the relevant systems of the economic operator and its overall economic operator with respect to the Bonsucro EU-RED requirements and checks for the effective implementation of relevant control systems;
c. Analysis of the risks which could lead to a material misstatement by the auditor, based on the verifier's professional knowledge and the information submitted by the economic operator;
d. Draw up a verification plan which corresponds to the risk analysis and the scope and complexity of the economic operator's activities related to the Bonsucro EU-RED Standard and its requirements, and which de fines the sampling methods to be used with respect to that operator's activities;
e. Carry out the verification plan by gathering evidence in accordance with the defined sampling methods, plus all relevant additional evidence, upon which the verifier's verification conclusion will be based; and
f. Request the operator to provide any missing elements of audit trails, explain variations, or revise claims or calculations, before reaching a final verification conclusion.

All audit reports shall be submitted to the Bonsucro secretariat. Audit reports shall include actual value GHG emission calculations including related background evidence on the application of GHG emission saving credits (e_{sca}), where applicable. Time spent on Bonsucro EURED audits (field visit, desk research) shall be documented by certification bodies and is monitored by the Bonsucro secretariat.

6.9 Bonsucro EU-RED requirements for auditing of farms

Under the generic Bonsucro Production Standard, a certificate holder can either be:

- a mill with a cane growing supply area, either land owned or leased by the mill. Technically this is one site and not a group, but the auditors take a risk-based sampling approach to visiting the different plots of lands (in Brazil they refer to these as ‘farms’);
- a mill with a cane growing supply area which includes independent farmers. The mill retains the responsibility for the conformity of the farmers to the Standards. The auditors take a risk-based sampling approach to visiting the farmers.

From a certification protocol Bonsucro considers every production standard audit as a group audit in its approach to sampling sites visited, even when the certificate holder is technically not a group.

In addition to the requirements for mills in the Bonsucro Certification Protocol, the following requirements for audits of individual farms shall apply under Bonsucro EU-RED

a. The audit sample must be representative of the whole group and determined using a combination of risk and random selection (random selection must be used to select a minimum of 25% of the sample). The farms selected for audit should vary from year to year.
b. The certification body shall verify that the group manager undertakes an internal review of the performance of each farm/site at least annually to assess the effectiveness of the documented procedures and the conformity of the sites against the Bonsucro EU-RED Standard and that appropriate non-conformities are issued.
c. When one sampled farm/site within the group is found not to be in conformity, the auditor, the certification body shall determine whether the issue is specific to one site or applies systematically to the whole group, in which case the certification body may suspend all sites included in the certification. If the issue applies specifically to one or some sites, the certification of the site(s) concerned shall be suspended.
d. For groups, a systemic non-conformity for a group manager or site is raised if there is a failure to meet a Standard requirement. A site-specific systemic non-conformity shall also apply to the Group Manager.
e. For Groups, an incidental non-conformity for a Group Manager or Site is raised if there is a failure to meet a Standard requirement but which can be considered a temporary lapse or is unusual/non-systemic: a site-specific incidental non-conformity shall also apply to the Group Manager

N.B. the above requirements will become applicable to all mills in the new Certification Protocol.

6.10 Specific aspects relevant for audits of actual GHG emission calculations

Economic operators can only make actual GHG values claims after the capability to conduct actual value calculations has been verified by an auditor during an audit.

Economic operators shall make available to auditors all relevant information concerning the calculation of actual GHG emissions in advance of the planned audit. This includes input data and any relevant evidence, information on the emission factors and standard values applied and their reference sources, GHG emission calculations and evidence relating to the application of GHG emission saving credits (, e_{sca}).

The auditor shall record the emissions occurring at the audited site in the audit report. For the processing of final fuels, the auditor shall record the emissions after allocation and the achieved savings. Should the emissions deviate significantly from typical values the report has to include information that explains the deviation.

Audit reports shall include actual value GHG emission calculations including related background evidence on the application of GHG emission saving credits (e_{sca}) where applicable.

Upon request Bonsucro will provide to the European Commission timely access to actual GHG calculations certified under the Bonsucro EU-RED Standard.

6.11 Specific aspects relevant for audits of mass balance systems

Economic operators shall make available to auditors all Bonsucro EU-RED mass balance data in advance of the planned audit.

For an initial certification audit before participation in a scheme, the auditor shall check the existence and set-up of the Bonsucro EU-RED mass balance system.

For annual audits thereafter, the auditor shall check at least the following:

a. List of all sites that are under the scope of Bonsucro EU-RED certification. Each site shall have its own mass balance records;
b. List of all inputs per site, including description of materials and details of all suppliers.
c. List of all outputs per site, including description of materials and details of all customers
d. Conversion factors applied;
e. Mass balance timeframe should be transparent, documented and consistent, and an appropriate period of time (refer to Chapter 5 for details);
f. A sample of the calculations (inputs, outputs, conversion factors, and any balances carried forward). All data should be checked against the book keeping system;
g. Inputs and outputs should be accompanied, where relevant, by a set of sustainability characteristics. Auditors should check that sustainability characteristics have been allocated appropriately. At the end of the mass balance period, the sustainability data carried forward should be equivalent to the physical stock .

Note: The mass balance records must contain information on both the inputs and the outputs of sustainable and unsustainable material (including where relevant fossil fuels) handled by the sites, and make a clear distinction between Bonsucro compliant material and Bonsucro EU-RED compliant material.

6.12 Requirements for expert on highly biodiverse grassland

Assessing whether grassland maintains the natural species composition and ecological characteristics and processes and whether grassland is species-rich can only be done by experts that have acquired specific qualifications for this purpose. Audit teams must include at least one member with documented expertise as noted below. These experts must be external to the target of the assessment, independent of the activity being audited and free from conflict of interest.

The required qualifications of the expert shall entail:

- Successfully completed tertiary education with a focus on biology and/or biodiversity;
- A specific qualification for the purpose of assessing the biodiversity of an area, e.g. for assessing whether grassland is species-rich and whether grassland maintains the natural species composition and ecological characteristics and processes;
- Knowledge about the practical application of biodiversity assessment tools;
- Knowledge of relevant regional and local conditions;
- Practical experience with geographic information systems (GIS) and remote sensing tools.

The role of the expert is to establish case by case whether a specific piece of land is, or in case of conversion, was highly biodiverse grassland. Such an assessment does not need to be done annually. Often, it is sufficient that it is done once e.g. if a piece of grassland is converted to sugarcane plantings.

Note: The role of the independent auditor is to assess whether the economic operator has shown compliance with the Bonsucro EU-RED Standard and document such compliance or any identified non-conformities.

6.13 Non-conformities, corrective actions and certification decision

Any non-conformity against the Bonsucro EU-RED requirements shall be raised as a major non-conformity.

If non-conformities against the Bonsucro EU-RED requirements are identified during the initial audit or the re-certification audit, no certification shall take place until all non-conformities have been closed.

If non-conformities against the Bonsucro EU-RED requirements are identified during the surveillance audit, an action plan shall be agreed and a maximum of 3 months shall be given to the economic operator to close non-conformities from date of the audit closing meeting. The contents of the action plan, details for implementation and follow up audits shall follow the requirements laid down in the Bonsucro Certification Protocol.

6.14 Establishment of at least a "limited assurance level" when conducting audits

Audits shall include control of quantitative claims made by operators, in particular in relation to mass balance data and greenhouse gas data. Based on the sampling of data, the auditor shall produce an audit statement specifying that at least the level of limited assurance was used, based on the guidelines laid down in the International Standard on Assurance Engagements (ISAE) 3000 (Revised), of the International Federation of Accountants (IFAC).

The European Commission has specified a limited assurance level as follows: 'it implies a reduction in risk to an acceptable level as the basis for a negative form of expression by the auditor such as 'based on our assessment nothing has come to our attention to cause us to believe that there are errors in the evidence', whereas a 'reasonable reassurance level' implies a reduction in risk to an acceptably low level as the basis for a positive form of expression such as 'based on our assessment, the evidence is free from material misstatement'.

The audit statement specifying the level of limited assurance, shall be included in the auditor's Bonsucro EU-RED audit report.

An example text for the audit statement is the following:
'Based on the assessment findings on-site, we verify that there are no significant issues or intentional errors in the evidence made available.
The findings are reasonably free from any material misstatement.

The assessment findings are limited to accuracy of the data and information as presented by [Operator] which has been sampled and was verified at the time of the assessment for this Bonsucro EU-RED report. Based on the documents and records presented during the on-site verifications made, it is concluded that [Operator] has been able to comply with the requirements of the Bonsucro EU-RED requirements.

7.REDII requirements for Bonsucro as voluntary scheme (owner)

7.1 General

This chapter details REDII requirements that apply to Bonsucro as voluntary scheme (owner). It specifies the procedures which Bonsucro has in place to comply with these requirements, in particular in relation:

- Recognition of other voluntary schemes and transparency on other scheme participation (7.2);
- Recognition of national schemes (7.3);
- Scheme transparency and reporting to the European Commission (7.4);
- Support for the European Commission in fulfilling its duties set out in Article 30(8) and Article 30(10) of REDII (7.5);
- Complaint procedure (7.6);
- Internal monitoring (7.7).

7.2 Other EC approved voluntary schemes

Recognition of other voluntary schemes

As a full member of ISEAL, Bonsucro supports ISEAL's processes for standards development and the requirements for the Assurance Code and Impact Reporting. Bonsucro encourages continued growth in the uptake of these best practices. Therefore, Bonsucro's first requirement for recognition of other voluntary schemes is full ISEAL membership. Furthermore, potential recognition will be restricted to voluntary schemes that are recognised by the European Commission in the context of EU-REDII (Directive 2018/2001), and only for the scope of the voluntary scheme that the EC recognises in this context.

Upon further review an independent decision will be taken regarding potential recognition of another voluntary scheme.

Transparency on other voluntary scheme participation

Economic operators that wish to apply for Bonsucro EU-RED certification shall upon registration disclose to Bonsucro whether they are a current or previous participant of another voluntary scheme, and also whether they had a different legal form or name in the past 12 months. Bonsucro will cross-check this information against other voluntary scheme certificate lists and also carry out customer Due Diligence/ Know Your Customer (in particular on companies with a limited trading history).

During the Bonsucro EU-RED audit, economic operators shall declare to the auditor the names of all EC approved voluntary biofuel schemes for they participate in. They shall make available all relevant information related to their participation in these schemes, including:

- volumes of sugar products that were produced including supply chain models that were used;
- volumes purchased and/or sold as certified by other EC approved voluntary schemes; and
- the audit reports of these schemes.

The Bonsucro EU-RED audit report shall contain details of all other EC approved voluntary schemes against which the operator has been certified (scheme name, certificate number, scope of certificate, validity period of certificate), as well as volumes of sugar products produced, purchased and/or sold with a certificate of those schemes.

The Bonsucro website (http://www.bonsucro.com/certified-members-3/) contains a list of economic operators that are Bonsucro and Bonsucro EU-RED certified, including details on the scope of certification and the volume certified, and the validity period of the certificate.

Prior to re-certification of any economic operator that was previously found to be in major non-compliance with this requirement, or any other aspect of the mandatory sustainability criteria in this standard, the auditor shall be required to bring this to the attention of Bonsucro (this requirement applies to all voluntary schemes that the economic operator is participating in).

7.3 Recognition of national schemes

The European Commission may recognise national schemes from EU countries as being in compliance with the conditions set out in REDII. Bonsucro will automatically recognise those schemes as regards the verification of compliance with the sustainability criteria set out in Articles 29(2) to (7) and (10) and the GHG savings thresholds set in Article 25(2) of REDII.

A Bonsucro EU-RED certified supply chain operator who receives products verified against an EC approved and recognised national scheme shall consider that product to be in compliance with REDII sustainability criteria set out in Articles set out in Articles 29(2) to (7) and (10) and the GHG savings thresholds set in Article 25(2).

7.4 Transparency

The Bonsucro website (www.bonsucro.com) contains details on the governance structure of Bonsucro and its ownership structure, the composition and experience of the Board of Directors, as well as contact details of the Bonsucro Secretariat.

The Bonsucro website also lists all approved Bonsucro and Bonsucro EU-RED scheme documentation, including revisions/updates and guidance documentation. Potential revisions are also found there during the time they are open for stakeholder consultation. The website also contains:

- A list of economic operators that are currently Bonsucro and Bonsucro EU-RED, including details on the scope of the certificate, its validity period. The list also includes up-to-date information on the withdrawal or suspension of certificates;
- Certification bodies which Bonsucro has approved to conduct Bonsucro EU-RED audits, including the entity or national public authority that the certification body was recognised by and is monitoring it.
- Names and scope of voluntary schemes recognised by Bonsucro.

Annual reporting to the European Commission

Bonsucro will submit an annual report to the European Commission by 30 April every year, covering the previous calendar year, including information concerning the operation of the Bonsucro EU-RED scheme. More in particular, the report will contain information in relation to:

a. The independence, modality and frequency of audits, both in relation to what is stated regarding those aspects in the scheme documentation, at the time the scheme concerned was approved by the Commission, and in relation to industry best practice;
b. The availability of, and experience and transparency in the application of, methods for identifying and dealing with non-compliance, with particular regard to dealing with situations or allegations of serious wrongdoing on the part of members of the scheme;
c. Transparency, particularly in relation to the accessibility of the scheme, the availability of translations in the applicable languages of the countries and regions from which raw

materials originate, the accessibility of a list of certified operators and relevant certificates, and the accessibility of auditor reports;

d. Stakeholder involvement, particularly as regards the consultation of indigenous and local communities prior to decision making during the drafting and reviewing of the scheme as well as during audits and the response to their contributions;
e. The overall robustness of the scheme, particularly in light of rules on the accreditation, qualification and independence of auditors and relevant scheme bodies;
f. Market updates of the scheme, the amount of feedstock's and biofuels certified, by country of origin and type, the number of participants (PART C on Production Volumes);
g. The ease and effectiveness of implementing a system that tracks the proof of conformity with the sustainability criteria that the scheme gives to its member(s), such a system intended to serve as a means of preventing fraudulent activity with a view, in particular, to the detection, treatment and follow-up of suspected fraud and other irregularities and, where appropriate, the number of cases of fraud or irregularities detected;
h. Options for entities to be authorized to recognise and monitor certification bodies;
i. Criteria for the recognition or accreditation of certification bodies;
j. Rules on how the monitoring of the certification bodies is to be conducted;
k. Possibilities for facilitating or improving the promotion of best practice.

The report will be prepared by the Bonsucro Secretariat in accordance with the requirements set by the European Commission (as outline above or otherwise updated by EC). For the preparation of this report, including collection of market data information, the Bonsucro Secretariat will make use of Bonsucro members' Annual Reports on Continuous Improvement', Bonsucro's Monitoring & Evaluation System
(www.bonsucro.com/monitoring-evaluation), Bonsucro EU RED audit reports and other resources.

7.5 Support for the European Commission in fulfilling its duties set out in Article 30(8) and Article 30(10) of REDII

Upon request of a Member State, or its own initiative, the European Commission may be required to investigate whether voluntary schemes operate according to the rules or to examine whether the sustainability and greenhouse gas emissions saving criteria in relation to a particular consignment are met.

Bonsucro will support the Commission in this effort and will ensure via procedures as well as contractual arrangements with participating operators and certification bodies that relevant data can be made available upon request, such as audit reports and actual greenhouse gas calculations.

Bonsucro will ensure that Bonsucro EU-RED certified economic operators enter all relevant requested information in the Union database as soon as the database starts operation. Certification bodies will check during audits that Bonsucro EU-RED certified economic operators have fulfilled this obligation (also refer to Indicator 5.3).

7.6 Complaint procedure

The Bonsucro Complaints and Grievance Management System has been detailed on the Bonsucro website: https://www.bonsucro.com/complaints-and-grievances/. The table below summarises the Complaints and Grievance Management System.

The annual report to the European Commission will contain information on the type of complaints received (refer to Section 7.4).

3 pathways to complain / appeal about	Bonsucro Member (or applicant)'s actions	Certification Body' actions	Bonsucro actions

Option	Managed by	Filing	Applicable Case	Scope	Process Website link	Link to audit process	Conflict of Interest Management	Cases Records /registry maintained by
Candidacy public consultation	Bonsucro (Secretariat, Membership Committee and Board)	Online form	Complaining about an organisation applying for Bonsucro membership	Code of Conduct	https://www.bonsucro.com/complaints-and-grievances/organisation-applying-for-bonsucro-membership/	Bonsucro Membership is a pre-requisite to applying for certification	See Bonsucro Membership procedure	Bonsucro Secretariat
Bonsucro Member' own Grievance Mechanism	Bonsucro Member	No info	Complaining about an organisation that is a Bonsucro member (regardless if certified, applying for certification, or not certified)	Code of Conduct	https://www.bonsucro.com/complaints-and-grievances/organisation-is-a-bonsucro-member/ First option on the list	n/a	No info	Bonsucro member
Bonsucro Grievance Mechanism Rules	CEDR	Email	Complaining about an organisation that is a Bonsucro member (regardless if certified, applying for certification, or not certified)	Code of Conduct Bonsucro Standards	http://www.bonsucro.com/complaints-and-grievances/bonsucro-grievance-mechanism/	See Grievance Mechanism Rules: interaction with Certification Body is outlined in one of the steps	See Grievance Mechanism Rules: Independently managed by CEDR	CEDR + Cases published on Bonsucro website at specific points in the process.
Certification Body Complaint and	Certification Body	Email (1)	Complaining about an organisation that is a Bonsucro member and is	Bonsucro Standards	List of certification bodies procedures: http://www.bonsucro.com/complaints-and-grievances/complaining-to-certification-body/	See Certification Bodies'	See Certification Bodies' individual procedures. Certification bodies shall take into account complaints received from third parties when	Certification Bodies

Option	Managed by	Filing	Applicable Case	Scope	Process Website link	Link to audit process	Conflict of Interest Management	Cases Records /registry maintained by
Allegation Procedure			applying for certification			individual procedures	developing the risk assessment of the auditee, the audit plan and during the audit itself. It can for example lead to an audit approach in which certain sustainability risks are assessed in more depth taking into account the complaints filed in relation to those risks. Complaints may be filed at the Bonsucro member, and complaints/allegations communicated to the CB by Bonsucro or a third party.	
Certification Body Complaint and Allegation Procedure	Certification Body	Email	Complaining about an organisation that is a Bonsucro member and holds a Bonsucro certificate	Bonsucro Standards	List of certification bodies procedures: http://www.bonsucro.com/complaints-and-grievances/complaining-to-certification-body/	See Certification Bodies' individual procedures	See Certification Bodies' individual procedures Certification bodies shall take into account complaints received from third parties when developing the audit plan and during the audit itself. This includes complaints filed at the Bonsucro member, and complaints/allegations communicated to the CB by Bonsucro or a third party.	Certification Bodies
Bonsucro Survey	Bonsucro	Online Form	Client raising concerns about their Certification Body	Certification Protocol	http://www.bonsucro.com/complaints-and-grievances/client-of-bonsucro-licensed-certification-body/ First option on the list	Can inform CBs' oversight process (and indirectly audit if applicable)	Will be integrated in next version of Accreditation and Oversight Procedure	Bonsucro
Certification Body Appeal and Complaint Procedure	Certification Body	Email	Client complaining about their Certification Body or appealing decision	Certification Protocol	List of certification bodies procedures: http://www.bonsucro.com/complaints-and-grievances/complaining-to-certification-body/	See Certification Bodies'	See Certification Bodies' individual procedures	Certification Bodies

Option	Managed by	Filing	Applicable Case	Scope	Process Website link	Link to audit process	Conflict of Interest Management	Cases Records /registry maintained by
						individual procedures		
Escalation to Bonsucro	Bonsucro	Email	Client complaining about their Certification Body or appealing decision	Certification Protocol	http://www.bonsucro.com/complaints-and-grievances/client-of-bonsucro-licensed-certification-body/ Third option on the list	Can inform CBs' oversight process (and indirectly audit if applicable)	Will be integrated in next version of Accreditation and Oversight Procedure	Bonsucro
Certification Body Complaint and Allegation Procedure	Certification Body	Email	Third Party complaining about a Certification Body	Certification Protocol	List of certification bodies procedures: http://www.bonsucro.com/complaints-and-grievances/complaining-to-certification-body/	See Certification Bodies' individual procedures	See Certification Bodies' individual procedures	Certification Bodies
Escalation to Bonsucro	Bonsucro	Email	Third Party complaining about a Certification Body	Certification Protocol	http://www.bonsucro.com/complaints-and-grievances/third-party-organisation-or-individual/ Second option on the list	Can inform CBs' oversight process (and indirectly audit if applicable)	Will be integrated in next version of Accreditation and Oversight Procedure	Bonsucro
Complaining about membership procedure	Bonsucro	Email	Candidate Member complaining about Bonsucro not follow its membership procedure	Membership procedure	http://www.bonsucro.com/complaints-and-grievances/bonsucro-candidate-member/	n/a	See Membership procedure	Bonsucro
Appealing a decision taken by Bonsucro or Complaining about Bonsucro Service	Bonsucro	Email	Bonsucro Member appealing a decision taken by Bonsucro or Complaining about Bonsucro Service	Applicable procedure or project agreement	http://www.bonsucro.com/complaints-and-grievances/bonsucro-member/	n/a	See Applicable procedure or project agreement	Bonsucro

Option	Managed by	Filing	Applicable Case	Scope	Process Website link	Link to audit process	Conflict of Interest Management	Cases Records /registry maintained by
Appealing a decision by Bonsucro to suspend or terminate a Certification Body licence	Bonsucro	Email	Bonsucro Licensed Certification Body appealing a decision by Bonsucro to suspend or terminate a Certification Body licence	Accreditation and Oversight Procedure	http://www.bonsucro.com/complaints-and-grievances/bonsucro-certification-body/ First option on the list	n/a	Will be integrated in next version of Accreditation and Oversight Procedure	Bonsucro
Appealing a decision by Bonsucro to deny an exemption application	Bonsucro	Email	Bonsucro Licensed Certification appealing a decision by Bonsucro to deny an exemption application	Exemption Procedure	http://www.bonsucro.com/complaints-and-grievances/bonsucro-certification-body/ Second option on the list	Yes	See Exemption Procedure	Bonsucro
Appealing a decision taken by Bonsucro or Complaining about Bonsucro Service	Bonsucro	Email	Bonsucro Licensed Certification Body (or applicant) appealing a decision by Bonsucro or Complaining about Bonsucro Service	Accreditation and Oversight Procedure or other applicable / Agreement	http://www.bonsucro.com/complaints-and-grievances/bonsucro-certification-body/ Third option on the list	Potentially	Will be integrated in next version of Accreditation and Oversight Procedure	Bonsucro
Appealing a decision by Bonsucro to suspend or terminate a Training Provider Licence	Bonsucro	Email	Bonsucro Licensed Training Provider appealing a decision by Bonsucro to suspend or terminate a Training Provider licence	Applicable procedure /agreement	http://www.bonsucro.com/complaints-and-grievances/a-bonsucro-licensed-training-provider/ First option on the list	n/a	Will be integrated in next version of Applicable procedure /agreement	Bonsucro
Appealing a decision taken by Bonsucro or Complaining about	Bonsucro	Email	Bonsucro Licensed Training Provider appealing a decision by Bonsucro or Complaining about Bonsucro Service	Applicable procedure /agreement	http://www.bonsucro.com/complaints-and-grievances/a-bonsucro-licensed-training-provider/ Second option on the list	n/a	Will be integrated in next version of Applicable procedure /agreement	Bonsucro

Option	Managed by	Filing	Applicable Case	Scope	Process Website link	Link to audit process	Conflict of Interest Management	Cases Records /registry maintained by
Bonsucro Service								
Appealing a decision taken by Bonsucro or Complaining about Bonsucro Service	Bonsucro	Email	Third Party appealing a decision by Bonsucro or Complaining about Bonsucro Service	Applicable procedure or project agreement	http://www.bonsucro.com/complaints-and-grievances/complaining-about-bonsucro-as-a-third-party/	n/a	Applicable procedure or project agreement	Bonsucro
Reporting / Complaining to ISEAL	ISEAL	Email	Complain about the outcome of a complaint to Bonsucro related to the operation of ISEAL system	Applicable ISEAL Code	http://www.bonsucro.com/complaints-and-grievances/reporting-to-a-third-party-organisation/ First option on the list	n/a	Independently managed by ISEAL	ISEAL
Contacting the European Commission	ISEAL	Email	Voicing your concerns regarding Bonsucro's implementation of RED2	RED2 publication	http://www.bonsucro.com/complaints-and-grievances/reporting-to-a-third-party-organisation/ Second option on the list	Potentially	Independently managed by the European Commission	European Commission

Although this is expected to change in the future, Bonsucro does not currently publish the date of upcoming audits and associated applicant and certification body's name. For this reason, when using this option, the complainant is given the option to email Bonsucro requesting for Bosnucro to forward their complaint / allegation to the relevant certification body. See http://www.bonsucro.com/complaints-and-grievances/organisation-is-a-bonsucro-member-and-is-applying-for-bonsucro-certification/ Second option on the list.

Additional clarification on the Bonsucro Grievance Mechanism: appointment of the Adjudicator/Administrator, and procedure to avoid conflict of interest in decision making
The Bonsucro Grievance Mechanism (GM) is one of the options offered to complain about a Bonsucro member. This mechanism is managed by CEDR (Centre for Effective Dispute Resolution), an independent third party (independent from Bonsucro, the certification bodies, the members etc.). CEDR is a well-established and highly respected organisation, at the forefront of providing mediation services for commercial disputes. CEDR's partnership with Bonsucro is aligned with its development of alternative dispute mechanisms in the field of human rights.
The partnership between Bonsucroe and CEDR is in response to the strong demand from stakeholders that Bonsucro's newly developed Grievance Mechanism offers mediation, with a fair and independent process to determine the validity of allegations and any subsequent action to be taken.
The independence of the adjudicator/administrator and the procedure to avoid conflict of interest in decision making has been detailed in grievance mechanism rules paragraphs 1.2 and 1.3. More information on this point is contained in the service contract between Bonsucro and CEDR (confidential).

7.7 Internal monitoring

Bonsucro's system for internal monitoring has been detailed in the following documents:

- The Bonsucro Certification Protocol, in particular Part A;
- The Bonsucro Accreditation and Oversight Procedures, Version 2 of 18 May 2018;
- The Bonsucro Complaints & Grievance Management System .

Results of the internal monitoring activities are evaluated on an annual basis by the Bonsucro secretariat. Depending on results and key issues identified, this may lead to one or more of the following actions:

- Publication of guidance documents for economic operators (producers and/or supply chain) and/or for certification bodies, providing guidance & clarification on specific aspects of the Bonsucro standards;
- Trainings for economic operators or certification bodies, providing guidance & clarification on specific aspects of the Bonsucro standards;
- Harmonisation meetings for certification bodies, to ensure harmonized auditing practices.

Guidance documents, trainings and other meetings may apply globally, or be developed for specific countries/regions (depending on needs assessment based on internal monitoring results).

Customer Due Diligence/Know your Customer
Bonsucro performs a due diligence of all organisations applying for Bonsucro membership, including a public consultation process.

The sources of information considered by Bonsucro include the following:

- Information submitted by the company (self-assessment questionnaire against Bonsucro Code of Conduct and evidence);
- Comments submitted during the 30 day-public consultation period (for applicant members only);
- Publicly available news/information in connection with the company;
- Online media checks to find out any news stories and/or human rights issues being publicly reported on that might raise the risk rating.

The information collected is checked by the Bonsucro against a risk-assessment framework developed in line with the Code of Conduct, and taking into account any comments received during the public consultation process.

The risk assessment informs the Bonsucro decision on membership based on a grading of risk which takes account of the following:

- Company is / is applying for a single membership or membership cohort;
- Company's human rights policy;
- Company's commitments to international/sector-specific standards;
- Company's risk identification & assessment;
- Company's risk management;
- Company's remediation / grievance mechanism;
- Findings or allegations of non-compliance with applicable laws;
- Adverse findings by a court, or other judicial body;
- Complaints to a non-judicial grievance process;
- Existence of any previous complaints or comments/rejections;
- Location of the organization;
- On line searches for any publicly available stories/news in connection with the company and relevant to the risk assessment;
- Comments received during 30 days candidacy period;
- Any other information gathered through informal communications, social media, networks.

N.B. Please note that Bonsucro periodically reviews its due diligence process to improve it, which might lead to an updated of the above list of information which is being considered.

Annex I Bonsucro EU-RED GHG calculation methodology

1.Introduction

One of the key requirements in EU-RED is a minimum level of greenhouse gas savings for final biofuels, bioliquids and biomass fuels compared to fossil fuel alternatives. The greenhouse gas emission savings from the use of biofuels, bioliquids and biomass fuels shall be:

a. at least 50 % for biofuels, biogas consumed in the transport sector, and bioliquids produced in installations in operation on or before 5 October 2015;
b. at least 60 % for biofuels, biogas consumed in the transport sector, and bioliquids produced in installations starting operation from 6 October 2015 until 31 December 2020;
c. at least 65 % for biofuels, biogas consumed in the transport sector, and bioliquids produced in installations starting operation from 1 January 2021;
d. at least 70 % for electricity, heating and cooling production from biomass fuels used in installations starting operation from 1 January 2021 until 31 December 2025,
e. and 80 % for installations starting operation from 1 January 2026.

An installation shall be considered to be in operation once the physical production of fuel, heat or cooling, or electricity has started (i.e. once the production of fuels including biofuels, biogas or bioliquids, or production of heat, cooling or electricity from biomass fuels has started).

EU-RED allows three options to comply with the greenhouse requirement: use of default values, calculation of actual values, or using a combination of disaggregated default values and calculated actual values.

This annex specifies how operators which wish to become or remain Bonsucro EU-RED certified can comply with the greenhouse gas criterion. Section 2 specifies general GHG requirements. Section 3 details the GHG calculation methodology for biofuels and bioliquids, and Section 4 details the GHG calculation methodology for biomass fuels.

2. General requirements

2.1 Options for the Bonsucro EU-RED GHG requirements

Supply chain operators shall use one of the following options for the greenhouse gas criterion for biofuels, bioliquids and biomass fuels:

a. Use of a default value for greenhouse gas emission saving if the production pathway is laid down in Part A or B of Annex V of REDII for biofuels and bioliquids and in Part A of Annex VI of EU-RED for biomass fuels. Default values can only be applied if the el value for those biofuels or bioliquids calculated in accordance with point 7 of Part C of Annex V of REDII and for those biomass fuels calculated in accordance with point 7 of Part B of Annex VI of -REDII is equal or less than zero;
b. Use of actual greenhouse gas values to calculate total greenhouse gas savings according to the REDII methodology and specified in Part C of Annex V of REDII for biofuels and bioliquids and in Part B of Annex VI of REDII for biomass fuels;
c. For biofuels and bioliquids, use of a value calculated as the sum of the formulas referred to in point 1 of Part C of Annex V of REDII, where disaggregated default values in Part D or E or Annex V of REDII may be used for some factors and actual value, calculated in accordance with the methodology laid down in Part C of Annex V of REDII, are used for all other factors;
d. For biomass fuels, use of a value calculated as the sum of the formulas referred to in point 1 of Part B of Annex VI of REDII, where disaggregated default values in Part C of Annex VI of REDII may be used for some factors, and actual values, calculated in accordance with the methodology laid down in Part B of Annex VI, are used for all other factors.

Detailed requirements and guidance on the use of default values and actual values have been elaborated below:

Use of default values

Default values listed in Annexes V and VI of REDII can only be applied if the process technology and feedstock used for the production of the biofuel match their description and scope, and also in the case of biomass fuels the transport distance. In case specific technologies are set out, the default values can only be used if those technologies were actually applied.

Note: Some of the default values were subject to minor revisions and updates were published in the REDII corrigenda published on 25 September. The default values in Annex V and Annex VI of REDII may be subject to further revisions in future. Any updates by the European Commission will become valid under Bonsucro EU-RED requirements. It is the responsibility of the auditor to check that economic operators are using the most up to date default values.

Use of disaggregated default values

Annex V and Annex VI of REDII also list disaggregated default values. Disaggregated default values relate to GHG emissions in part of the supply chain/biofuel production pathway, and can be used in combination with actual values to calculate overall GHG emissions and emission savings.

Producers and supply chain operators may use disaggregated default values for cultivation (e_{ec}) processing (e_p) and/or transport and distribution (e_{td}) specified in Annex V and Annex VI of EU-RED. These disaggregated default values can be combined with other disaggregated default values representing other parts of the supply chain, or with actual values for that part of the supply chain.

Annex V and Annex VI of EU-RED do not provide default emission values for land use change (e_l). This means that if a disaggregated default value is used for cultivation (e_{ec}), an actual GHG emission value for land use change will need to be added.

If supply chain operators use a combination of disaggregated default values and actual values and/or change from disaggregated default values to actual values this shall be done in accordance with the methodology presented in this document (refer to Chapter 4).

Producers and supply chain operators shall clearly communicate to the next economic operator that disaggregated default values or a combination of disaggregated default values and actual values is used for the REDII GHG criterion.

Note: Some of the disaggregated default values were subject to minor revisions and updates were published in the REDII corrigenda published on 25 September. The disaggregated default values in Annex V and Annex VI of REDII may be subject to further revisions in future. Any updates by the European Commission will become valid under Bonsucro EU-RED requirements. It is the responsibility of the auditor to check that economic operators are using the most up to date disaggregated default values.

Use of actual values

Producers are only allowed to use actual GHG values after the capability to conduct GHG emission calculations has been verified by an auditor. Such a verification shall be performed during the audit of the producer prior to this issuance of the first Bonsucro EU-RED certification.

Information on actual GHG emissions has to be provided for all relevant elements of the GHG emission calculation formula. 'Relevant' refers in this context to elements for which reporting is obligatory (e.g. e_l in case of land use change), all elements for which actual values should be used instead of disaggregated default values and all elements related to emission savings (if applicable). If at any point of the chain of custody emissions have occurred and are not recorded, so that the calculation of an actual value is no longer feasible for operators downstream in the chain of custody, this must be clearly indicated in the delivery notes.

When using actual values, at each step of the chain of custody, GHG emission estimates shall be added to the GHG value included in the documentation to the consignment purchased from the previous operator in the chain of custody.
The following GHG emissions shall be considered:

- Additional emissions from transport and/or processing have to be added to e_p and/or e_{td} respectively.
- Energy losses occurred during processing or if relevant transportation or storage have to be taken into account using a 'feedstock factor'. This applies to each processing step, but can be also relevant for other steps in the chain of custody e.g. drying of feedstock (refer to section 3 and 4 for details).
- Whenever a processing step yields co-products, emissions need to be allocated using an 'allocation factor' following the rules set out in the GHG emission calculation methodology (refer to section 3 and 4 for details).
- The actual greenhouse gas data shall be communicated to the next economic operator. The greenhouse gas intensity shall be expressed as kg $CO_{2\text{-}eq}$/dry-tonne feedstock or intermediary product, or as g $CO_{2\text{-}eq}$/MJ biofuel, bioliquid or biomass fuel. This means that at the last processing step the emission estimate needs to be converted into the unit g $CO_{2\text{-}eq}$/MJ of final biofuel, bioliquid or biomass fuel.

Actual values can only be calculated when all relevant information is available and transmitted through the chain of custody:

a. Actual values of emissions from cultivation can only be determined at the origin of the chain of custody.
b. Actual values of emissions from transport can only be determined if emissions of all transport steps are recorded and transmitted through the chain of custody.
c. Actual values of emissions from processing can only be determined if emissions of all processing steps are recorded and transmitted through the chain of custody.

Whenever information which is relevant for the calculation of actual emissions is not available, default values must be used

Standard calculation values published on the European Commission website shall be applied whenever available. Alternative values may be used but must be appropriately and fully justified and noted in the calculation documentation to facilitate verification by auditors.

For the calculation of actual GHG emissions, all relevant input data shall be collected on site, documented and made available to the auditor. Section 3-5 specify which data shall be collected at every step of the supply chain. It is not necessary to include in the calculation data which will have little or no effect on the result, such as chemicals used in low amounts in processing.

Input data used for actual GHG calculation shall cover a full year (12 months calculation period). This shall be as recent as possible, or alternatively cover the previous calendar year or financial year of the operations. The calculation period covered must be notified on the calculation sheet.

Records of greenhouse gas data and calculations shall be kept for 5 years.

Use of an EU approved GHG calculation tool

It is recommended that the GHG calculations are executed by using an EU approved calculation tool (if available). Such tool contains emission factors, conversion factors and formulas which have been approved by the EU. If an EU approved tool is not used for the calculations the auditor is required to verify both the inputs and the calculations used (emission factors, conversion factors and formulas).

If an EU approved tool is used the auditor is required to verify:

- That the correct version of the tool has been used;
- That the tool has been applied correctly, including a correct selection of the pathway;
- If any modifications to the pre-defined pathway were made, and that these modifications have been done correctly if made;
- That all relevant GHG information has been taken into account in the correct way.

The tool used for the calculations shall be reported in the audit report.

2.2 Transfer of GHG data through the supply chain

Each consignment transacted shall contain information on GHG emissions, including accurate data on all relevant elements of the emission calculation formula (i.e. e_{ec}, e_l, e_p, e_{td} , e_{sca}).

In case actual values are not used, information on the amount of GHG emissions shall not be transmitted through the chain of custody before the last processing step. If at any point of the chain of custody emissions have occurred and are not recorded, so that the calculation of an actual value is

no longer feasible for operators downstream in the chain of custody, this must be clearly indicated in the delivery notes.

Averaging of GHG data
Where a combined consignment is supplied to a client, averaging GHG data is not allowed. The original GHG value of each component of the consignment can be allocated to a similar amount of outgoing material. Alternatively, a group consignment can use the worst GHG performance.

Each separate GHG value must be reported on the documents going to the client (buyer) or the highest (worst) GHG value can be used for the entire consignment. Other sustainability data such as country of origin and feedstock type can be grouped if identical.

2.3 Use of typical emissions from cultivation published by EC

Member States, or competent authorities of third countries, may submit to the Commission reports including data on typical emissions from cultivation of feedstock (Article 31(2) of REDII). Bonsucro allows operators to apply these values as an alternative to actual values provided these have been published in the unit g $CO_{2\text{-}eq}$/dry-ton of feedstock on the European Commission website.

3. Methodology for the calculation of GHG emissions from production and use of transport fuels, biofuels and bioliquids

3.1 Calculation of greenhouse gas emissions from the production and use of biofuels and bioliquids

Greenhouse gas emissions from the production and use of biofuels shall be calculated as:

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

Where

E	= total emissions from the use of biofuels
e_{ec}	= emissions from the extraction or cultivation of raw materials
e_l	= annualised 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 use of the biofuel
e_{sca}	= emission saving from soil carbon accumulation via improved agricultural management
e_{ccs}	= emission saving from carbon capture and geological storage
e_{ccr}	= emission saving from carbon capture and replacement

Under Bonsucro EU-RED, emission saving from carbon capture and geological storage (e_{ccs}) and emission saving from carbon capture and replacement (e_{ccr}) can not be applied.

Emissions from the manufacture of machinery and equipment shall not be taken into account.

Greenhouse gas emissions from the production and use of bioliquids shall be calculated as for biofuels (E), but with the extension necessary for including the energy conversion to electricity and/or heat and cooling produced, as follows:

(i) For energy installations delivering only heat:

$$EC_h = \frac{E}{\eta_h}$$

(ii) For energy installations delivering only electricity:

$$EC_{el} = \frac{E}{\eta_{el}}$$

Where

EC h,el = Total greenhouse gas emissions from the final energy commodity;
E = total greenhouse gas emissions of the bioliquid before end-conversion
η_{el} =the electrical efficiency, defined as the annual electricity produced divided by the annual bioliquid input based on its energy content

η_h = The heat efficiency, defined as the annual useful heat output divided by the annual bioliquid input based on its energy content

(iii) For the electricity or mechanical energy coming from energy installations delivering useful heat together with electricity and/or mechanical energy:

$$EC_{el} = \frac{E}{\eta_{el}} \left(\frac{C_{el} \cdot \eta_{el}}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h} \right)$$

(iv) For the useful heat coming from energy installations delivering heat together with electricity and/or mechanical energy:

$$EC_h = \frac{E}{\eta_h} \left(\frac{C_h \cdot \eta_h}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h} \right)$$

where:
$EC_{h,el}$ = Total greenhouse gas emissions from the final energy commodity.
ETotal = greenhouse gas emissions of the bioliquid before end-conversion.
η_{el} = The electrical efficiency, defined as the annual electricity produced divided by the annual fuel input based on its energy content.
η_h = The heat efficiency, defined as the annual useful heat output divided by the annual fuel input based on its energy content.
C_{el} = Fraction of exergy in the electricity, and/or mechanical energy, set to 100 % (C_{el} = 1).
C_h Carnot = efficiency (fraction of exergy in the useful heat).

The Carnot efficiency, C_h, for useful heat at different temperatures is defined as:

$$C_h = \frac{T_h - T_0}{T_h}$$

where

T_h = Temperature, measured in absolute temperature (kelvin) of the useful heat at point of delivery.
T_0 = Temperature of surroundings, set at 273,15 kelvin (equal to 0 °C)

If the excess heat is exported for heating of buildings, at a temperature below 150 °C (423,15 kelvin), C_h can alternatively be defined as follows:

C_h = Carnot efficiency in heat at 150 °C (423,15 kelvin), which is: 0,3546

For the purposes of that calculation, the following definitions apply:
(a) cogeneration' means the simultaneous generation in one process of thermal energy and electricity and/or mechanical energy;
(b) useful heat' means heat generated to satisfy an economical justifiable demand for heat, for heating and cooling purposes;

(c) 'economically justifiable demand' means the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions.

3.2 Expression of greenhouse gas emissions from biofuels and bioliquids

Greenhouse gas emissions from biofuels and bioliquids shall be expressed as follows:

(a) greenhouse gas emissions from biofuels, E, shall be expressed in terms of grams of CO_2 equivalent per MJ of fuel, g $CO_{2\text{-eq}}$/MJ.

(b) greenhouse gas emissions from bioliquids, EC, in terms of grams of CO_2 equivalent per MJ of final energy commodity (heat or electricity), g $CO_{2\text{-eq}}$/MJ.

When heating and cooling are co-generated with electricity, emissions shall be allocated between heat and electricity (as under 1(b)), irrespective if the heat is used for actual heating purposes or for cooling (Note: Heat or waste heat is used to generate cooling (chilled air or water) through absorption chillers. Therefore, it is appropriate to calculate only the emissions associated to the heat produced per MJ of heat, irrespectively if the end-use of the heat is actual heating or cooling via absorption chillers).

Where the greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} are expressed in unit g $CO_{2\text{-eq}}$/dry-ton of feedstock, the conversion to grams of CO_2 equivalent per MJ of fuel, g $CO_{2\text{-eq}}$/MJ, shall be calculated as follows:

$$e_{ec}\text{fuel}_a \left[\frac{gCO_2eq}{MJfuel}\right]_{ec} = \frac{e_{ec}\text{feedstock}_a \left[\frac{gCO_2eq}{t_{dry}}\right]}{LHV_a \left[\frac{MJfeedstock}{tdry\ feedstock}\right]} \cdot \text{Fuel feedstock factor}_a \cdot \text{Allocation factor fuel}_a$$

Where:

$$\text{Allocation factor fuel}_a = \left[\frac{\text{Energy in fuel}}{\text{Energy fuel} + \text{Energy in co-products}}\right]$$

$$\text{Fuel feedstock factor}_a = [\text{Ratio of MJ feedstock required to make 1 MJ fuel}]$$

Emissions per dry-ton feedstock shall be calculated as follows:

$$e_{ec}\text{feedstock}_a \left[\frac{gCO_2eq}{t_{dry}}\right] = \frac{e_{ec}\text{feedstock}_a \left[\frac{gCO_2eq}{t_{moist}}\right]}{(1 - \text{moisture content})}$$

(Note: the formula for calculating greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} describes cases where feedstock is converted into biofuels in one step. For more complex supply chains, adjustments are needed for calculating greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} for intermediate products.)

3.3 Calculation of greenhouse gas emissions savings from biofuels and bioliquids
Greenhouse gas emissions savings from biofuels shall be calculated as follows:

SAVING = $(E_{F(t)} – E_B)/E_{F(t)}$,

Where
E_B = total emissions from the biofuel; and
$E_{F(t)}$= total emissions from the fossil fuel comparator for transport

Greenhouse gas emissions savings from heat and cooling, and electricity being generated from bioliquids biofuels shall be calculated as:

SAVING = $(EC_{F(h\&c,el)} – EC_{B(h\&c,el)})/EC_{F(h\&c,el)}$,

Where
$EC_{B(h\&c,el)}$total emissions from the heat or electricity; and
$EC_{F(h\&c,el)}$total emissions from the fossil fuel comparator for useful heat or electricity

3.4 CO_2-intensity of greenhouse gases
The greenhouse gases taken into account for the purposes of point 1 shall be CO_2, N_2O and CH_4. For the purposes of calculating CO_2 equivalence, those gases shall be valued as follows:

CO_2: 1
N_2O: 298
CH_4: 25

3.5 Emissions from the extraction or cultivation of raw materials (e_{ec})
Emissions from the cultivation of raw materials (e_{ec}) shall include the following:

- emissions from the cultivation process, and from inputs used (e.g. chemicals);
- emissions related to the harvesting and collection of sugarcane.

Capture of CO_2 in the cultivation of raw materials shall be excluded.

Emissions related to the crushing and further processing shall be accounted for under 'emissions from processing (e_p)'

Actual values of emissions from cultivation shall be calculated at the origin of the chain of custody, and shall be transmitted through the chain of custody up to the last interface. Actual emissions from cultivation can only be calculated if all relevant GHG information is available and has been passed along the supply chain. Emissions shall be expressed in kg $CO_{2\text{-}eq}$/dry tonne feedstock.

To calculate e_{ec} at least the following data shall be collected:

- quantities of mineral and organic fertilisers used (N, P, K, Ca fertilisers), in kg/ha in year of sugarcane harvest considered;
- quantity of other chemicals used (e.g. pesticides), in kg/ha in year of sugarcane harvest considered;
- fuel and electricity consumption, in l/ha and kWh/ha in year of sugarcane harvest considered;
- yield of harvest, i.e. the quantity of sugarcane in the year of sugarcane harvest considered (kg dry feedstock/ha*a).

Other emission relevant data not listed above shall be included in the calculation (e.g. other inputs for the cultivation).

The procedure for data measurement, collection and GHG emission calculation shall be documented.

Producers of sugarcane shall use the following formula to calculate emissions from cultivation:

$$eec = \frac{\text{EMfertilizer} + \text{EMfield} + \text{EMpesticide} + \text{EMfuel} + \text{EMelectricity}}{\text{yield main product}}$$

Emissions shall be expressed per yield dry product (kg $sugarcane_{dry}$/ha*a). The following formula shall be used to convert emissions per tonne of moist product to emissions per tonne of dry product:

$$e_{ec\ dry} = e_{ec\ moist} / (1 - \text{moisture content})$$

Emissions caused by fertiliser use ($EM_{fertiliser}$)

Emissions caused by use of fertilisers ($EM_{fertiliser}$) shall be calculated using the following formula:

$$EM_{fertiliser} = \text{fertiliser use} * EF_{production\ fertilisers}$$

In which:

$EM_{fertilizer}$ = GHG emissions from fertilizer use (kg $CO_{2\text{-}eq}$/ha*a)
Fertiliser use = fertiliser use in kg/ha*a
$EF_{production\ fertilizer}$ = emission factor for fertilizer production (kg $CO_{2\text{-}eq}$/kg fertiliser)

Field emissions (EM_{field})

Field emissions (N_2O) caused by use of nitrogen fertilisers (EM_{field}) shall be calculated using the following formula:

$$EM_{field} = \text{fertiliser use} * EF_{field}$$

In which:

EM_{field} = GHG field emissions from fertilizer use (kg $CO_{2\text{-}eq}$/ha*a)
Fertiliser use = fertiliser use in kg/ha*a
EF_{field} = emission factor for field emissions of N-fertiliser (i.e. the emission of nitrous oxide (N_2O, expressed in kg $CO_{2\text{-}eq}$/kg N fertiliser):

N_2O field emissions must be calculated for synthetic and organic nitrogen fertilisers as well as for crop residues left at the sugarcane plantings. N_2O emissions from soils shall be calculated using the IPPC methodology[2], including what are described as 'direct' and 'indirect' N_2O emissions. All three IPCC Tiers can be used. Calculations using Tier 1 can be done using the BioGrace calculation tool. Tier 3 requires detailed measurements and/or modelling of N_2O emissions.

Emissions caused by pesticide use ($EM_{pesticide}$)

Emissions caused by use of fertilisers ($EM_{pesticide}$) shall be calculated using the following formula:

$$EM_{pesticide} = \text{pesticide use} * EF_{production\ pesticide}$$

In which:

$EM_{pesticides}$ = GHG emissions from pesticides use (kg $CO_{2\text{-}eq}$/ha*a)
Pesticide use = pesticide use in kg/ha*a
$Ef_{production\ pesticides}$ = GHG emission factor for pesticide production (kg $CO_{2\text{-}eq}$/kg pesticide)

Emissions caused by fuel use

Emissions caused by use of fuel (EM_{fuel}) shall be calculated using the following formula:

$$EM_{fuel} = \text{fuel use} * EF_{fuel}$$

In which:

EM_{fuel} = GHG emissions from fuel use (kg $CO_{2\text{-}eq}$/ha*a)
Fuel use = fuel use in liter/ha*a
EF_{fuel} = GHG emission factor of the fuel (kg $CO_{2\text{-}eq}$/liter)

Emissions caused by electricity use

Emissions caused by electricity use ($EM_{electricity}$) shall be calculated using the following formula:

$$EM_{electricity} = \text{electricity use} * EF_{electricity}$$

In which:

$EM_{electricity}$ = GHG emissions caused by electricity use (kg $CO_{2\text{-}eq}$/ha*a)
Electricity use = electricity use in kWh/ha*a
$EF_{electricity}$ = the emission factor for electricity (in kg $CO_{2\text{-}eq}$/kWh, e.g. based on the national electricity mix in the country where cultivation takes place)

Emission factors for fertiliser and pesticide production and for fuel and electricity shall be taken from the database on the European Commission (website: http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes), or, if not available in that database, shall be taken from other scientifically recognised databases (e.g. EcoInvent) or scientific literature sources.

[2] Refer to 2006 IPCC guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11 (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_11_Ch11_N2O&CO2.pdf)

Following REDII, agricultural residues are considered to have zero GHG emissions until the point of collection.

Note: Estimates of emissions from agriculture biomass cultivation may be derived from the use of regional averages for cultivation emissions included in the reports referred to in Article 31(4) of REDII or the information on the disaggregated default values for cultivation emissions included in this Annex, as an alternative to using actual values. In the absence of relevant information in those reports it is allowed to calculate averages based on local farming practises based for instance on data of a group of farms, as an alternative to using actual values.

3.6 Emissions savings from improved agricultural management (e_{sca})

For the purposes of the calculation referred to in point 1(a), greenhouse gas emissions savings from improved agriculture management, esca, such as shifting to reduced or zero-tillage, improved crop/rotation, the use of cover crops, including crop residue management, and the use of organic soil improver (e.g. compost, manure fermentation digestate), shall be taken into account only if solid and verifiable evidence is provided that the soil carbon has increased or that it is reasonable to expect to have increased over the period in which the raw materials concerned were cultivated while taking into account the emissions where such practices lead to increased fertiliser and herbicide use.

3.7 Emissions from carbon stock changes caused by land-use change (e_l)

Annualised emissions from carbon stock changes caused by land-use change, e_l, shall be calculated by dividing total emissions equally over 20 years. For the calculation of those emissions, the following rule shall be applied:

$$e_l = (CS_R - CS_A) \times 3{,}664 \times 1/20 \times 1/P - e_B$$

in which:

e_l = annualised greenhouse gas emissions from carbon stock change due to land-use change (measured as mass (grams) of CO_2-equivalent per unit of biofuel or bioliquid energy (megajoules)). 'Cropland' and 'perennial cropland' shall be regarded as one land use ('Cropland' as defined by IPCC, 'Perennial crops' are defined as multi-annual crops, the stem of which is usually not annually harvested such as short rotation coppice);

CS_R = the carbon stock per unit area associated with the reference land-use (measured as mass (tonnes) of carbon per unit area, including both soil and vegetation). The reference land-use shall be the land-use in January 2008 or 20 years before the raw material was obtained, whichever was the later;

CS_A = the carbon stock per unit area associated with the actual land-use (measured as mass (tonnes) of carbon per unit area, including both soil and vegetation). In cases where the carbon stock accumulates over more than one year, the value attributed to CS_A shall be the estimated stock per unit area after 20 years or when the crop reaches maturity, whichever the earlier;

The factor 3,664 is the quotient obtained by dividing the molecular weight of CO_2 (44,010 g/mol) by the molecular weight of carbon (12,011 g/mol)

P = the productivity of the crop (measured as biofuel or bioliquid energy per unit area per year) and

e_B = bonus of 29 g $CO_{2\text{-}eq}$/MJ biofuel or bioliquid if biomass is obtained from restored degraded land under the condition that evidence is provided that the land:

- was not in use for agriculture or any other activity in January 2008; and
- is severely degraded land, including such land that was formerly in agricultural use. Severely degraded land' means land that, for a significant period of time, has either been significantly salinated or presented significantly low organic matter content and has been severely eroded.

The bonus of 29 g $CO_{2\text{-}eq}$/MJ shall apply for a period of up to 20 years from the date of conversion of the land to agricultural use, provided that a steady increase in carbon stocks as well as a sizable reduction in erosion phenomena for land falling under (b) are ensured.

Note: The Commission shall review, by 31 December 2020, guidelines for the calculation of land carbon stocks drawing on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories – volume 4 and in accordance with Regulation (EU) No 525/2013 and Regulation (EU) 2018/841 of the European Parliament and of the Council. The Commission guidelines shall serve as the basis for the calculation of land carbon stocks for the purposes of this Directive.

3.8 Emissions from processing (e_p)

Actual values of emissions from processing shall be determined by recording emissions of all processing steps and transmitting processing emission information through the chain of custody up to the last processing step.

All GHG emission from processing shall be included, including emissions from the processing itself, from waste(water) and leakage and from the production of chemicals or feedstocks used in the processing including the CO2 emissions corresponding to the carbon contents of fossil inputs (whether or not actually combusted in the process). Emissions from processing shall include emissions from drying of interim products and materials where relevant.

Supply chain operators shall use the following formula to calculate emissions from a processing step (e_p, in kg $CO_{2\text{-}eq}$/dry-tonne):

$$ep = \frac{\text{EMelectricity} + \text{EMheat} + \text{EMinputs} = \text{EMwastewater}}{\text{yield intermediate product}}$$

In which the 'yield intermediate product' (tonnes/a) shall refer to dry tonnages. In case e_p was calculated on moist tonnage basis, it shall be converted to dry tonnage basis using the following formula:

$$e_{p\ \text{dry tonnage}} = e_{p\ \text{moist tonnage}} / (1\text{- moisture content})$$

GHG emissions from electricity ($EM_{electricity}$), heat (EM_{heat}), inputs (EM_{inputs}) and wastewater ($EM_{wastewater}$) shall be calculated following the formula specified below:

Electricity
To calculate emissions from electricity use ($EM_{electricity}$, in kg $CO_{2\text{-}eq}$/a), the following formula shall be used:

$$EM_{electricity} = \text{electricity consumption} * EF_{energy\ mix}$$

In which the electricity consumption is in kWh/a, and EF is the electricity emission factor (kg $CO_{2\text{-}eq}$/kWh).
In accounting for the consumption of electricity not produced within the fuel production plant, the greenhouse gas emissions intensity of the production and distribution of that electricity shall be assumed to be equal to the average emission intensity of the production and distribution of electricity in a defined region. For processing units in the EU, the most logical choice is the EU (EU average GHG intensity of electricity). For processing units outside the EU, the national average could be an appropriate choice.

By way of derogation from this rule, producers may use an average value for an individual electricity production plant for electricity produced by that plant, if that plant is not connected to the electricity grid.

Heat production
To calculate emissions from heat production (EM_{heat}, in kg $CO_{2\text{-}eq}$/a), the following formula shall be used:

$$EM\ heat = \text{fuel consumption} * Ef_{fuel}$$

In which the fuel consumption is in kg/a, and EF is the fuel emission factor (kg $CO_{2\text{-}eq}$/kg).

Inputs production
To calculate emissions from inputs in the processing ($EM_{input,}$ in kg $CO_{2\text{-}eq}$/a), the following formula shall be used:

$$EM_{inputs} = \text{input consumption} * EF_{inputs}$$

In which 'inputs consumption' is in kg or liter per annum, and EF_{inputs} is the emission factor for the inputs (kg $CO_{2\text{-}eq}$ per kg or per liter)

Wastewater
To calculate emissions from processing wastewater ($EM_{wastewater,}$ in kg $CO_{2\text{-}eq}$/a), the following formula shall be used:

$$EM_{wastewater} = \text{volume of wastewater} * EF_{wastewater}$$

In which 'volume of wastewater' is in cbm/a, and EFwastewater is the emission factor for the wastewater generated (kg $CO_{2\text{-}eq}$/cbm wastewater)

To calculate e_p, the following data shall be collected at all processing units:

- Quantity of main products and co-products (t/a);
- Quantity of waste and wastewater generated (kg/a);

- Quantity of chemicals and other inputs to the process (kg/a or l/a);
- Electricity consumption (kWh/a) including the source of electricity;
- Heat consumption (MJ/a), the fuel used for heat production, and the type of heating system used (e.g. boiler or CHP).

Input data for GHG emission calculations shall be measured or be based on the technical specifications of the processing facility.

Emissions shall be calculated for every processing step individually, and be summed up by the processor to calculate e_p. Actual emissions from transport and distribution can only be calculated if all relevant GHG information from all processing is available and has been passed along the supply chain. Emissions shall be expressed in kg $CO_{2\text{-}eq}$/dry tonne feedstock .

Calculations shall include emission factors for process specific inputs, fuels used, electricity and heat. Data shall be taken from the database on the European Commission (website: http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes), or, if not available in that database, shall be taken from other scientifically recognised databases (e.g. EcoInvent) or scientific literature sources.

3.9 Emissions from transport and distribution (e_{td})

Emissions from transport and distribution (e_{td}, in kg $CO_{2\text{-}eq}$/dry-tonne feedstock) shall include emissions from the transport and storage of raw material and intermediate products, and from storage and distribution of finished biofuels (including emissions from filling stations and depots).

Supply chain operators shall use the following formula to calculate emissions from transport and distribution.

$$etd = \frac{\mathrm{Tneeded} * (\mathrm{dloaded} * \mathrm{Kloaded} + \mathrm{dempty} * \mathrm{Kempty}) * \mathrm{EFfuel}}{quantity\ transported\ input\ material}$$

In which:

T_{needed} = number of transports (total quantity transported divided by load per transport)
d_{loaded} = transport distance of loaded transport system (km)
d_{empty} = transport distance of empty transport system (km)
K_{loaded} = fuel use/km of loaded transport system (l/km)
K_{empty} = fuel use per km of empty transport system (l/km)
EF_{fuel} = greenhouse gas emission factor for fuel used(g $CO_{2\text{-}eq}$/liter)

Emissions shall be calculated for every transport step individually, and be summed up by the last interface to calculate e_{td}. Actual emissions from transport and distribution can only be calculated if all relevant GHG information from all transport steps is available and has been passed along the supply chain. Emissions shall be expressed in kg $CO_{2\text{-}eq}$/dry tonne feedstock. The following formula shall be used to convert emissions per tonne of moist product to emissions per tonne of dry product:

$e_{td\ dry} = e_{td\ moist}$ / (1 - moisture content)

To calculate e_{td}, the following data shall be collected at all processing units:

- transport distances (km) of loaded and empty freights (loaded return freights do not have to be taken into account);
- mode of transport (e.g. diesel truck, 40t);
- amount of feedstock transported per load.

If upstream transport is calculated, the calculated GHG emissions shall be divided by the amount of input material applying a feedstock factor and an allocation factor. This is because processing plants calculate upstream transport emissions in kg $CO_{2\text{-eq}}$/kg of dry matter of the transported feedstock.

In addition, GHG emissions from filling stations and depots shall be taken into account following the guidelines and data laid down in the European Commission note on GHG emissions from filling stations and depots (refer to the Box below). If more than one depot is used, GHG emissions of all depots shall be taken into account.

Other factors for calculation shall include fuel consumption of the used transport mode, when loaded and empty (liter/km), emission factor of the fuel ($CO_{2\text{-eq}}$/liter).

Emission factors shall be taken from the database on the European Commission (website: http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes), or, if not available in that database, shall be taken from other scientifically recognised databases (e.g. EcoInvent) or scientific literature sources.

European Commission note on emissions from filling stations and depots

EC Communication 160/02 said (see section 2.1):

"Member States need to define which economic operators need to submit the information concerned. Most transport fuels are subject to excise duty, which is payable on release for consumption (9). The obvious choice is to place the responsibility for submitting information on biofuels on the economic operator who pays the duty. At this point information with regard to the sustainability criteria along the entire fuel chain should be available (10)."

With footnote (10): *The one exception could be the greenhouse gas emissions from distribution of the fuel (if needed for the calculation of an actual value). It would be appropriate to use a standard coefficient for this.*

Therefore, it would make sense to use a standard coefficient for this (the BioGrace excel sheets show what numbers are used for filling stations in the typical/default values; those numbers a scheme could consider using).

In addition, the emissions at the fuel depot also need to be included. Emissions at the depot and filling station both relate to electricity usage. One important point to note is that for imported biofuels there may be several depots that need to be included in the calculation (e.g. import and export terminals). This point should be reflected in the proposed text.

BioGrace includes the following depot and filling station emissions (for all biofuels):

- Depot: 0.11 gCO2/MJ fuel (based on electricity usage of 0.00084 MJ/MJ fuel and the standard values for Electricity NG CCGT and Electricity EU mix LV)

- Filling station: 0.44 gCO2/MJ fuel (based on electricity usage of 0.0034 MJ/MJ fuel and the standard value for Electricity EU mix LV)

Please note that for information the original reference source for the electricity usage at the depot and filling station is: Dautrebande O., TotalFinaElf 2002.

N.B. The emissions relating to depots and filling stations can be updated based on the latest electricity emission factor.

3.10 Emissions of the fuel in use (e_u)

Emissions of the fuel in use, e_u, shall be taken to be zero for biofuels and bioliquids.

Emissions of non-CO_2 greenhouse gases (N_2O and CH_4) of the fuel in use shall be included in the e_u factor for bioliquids.

3.11 Cogeneration of heat and/or electricity

Where a cogeneration unit – providing heat and/or electricity to a fuel production process for which emissions are being calculated – produces excess electricity and/or excess useful heat, the greenhouse gas emissions shall be divided between the electricity and the useful heat according to the temperature of the heat (which reflects the usefulness (utility) of the heat). The useful part of the heat is found by multiplying its energy content with the Carnot efficiency, C_h, calculated as follows:

$$C_h = \frac{T_h - T_0}{T_h}$$

In which:

T_h = Temperature, measured in absolute temperature (kelvin) of the useful heat at point of delivery.

T_0= Temperature of surroundings, set at 273,15 kelvin (equal to 0 °C)

If the excess heat is exported for heating of buildings, at a temperature below 150 °C (423,15 kelvin), C_h can alternatively be defined as follows:

C_h = Carnot efficiency in heat at 150 °C (423,15 kelvin), which is: 0,3546

For the purposes of that calculation, the actual efficiencies shall be used, defined as the annual mechanical energy, electricity and heat produced respectively divided by the annual energy input.

For the purposes of that calculation, the following definitions apply:

(a) cogeneration' shall mean the simultaneous generation in one process of thermal energy and electrical and/or mechanical energy;
(b) 'useful heat' shall mean heat generated to satisfy an economical justifiable demand for heat, for heating or cooling purposes;
(c) 'economically justifiable demand' shall mean the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions.

3.12 Adjusting GHG emissions throughout the supply chain

General
At every step of the supply chain, additional emissions from transport and/or processing shall be added to e_p and/or e_{td}, respectively.

Application of the feedstock factor
Additionally, a feedstock factor shall be applied to all emissions to take the mass losses occurred into account. A feedstock factor shall be applied at every processing step but may also be relevant at other steps where mass losses occur (e.g. storage). This means that all GHG emissions that are linked with the incoming feedstock (upstream emissions from e_{sca} e_i, e_p, e_{td} and e_e) shall be adjusted to the respective intermediate product using the feedstock factor.

The feedstock factor shall be calculated using the following formula:

Feedstock factor = feedstock (kg_{dry}) / intermediate product (kg_{dry})

Where 'feedstock' is the input material of the processing step considered, and 'intermediate product' is the output material of the processing step considered. The calculation of the feedstock factor shall be based on actual plant data.

After application of the feedstock factor to the upstream emissions, the additional emissions occurring at the recipient (i.e. the supply chain operator where the feedstock factor is calculated) shall be included.

N.B. For the application of the feedstock factor the LHV values per dry tonne need to be applied while for the calculation of the allocation factor LHV values for wet biomass need to be used as this approach was also applied for the calculation of the default values.

Application of the allocation factor
Allocation of GHG emissions shall take place at every processing step in the supply chain where a co-product(s) is produced. The GHG emissions up to this processing step shall be distributed to the main product and the co-product proportional to their energy content and weight. GHG emissions downstream of the processing step (e.g. further downstream processing or transport & distribution) shall not be included in the allocation, as these emissions are not related to the co-product.

The allocation shall include the emissions from e_{ec} + e_l + e_{sca} + those fractions of e_p and e_{td} that take place up to and including the process step at which a co-product is produced. If any allocation to co-products has taken place at an earlier process step in the life-cycle, the fraction of those emissions assigned in the last such process step to the intermediate fuel product shall be used for those purposes instead of the total of those emissions.

In the case of biofuels and bioliquids, all co-products shall be taken into account for the purposes of the calculation. No emissions shall be allocated to wastes and residues. Co-products that have a negative energy content shall be considered to have an energy content of zero for the purposes of the calculation.

Processing wastes and residues including bagasse shall be considered to have zero life-cycle greenhouse gas emissions up to the process of collection of those materials irrespectively of whether they are processed to interim products before being transformed into the final product.

In the case of fuels produced in refineries, other than the combination of processing plants with boilers or cogeneration units providing heat and/or electricity to the processing plant, the unit of analysis for the purposes of the calculation shall be the refinery.

The following formula shall be used to calculate the allocation factor for intermediate products and biofuels, respectively (with eec here used as an example):

eec intermediate product, allocated =
eec intermediate product,non-allocated * allocation factor intermediate product

with eec in kg $CO_{2\text{-}eq}$/tonne dry product

$$\text{Allocation factor intermediate product} = \frac{\text{Energy content intermediate product}}{(\text{Energy content intermediate product} + \text{Energy content co} - \text{product})}$$

In which:
Energy content intermediate product = $\text{Yield}_{\text{intermediate product}}$ * $\text{LHV}_{\text{intermediate product}}$

And:
Energy content co-product = $\text{Yield}_{\text{co-product}}$ * $\text{LHV}_{\text{co-product}}$

With energy contents in MJ, yields in kg dry/a and LHVs in MJ/kg.

The energy content shall be calculated using the lower heating value (LHV) and the yield. The LHV shall refer to the entire (moist) (co-)product, not only to the dry fraction of the (co-)product. This 'wet definition LHV' shall be calculated by subtracting from the LHV of the dry matter, the energy needed to evaporate the water in the wet material.

The energy content of co-products with a negative energy content shall be set at zero.
To calculate the allocation factor the following data shall be used:

- Mass/yield data for products and co-products shall be calculated from on-site mass balance data (kg dry);
- LHV data for products and co-products shall come from published sources.

Calculating emissions from cultivation when processing intermediate products
The following formula shall be applied to emissions from cultivation when processing intermediate products:

e_{ec} intermediate product$_a$ = e_{ec} feedstock$_a$ * feedstock factor$_a$ * allocation factor intermediate product$_a$

with: e_{ec} intermediate product$_a$ and e_{ec} feedstock$_a$ in g $CO_{2\text{-}eq}/kg_{dry}$

and:
Feedstock factor = ratio of kg dry feedstock required to make 1 kg dry intermediate product
Allocation factor intermediate product=(Energy content intermediate product /(Energy content intermediate product+Energy content co−products))

3.13 Fossil fuel comparator
For biofuels, for the purposes of the calculation referred to in section 3.3 of this Annex, the fossil fuel comparator $E_{F(t)}$ shall be 94 g $CO_{2\text{-}eq}$/MJ.

For bioliquids used for the production of electricity, for the purposes of the calculation referred to in section 3.3 of this Annex, the fossil fuel comparator $EC_{F(e)}$ shall be 183 g $CO_{2\text{-}eq}$/MJ.

For bioliquids used for the production of useful heat, as well as for the production of heating and/or cooling, for the purposes of the calculation referred to in section 3.3 of this Annex, the fossil fuel comparator $EC_{F(h\&c)}$ shall be 80 g $CO_{2\text{-}eq}$/MJ.

4. Methodology for the calculation of GHG emissions from production and use of biomass fuels

4.1 Calculation of greenhouse gas emissions from the production and use of biomass fuels
Greenhouse gas emissions from the production and use of biomass fuels before conversion into electricity, heating and cooling, shall be calculated as:

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

Where

E	= total emissions from the use of biofuels
e_{ec}	= emissions from the extraction or cultivation of raw materials
e_l	= annualised 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 use of the biofuel
e_{sca}	= emission saving from soil carbon accumulation via improved agricultural management
e_{ccs}	= emission saving from carbon capture and geological storage
e_{ccr}	= emission saving from carbon capture and replacement

Under Bonsucro EU-RED, emission saving from carbon capture and geological storage (e_{ccs}) and emission saving from carbon capture and replacement (e_{ccr}) can not be applied.

Emissions from the manufacture of machinery and equipment shall not be taken into account.

Greenhouse gas emissions from the use of biomass fuels in producing electricity, heating and cooling, including the energy conversion to electricity and/or heat or cooling produced, shall be calculated as follows:

(i) For energy installations delivering only heat:

$$EC_h = \frac{E}{\eta_h}$$

(ii) For energy installations delivering only electricity:

$$EC_{el} = \frac{E}{\eta_{el}}$$

Where:

ECh,el = Total greenhouse gas emissions from the final energy commodity.
E = Total greenhouse gas emissions of the fuel before end-conversion.
ηel = The electrical efficiency, defined as the annual electricity produced divided by the annual fuel input, based on its energy content.
ηh = The heat efficiency, defined as the annual useful heat output divided by the annual fuel input, based on its energy content.

(iii) For the electricity or mechanical energy coming from energy installations delivering useful heat together with electricity and/or mechanical energy:

$$EC_{el} = \frac{E}{\eta_{el}} \left(\frac{C_{el} \cdot \eta_{el}}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h} \right)$$

(iv) For the useful heat coming from energy installations delivering heat together with electricity and/or mechanical energy:

$$EC_h = \frac{E}{\eta_h} \left(\frac{C_h \cdot \eta_h}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h} \right)$$

where:

$EC_{h,el}$ = Total greenhouse gas emissions from the final energy commodity.
E = Total greenhouse gas emissions of the fuel before end-conversion.
η_{el} = The electrical efficiency, defined as the annual electricity produced divided by the annual energy input, based on its energy content.
η_h = The heat efficiency, defined as the annual useful heat output divided by the annual energy input, based on its energy content.
C_{el} = Fraction of exergy in the electricity, and/or mechanical energy, set to 100 % (C_{el} = 1).
C_h = Carnot efficiency (fraction of exergy in the useful heat).

The Carnot efficiency, C_h, for useful heat at different temperatures is defined as:

$$C_h = \frac{T_h - T_0}{T_h}$$

where:

T_h = Temperature, measured in absolute temperature (kelvin) of the useful heat at point of delivery.
T_0 = Temperature of surroundings, set at 273,15 kelvin (equal to 0 °C).

If the excess heat is exported for heating of buildings, at a temperature below 150 °C (423,15 kelvin), C_h can alternatively be defined as follows:

C_h = Carnot efficiency in heat at 150 °C (423,15 kelvin), which is: 0,3546

For the purposes of that calculation, the following definitions apply:

(i) cogeneration' shall mean the simultaneous generation in one process of thermal energy and electricity and/or mechanical energy;
(ii) useful heat' shall mean heat generated to satisfy an economical justifiable demand for heat, for heating or cooling purposes;
(iii) 'economically justifiable demand' shall mean the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions.

4.2 Expression of greenhouse gas emissions from biofuels and bioliquids

Greenhouse gas emissions from biomass fuels shall be expressed as follows:

(a) greenhouse gas emissions from biomass fuels, E, shall be expressed in terms of grams of CO_2 equivalent per MJ of biomass fuel, g $CO_{2\text{-eq}}$/MJ;

(b greenhouse gas emissions from heating or electricity, produced from biomass fuels, EC, shall be expressed in terms of grams of CO_2 equivalent per MJ of final energy commodity (heat or electricity), g $CO_{2\text{-eq}}$/MJ.

When heating and cooling are co-generated with electricity, emissions shall be allocated between heat and electricity (as under point 1(d)), irrespective if the heat is used for actual heating purposes or for cooling. (Note: Heat or waste heat is used to generate cooling (chilled air or water) through absorption chillers. Therefore, it is appropriate to calculate only the emissions associated to the heat produced per MJ of heat, irrespectively if the end-use of the heat is actual heating or cooling via absorption chillers).

Where the greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} are expressed in unit g $CO_{2\text{-eq}}$/dry-ton of feedstock, the conversion to grams of CO_2 equivalent per MJ of fuel, g $CO_{2\text{-eq}}$/MJ, shall be calculated as follows:

$$e_{ec}\text{fuel}_a \left[\frac{gCO_2eq}{MJfuel}\right]_{ec} = \frac{e_{ec}\text{feedstock}_a \left[\frac{gCO_2eq}{t_{dry}}\right]}{LHV_a \left[\frac{MJfeedstock}{tdry\ feedstock}\right]} \cdot \text{Fuel feedstock factor}_a \cdot \text{Allocation factor fuel}_a$$

Where

$$\text{Allocation factor fuel}_a = \left[\frac{\text{Energy in fuel}}{\text{Energy fuel} + \text{Energy in co-products}}\right]$$

$$\text{Fuel feedstock factor}_a = [\text{Ratio of MJ feedstock required to make 1 MJ fuel}]$$

Emissions per dry-ton feedstock shall be calculated as follows:

$$e_{ec}\text{feedstock}_a \left[\frac{gCO_2eq}{t_{dry}}\right] = \frac{e_{ec}\text{feedstock}_a \left[\frac{gCO_2eq}{t_{moist}}\right]}{(1 - \text{moisture content})}$$

(Note: the formula for calculating greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} describes cases where feedstock is converted into biofuels in one step. For more complex supply chains, adjustments are needed for calculating greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} for intermediate products.)

4.3 Calculation of greenhouse gas emissions savings from biomass fuels

Greenhouse gas emissions savings from biomass fuels used as transport fuels shall be calculated as follows:

SAVING = $(E_{F(t)} - E_B)/E_{F(t)}$

where
E_B = total emissions from biomass fuels used as transport fuels; and
$E_{F(t)}$ = total emissions from the fossil fuel comparator for transport

Greenhouse gas emissions savings from heat and cooling, and electricity being generated from biomass fuels shall be calculated as follows:

SAVING = $(EC_{F(h\&c,el)} - EC_{B(h\&c,el)})/EC_{F\ (h\&c,el)}$,

where
$EC_{B(h\&c,el)}$total emissions from the heat or electricity,
$EC_{F(h\&c,el)}$total emissions from the fossil fuel comparator for useful heat or electricity.

4.4 CO2-intensity of greenhouse gases
The greenhouse gases taken into account for the purposes outlined in section 4.1 of this annex shall be CO_2, N_2O and CH_4. For the purposes of calculating CO_2 equivalence, those gases shall be valued as follows:

CO_2: 1
CH_4: 25
N_2O: 298

4.5 Emissions from the extraction, harvesting or cultivation of raw materials (e_{ec})
Emissions from the cultivation of raw materials (e_{ec}) shall include the following:

- emissions from the cultivation process, and from inputs used (e.g. chemicals);
- emissions related to the harvesting and collection of sugarcane.

Capture of CO_2 in the cultivation of raw materials shall be excluded.

Emissions related to the crushing and further processing shall be accounted for under 'emissions from processing (e_p)'

Actual values of emissions from cultivation shall be calculated at the origin of the chain of custody, and shall be transmitted through the chain of custody up to the last interface. Actual emissions from cultivation can only be calculated if all relevant GHG information is available and has been passed along the supply chain. Emissions shall be expressed in kg $CO_{2\text{-}eq}$/dry tonne feedstock.

To calculate e_{ec} at least the following data shall be collected:

- quantities of mineral and organic fertilisers used (N, P, K, Ca fertilisers), in kg/ha in year of sugarcane harvest considered;
- quantity of other chemicals used (e.g. pesticides), in kg/ha in year of sugarcane harvest considered;
- fuel and electricity consumption, in l/ha and kWh/ha in year of sugarcane harvest considered;
- yield of harvest, i.e. the quantity of sugarcane in the year of sugarcane harvest considered (kg dry feedstock/ha*a).

Other emission relevant data not listed above shall be included in the calculation (e.g. other inputs for the cultivation).

The procedure for data measurement, collection and GHG emission calculation shall be documented.

Producers of sugarcane shall use the following formula to calculate emissions from cultivation:

$$eec = \frac{\text{EMfertilizer} + \text{EMfield} + \text{EMpesticide} + \text{EMfuel} + \text{EMelectricity}}{\text{yield main product}}$$

Emissions shall be expressed per yield dry product (kg sugarcane$_{dry}$/ha*a). The following formula shall be used to convert emissions per tonne of moist product to emissions per tonne of dry product:

$$e_{ec\ dry} = e_{ec\ moist} / (1 - \text{moisture content})$$

Emissions caused by fertiliser use ($EM_{fertiliser}$)

Emissions caused by use of fertilisers ($EM_{fertiliser}$) shall be calculated using the following formula:

$$EM_{fertiliser} = \text{fertiliser use} * EF_{production\ fertilisers}$$

In which:

$EM_{fertilizer}$ = GHG emissions from fertilizer use (kg $CO_{2\text{-}eq}$/ha*a)
Fertiliser use = fertiliser use in kg/ha*a
$EF_{production\ fertilizer}$ = emission factor for fertilizer production (kg $CO_{2\text{-}eq}$/kg fertiliser)

Field emissions (EM_{field})

Field emissions (N_2O) caused by use of nitrogen fertilisers (EM_{field}) shall be calculated using the following formula:

$$EM_{field} = \text{fertiliser use} * EF_{field}$$

In which:

EM_{field} = GHG field emissions from fertilizer use (kg $CO_{2\text{-}eq}$/ha*a)
Fertiliser use = fertiliser use in kg/ha*a
EF_{field} = emission factor for field emissions of N-fertiliser (i.e. the emission of nitrous oxide (N_2O, expressed in kg $CO_{2\text{-}eq}$/kg N fertiliser):

N_2O field emissions must be calculated for synthetic and organic nitrogen fertilisers as well as for crop residues left at the sugarcane plantings. N_2O emissions from soils shall be calculated using the IPPC methodology[3], including what are described as 'direct' and 'indirect' N_2O emissions. All three IPCC Tiers can be used. Calculations using Tier 1 can be done using the BioGrace calculation tool. Tier 3 requires detailed measurements and/or modelling of N_2O emissions.

[3] Refer to 2006 IPCC guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11 (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_11_Ch11_N2O&CO2.pdf)

Emissions caused by pesticide use ($EM_{pesticide}$)

Emissions caused by use of fertilisers ($EM_{pesticide}$) shall be calculated using the following formula:

$$EM_{pesticide} = \text{pesticide use} * EF_{\text{production pesticide}}$$

In which:

$EM_{pesticides}$ = GHG emissions from pesticides use (kg $CO_{2\text{-eq}}$/ha*a)

Pesticide use = pesticide use in kg/ha*a

$Ef_{\text{production pesticides}}$ = GHG emission factor for pesticide production (kg $CO_{2\text{-eq}}$/kg pesticide)

Emissions caused by fuel use

Emissions caused by use of fuel (EM_{fuel}) shall be calculated using the following formula:

$$EM_{fuel} = \text{fuel use} * EF_{fuel}$$

In which:

EM_{fuel} = GHG emissions from fuel use (kg $CO_{2\text{-eq}}$/ha*a)

Fuel use = fuel use in liter/ha*a

EF_{fuel} = GHG emission factor of the fuel (kg $CO_{2\text{-eq}}$/liter)

Emissions caused by electricity use

Emissions caused by electricity use ($EM_{electricity}$) shall be calculated using the following formula:

$$EM_{electricity} = \text{electricity use} * EF_{electricity}$$

In which:

$EM_{electricity}$ = GHG emissions caused by electricity use (kg $CO_{2\text{-eq}}$/ha*a)

Electricity use = electricity use in kWh/ha*a

$EF_{electricity}$ = the emission factor for electricity (in kg $CO_{2\text{-eq}}$/kWh, e.g. based on the national electricity mix in the country where cultivation takes place)

Emission factors for fertiliser and pesticide production and for fuel and electricity shall be taken from the database on the European Commission (website: http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes), or, if not available in that database, shall be taken from other scientifically recognised databases (e.g. EcoInvent) or scientific literature sources.

Following REDII, agricultural residues are considered to have zero GHG emissions until the point of collection.

Note: Estimates of emissions from agriculture biomass cultivation may be derived from the use of regional averages for cultivation emissions included in the reports referred to in Article 31(4) of EU-RED or the information on the disaggregated default values for cultivation emissions included in this Annex, as an alternative to using actual values. In the absence of relevant information in those reports it is allowed to calculate averages based on local farming practises based for instance on data of a group of farms, as an alternative to using actual values.

4.6 Emissions savings from improved agricultural management (e_{sca})

For the purposes of the calculation referred to in section 4.1 of this annex, greenhouse gas emissions savings from improved agriculture management, esca, such as shifting to reduced or zero-tillage, improved crop/rotation, the use of cover crops, including crop residue management, and the use of organic soil improver (e.g. compost, manure fermentation digestate), shall be taken into account only if solid and verifiable evidence is provided that the soil carbon has increased or that it is reasonable to expect to have increased over the period in which the raw materials concerned were cultivated while taking into account the emissions where such practices lead to increased fertiliser and herbicide use.

4.7 Emissions from carbon stock changes caused by land-use change (e_l)

Annualised emissions from carbon stock changes caused by land-use change, e_l, shall be calculated by dividing total emissions equally over 20 years. For the calculation of those emissions, the following rule shall be applied:

$$e_l = (CS_R - CS_A) \times 3{,}664 \times 1/20 \times 1/P - e_B$$

in which:

e_l = annualised greenhouse gas emissions from carbon stock change due to land-use change (measured as mass (grams) of CO_2-equivalent per unit of biofuel or bioliquid energy (megajoules)). 'Cropland' and 'perennial cropland' shall be regarded as one land use ('Cropland' as defined by IPCC, 'Perennial crops' are defined as multi-annual crops, the stem of which is usually not annually harvested such as short rotation coppice);

CS_R = the carbon stock per unit area associated with the reference land-use (measured as mass (tonnes) of carbon per unit area, including both soil and vegetation). The reference land-use shall be the land-use in January 2008 or 20 years before the raw material was obtained, whichever was the later;

CS_A = the carbon stock per unit area associated with the actual land-use (measured as mass (tonnes) of carbon per unit area, including both soil and vegetation). In cases where the carbon stock accumulates over more than one year, the value attributed to CS_A shall be the estimated stock per unit area after 20 years or when the crop reaches maturity, whichever the earlier;

The factor 3,664 is the quotient obtained by dividing the molecular weight of CO_2 (44,010 g/mol) by the molecular weight of carbon (12,011 g/mol)

P = the productivity of the crop (measured as biofuel or bioliquid energy per unit area per year) and

e_B = bonus of 29 g $CO_{2\text{-eq}}$/MJ biofuel or bioliquid if biomass is obtained from restored degraded land under the condition that evidence is provided that the land:

- was not in use for agriculture or any other activity in January 2008; and
- is severely degraded land, including such land that was formerly in agricultural use. Severely degraded land' means land that, for a significant period of time, has either been significantly salinated or presented significantly low organic matter content and has been severely eroded.

The bonus of 29 g $CO_{2\text{-eq}}$/MJ shall apply for a period of up to 20 years from the date of

conversion of the land to agricultural use, provided that a steady increase in carbon stocks as well as a sizable reduction in erosion phenomena for land falling under (b) are ensured.

Note: The Commission shall review, by 31 December 2020, guidelines for the calculation of land carbon stocks drawing on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories – volume 4 and in accordance with Regulation (EU) No 525/2013 and Regulation (EU) 2018/841 of the European Parliament and of the Council. The Commission guidelines shall serve as the basis for the calculation of land carbon stocks for the purposes of this Directive.

4.8 Emissions from processing (e_p)

Actual values of emissions from processing shall be determined by recording emissions of all processing steps and transmitting processing emission information through the chain of custody up to the last processing step.

All GHG emission from processing shall be included, including emissions from the processing itself, from waste(water) and leakage and from the production of chemicals or feedstocks used in the processing including the CO2 emissions corresponding to the carbon contents of fossil inputs (whether or not actually combusted in the process). Emissions from processing shall include emissions from drying of interim products and materials where relevant.

Supply chain operators shall use the following formula to calculate emissions from a processing step (e_p, in kg $CO_{2\text{-}eq}$/dry-tonne):

$$ep = \frac{\text{EMelectricity} + \text{EMheat} + \text{EMinputs} = \text{EMwastewater}}{\text{yield intermediate product}}$$

In which the 'yield intermediate product' (tonnes/a) shall refer to dry tonnages. In case e_p was calculated on moist tonnage basis, it shall be converted to dry tonnage basis using the following formula:

$$e_{p\ \text{dry tonnage}} = e_{p\ \text{moist tonnage}} / (1\text{- moisture content})$$

GHG emissions from electricity ($EM_{electricity}$), heat (EM_{heat}), inputs (EM_{inputs}) and wastewater ($EM_{wastewater}$) shall be calculated following the formula specified below:

Electricity

To calculate emissions from electricity use ($EM_{electricity}$, in kg $CO_{2\text{-}eq}$/a), the following formula shall be used:

$$EM_{electricity} = \text{electricity consumption} * EF_{energy\ mix}$$

In which the electricity consumption is in kWh/a, and EF is the electricity emission factor (kg $CO_{2\text{-}eq}$/kWh).

In accounting for the consumption of electricity not produced within the fuel production plant, the greenhouse gas emissions intensity of the production and distribution of that electricity shall be assumed to be equal to the average emission intensity of the production and distribution of

electricity in a defined region. For processing units in the EU, the most logical choice is the EU (EU average GHG intensity of electricity). For processing units outside the EU, the national average could be an appropriate choice.

By way of derogation from this rule, producers may use an average value for an individual electricity production plant for electricity produced by that plant, if that plant is not connected to the electricity grid.

Heat production
To calculate emissions from heat production (EM_{heat}, in kg $CO_{2\text{-}eq}$/a), the following formula shall be used:

$$EM\ heat = fuel\ consumption * Ef_{fuel}$$

In which the fuel consumption is in kg/a, and EF is the fuel emission factor (kg $CO_{2\text{-}eq}$/kg).

Inputs production
To calculate emissions from inputs in the processing ($EM_{input,}$ in kg $CO_{2\text{-}eq}$/a), the following formula shall be used:

$$EM_{inputs} = input\ consumption * EF_{inputs}$$

In which 'inputs consumption' is in kg or liter per annum, and EF_{inputs} is the emission factor for the inputs (kg $CO_{2\text{-}eq}$ per kg or per liter)

Wastewater
To calculate emissions from processing wastewater ($EM_{wastewater,}$ in kg $CO_{2\text{-}eq}$/a), the following formula shall be used:

$$EM_{wastewater} = volume\ of\ wastewater * EF_{wastewater}$$

In which 'volume of wastewater' is in cbm/a, and EFwastewater is the emission factor for the wastewater generated (kg $CO_{2\text{-}eq}$/cbm wastewater)

To calculate e_p, the following data shall be collected at all processing units:

- Quantity of main products and co-products (t/a);
- Quantity of waste and wastewater generated (kg/a);
- Quantity of chemicals and other inputs to the process (kg/a or l/a);
- Electricity consumption (kWh/a) including the source of electricity;
- Heat consumption (MJ/a), the fuel used for heat production, and the type of heating system used (e.g. boiler or CHP).

Input data for GHG emission calculations shall be measured or be based on the technical specifications of the processing facility.

Emissions shall be calculated for every processing step individually, and be summed up by the processor to calculate e_p. Actual emissions from transport and distribution can only be calculated if all relevant GHG information from all processing is available and has been passed along the supply chain. Emissions shall be expressed in kg $CO_{2\text{-}eq}$/dry tonne feedstock .

Calculations shall include emission factors for process specific inputs, fuels used, electricity and heat. Data shall be taken from the database on the European Commission (website: http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes), or, if not available in that database, shall be taken from other scientifically recognised databases (e.g. EcoInvent) or scientific literature sources.

4.9 Emissions from transport and distribution (e_{td})

Emissions from transport and distribution (e_{td}, in kg $CO_{2\text{-}eq}$/dry-tonne feedstock) shall include emissions from the transport and storage of raw material and intermediate products, and from storage and distribution of finished biofuels (including emissions from filling stations and depots).

Supply chain operators shall use the following formula to calculate emissions from transport and distribution.

$$etd = \frac{\text{Tneeded} * (\text{dloaded} * \text{Kloaded} + \text{dempty} * \text{Kempty}) * \text{EFfuel}}{quantity\ transported\ input\ material}$$

In which:

T_{needed} = number of transports (total quantity transported divided by load per transport)
d_{loaded} = transport distance of loaded transport system (km)
d_{empty} = transport distance of empty transport system (km)
K_{loaded} = fuel use/km of loaded transport system (l/km)
K_{empty} = fuel use per km of empty transport system (l/km)
EF_{fuel} = greenhouse gas emission factor for fuel used (g $CO_{2\text{-}eq}$/liter)

Emissions shall be calculated for every transport step individually, and be summed up by the last interface to calculate e_{td}. Actual emissions from transport and distribution can only be calculated if all relevant GHG information from all transport steps is available and has been passed along the supply chain. Emissions shall be expressed in kg $CO_{2\text{-}eq}$/dry tonne feedstock. The following formula shall be used to convert emissions per tonne of moist product to emissions per tonne of dry product:

$e_{td\ dry} = e_{td\ moist}$ / (1 - moisture content)

To calculate e_{td}, the following data shall be collected at all processing units:

- transport distances (km) of loaded and empty freights (loaded return freights do not have to be taken into account);
- mode of transport (e.g. diesel truck, 40t);
- amount of feedstock transported per load.

If upstream transport is calculated, the calculated GHG emissions shall be divided by the amount of input material applying a feedstock factor and an allocation factor. This is because processing plants calculate upstream transport emissions in kg $CO_{2\text{-}eq}$/kg of dry matter of the transported feedstock.

Other factors for calculation shall include fuel consumption of the used transport mode, when loaded and empty (liter/km), emission factor of the fuel ($CO_{2\text{-}eq}$/liter).

Emission factors shall be taken from the database on the European Commission (website: http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes), or, if not available in that database, shall be taken from other scientifically recognised databases (e.g. EcoInvent) or scientific literature sources.

4.10 Emissions of the fuel in use (e_u)

Emissions of CO_2 from fuel in use, e_u, shall be taken to be zero for biomass fuels.

Emissions of non-CO_2 greenhouse gases (CH_4 and N_2O) from the fuel in use shall be included in the eu factor.

4.11 Cogeneration of heat and/or electricity

Where a cogeneration unit – providing heat and/or electricity to a biomass fuel production process for which emissions are being calculated – produces excess electricity and/or excess useful heat, the greenhouse gas emissions shall be divided between the electricity and the useful heat according to the temperature of the heat (which reflects the usefulness (utility) of the heat). The useful part of the heat is found by multiplying its energy content with the Carnot efficiency, C_h, calculated as follows:

$$C_h = \frac{T_h - T_0}{T_h}$$

In which:

T_h = Temperature, measured in absolute temperature (kelvin) of the useful heat at point of delivery.

T_0 = Temperature of surroundings, set at 273,15 kelvin (equal to 0 °C).

If the excess heat is exported for heating of buildings, at a temperature below 150 °C (423,15 kelvin), C_h can alternatively be defined as follows:

C_h = Carnot efficiency in heat at 150 °C (423,15 kelvin), which is: 0,3546

For the purposes of that calculation, the actual efficiencies shall be used, defined as the annual mechanical energy, electricity and heat produced respectively divided by the annual energy input.

For the purposes of that calculation, the following definitions apply:

(a) 'cogeneration' shall mean the simultaneous generation in one process of thermal energy and electrical and/or mechanical energy;
(b) useful heat' shall mean heat generated to satisfy an economical justifiable demand for heat, for heating or cooling purposes
(c) useful heat' shall mean heat generated to satisfy an economical justifiable demand for heat, for heating or cooling purposes

4.12 Adjusting GHG emissions throughout the supply chain

General

At every step of the supply chain, additional emissions from transport and/or processing shall be added to e_p and/or e_{td}, respectively.

Application of the feedstock factor
Additionally, a feedstock factor shall be applied to all emissions to take the mass losses occurred into account. A feedstock factor shall be applied at every processing step but may also be relevant at other steps where mass losses occur (e.g. storage). This means that all GHG emissions that are linked with the incoming feedstock (upstream emissions from e_{sca} e_i, e_p, e_{td} and e_e) shall be adjusted to the respective intermediate product using the feedstock factor.

The feedstock factor shall be calculated using the following formula:

Feedstock factor = feedstock (kg_{dry}) / intermediate product (kg_{dry})

Where 'feedstock' is the input material of the processing step considered, and 'intermediate product' is the output material of the processing step considered. The calculation of the feedstock factor shall be based on actual plant data.

After application of the feedstock factor to the upstream emissions, the additional emissions occurring at the recipient (i.e. the supply chain operator where the feedstock factor is calculated) shall be included.

N.B. For the application of the feedstock factor the LHV values per dry tonne need to be applied while for the calculation of the allocation factor LHV values for wet biomass need to be used as this approach was also applied for the calculation of the default values.

Application of the allocation factor
Allocation of GHG emissions shall take place at every processing step in the supply chain where a co-product(s) is produced. The GHG emissions up to this processing step shall be distributed to the main product and the co-product proportional to their energy content and weight. GHG emissions downstream of the processing step (e.g. further downstream processing or transport & distribution) shall not be included in the allocation, as these emissions are not related to the co-product.
The allocation shall include the emissions from e_{ec} + e_l + e_{sca} + those fractions of e_p and e_{td} that take place up to and including the process step at which a co-product is produced. If any allocation to co-products has taken place at an earlier process step in the life-cycle, the fraction of those emissions assigned in the last such process step to the intermediate fuel product shall be used for those purposes instead of the total of those emissions.

In the case of biogas and biomethane, all co-products that do not fall under the scope of e_l shall be taken into account for the purpose of that calculation. No emissions shall be calculated to wastes and residues. Co-products that have a negative energy content shall be considered to have an energy content of zero for the purpose of the calculation.

Wastes and residues from processing including bagasse, shall be considered to have zero life-cycle greenhouse gas emissions up to the process of collection of those materials irrespectively of whether they are processed to interim products before being transformed into the final product.
In the case of fuels produced in refineries, other than the combination of processing plants with boilers or cogeneration units providing heat and/or electricity to the processing plant, the unit of analysis for the purposes of the calculation shall be the refinery.

The following formula shall be used to calculate the allocation factor for intermediate products and biofuels, respectively (with eec here used as an example):

eec intermediate product, allocated =

eec intermediate product,non-allocated * allocation factor intermediate product

with eec in kg $CO_{2\text{-}eq}$/tonne dry product

$$\text{Allocation factor intermediate product} = \frac{\text{Energy content intermediate product}}{(\text{Energy content intermediate product} + \text{Energy content co} - \text{product})}$$

In which:
Energy content intermediate product = $Yield_{intermediate\ product}$ * $LHV_{intermediate\ product}$

And:
Energy content co-product = $Yield_{co\text{-}product}$ * $LHV_{co\text{-}product}$

With energy contents in MJ, yields in kg dry/a and LHVs in MJ/kg.

The energy content shall be calculated using the lower heating value (LHV) and the yield. The LHV shall refer to the entire (moist) (co-)product, not only to the dry fraction of the (co-)product. This 'wet definition LHV' shall be calculated by subtracting from the LHV of the dry matter, the energy needed to evaporate the water in the wet material.

The energy content of co-products with a negative energy content shall be set at zero.
To calculate the allocation factor the following data shall be used:

- Mass/yield data for products and co-products shall be calculated from on-site mass balance data (kg dry);
- LHV data for products and co-products shall come from published sources.

Calculating emissions from cultivation when processing intermediate products
The following formula shall be applied to emissions from cultivation when processing intermediate products:

e_{ec} intermediate $product_a$ = e_{ec} $feedstock_a$ * feedstock $factor_a$ * allocation factor intermediate $product_a$

with: e_{ec} intermediate $product_a$ and e_{ec} $feedstock_a$ in g $CO_{2\text{-}eq}$/kg_{dry}

and:
Feedstock factor = ratio of kg dry feedstock required to make 1 kg dry intermediate product
Allocation factor intermediate product=(Energy content intermediate product /(Energy content intermediate product+Energy content co−products))

4.13 Fossil fuel comparator
For biomass fuels used for the production of electricity, for the purposes of the calculation referred to in section 4.3 of this annex, the fossil fuel comparator $EC_{F(el)}$ shall be 183 g $CO_{2\text{-}eq}$/MJ electricity or 212 g $CO_{2\text{-}eq}$/MJ electricity for the outermost regions.

For biomass fuels used for the production of useful heat, as well as for the production of heating and/or cooling, for the purposes of the calculation referred to in section 4.3 of this annex, the fossil fuel comparator $EC_{F(h)}$ shall be 80 g $CO_{2\text{-}eq}$/MJ heat.

For biomass fuels used for the production of useful heat, in which a direct physical substitution of coal can be demonstrated, for the purposes of the calculation referred to in section 4.3 of this annex, the fossil fuel comparator $EC_{F(h)}$ shall be 124 g $CO_{2\text{-}eq}$/MJ heat.

For biomass fuels used as transport fuels, for the purposes of the calculation referred to in section 4.3 of this annex, the fossil fuel comparator $EC_{F(h)}$ shall be 94 g $CO_{2\text{-}eq}$/MJ.