

**ICONE**

Instituto de Estudos do  
Comércio e Negociações  
Internacionais

*Institute for International  
Trade Negotiations*

## **Benchmark of cane-derived renewable jet fuel against major sustainability standards**

### **Report**

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## **About ICONE**

The Institute for International Trade Negotiations (ICONE) is an independent non-profit organization established in 2003. Through its technical and applied research work ICONE supports the private sector, international organizations, society, and governments with information and strategic studies contributing to the international debate on agriculture and development.

ICONE has been recognized domestically and internationally for excellence in its applied research. The institute has developed expertise in trade policy and international negotiations, emerging economies and agriculture trade, modeling agriculture and land-use change, agricultural-based biofuels and sustainability.

ICONE has been engaged in several projects and research initiatives related to biofuels, land-use change and green-house gases emissions, especially through the use of BLUM (Brazilian Land Use Model), the economic model for Brazilian agriculture. The BLUM encompasses a comprehensive database of economic and satellite imagery data of the main agricultural products produced in Brazil.

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## 1. Executive Summary

This study was developed in order to understand the differences in the requirements of major sustainability standards for the production of biofuels and to understand the main challenges in the implementation of these standards in Brazil. Such study is a demand of the aviation industry, which is increasingly interested in adopting renewable energy sources, more particularly in the form of biojet fuels.

The analyzed initiatives are Bonsucro, the Roundtable on Sustainable Biofuels (RSB), the International Sustainability and Carbon Certification (ISCC) and the Inter-American Development Bank Biofuels Sustainability Scorecard (IDB Scorecard), although the latter is a self-assessment tool rather than a certification. The principles and criteria in the analyzed standards are mainly focused on environmental issues, such as GHG emissions, land use change and biodiversity conservation; and social issues, such as labor and worker health and safety. Some standards also have principles and criteria related to economic issues, such as production and processing efficiency. Throughout the process of developing this study, representatives from these initiatives were invited to provide feedback and suggestions on the analysis and methodology used.

The benchmark was carried out for the production and chain of custody standards, as well as for governance and system operations (including conformity and risk assessments) of the initiatives. The main differences were found to be in the way that each standard requires proof of compliance (evidence) with criteria, as well as in the governance structures, scope of the standards and system operations. The differences among governance structures are important, since they are related to the standard setting process and transparency protocol adopted by the standards and, therefore, to their legitimacy. Bonsucro and RSB are part of the ISEAL Alliance and follow the ISEAL code of good standard setting processes, which should ensure that the standard setting process is transparent and involves multiple and relevant stakeholders. ISCC is not an ISEAL member and there are no public records of the standard setting process adopted. Although it was initiated by the German government, it is now managed by a multi-stakeholder process.

The criteria in the standards are generally similar. There are differences, however, in additional criteria included in RSB - related to GMOs, food security and ILUC - and in ISCC - related to food security. There are also important differences in the criteria and definitions related to high conservation value areas (HCVA) in the standards.

The gap analysis was carried out for Bonsucro, RSB and ISCC. Interviewed groups included sugarcane mills already certified or in the process of becoming certified by one of these initiatives, intermediary companies and certifying companies. Both production and chain of custody standards were assessed to identify the existing gaps between the standards and current practices adopted along the supply chain, as well as the challenges in implementing these standards in Brazil.

The gap analysis revealed that the main bottlenecks for certification are related to its expansion. The implementation of sugarcane biofuel certification in Brazil has taken place so far only in producer-owned/managed areas and in companies/mills with established management programs, which facilitated the process. The expansion of certification to smaller producers and

third party supplier areas will be a much greater challenge. Although the gaps vary among the standards, there is a very important gap that is common to all related to compliance with some points of the Brazilian legislation, especially environmental (Forest Code), labor (overtime, shifts and breaks) and worker health and safety (NR-31). This problem is common to the entire agricultural sector in Brazil. Many producers are in the process of becoming compliant with the law, which is an important first step that is generally accepted by the certifications. Another important gap identified, also related to compliance with the law, is that of necessary structural adaptations, especially in mills with older plant configuration.

There are other gaps that go beyond the law, especially related to the interpretation and implementation of certain criteria, such as HCVA, ILUC and food security. The requirements of these criteria are not clear and there is uncertainty regarding how they will be implemented in Brazil. Other gaps, such as formal communication with stakeholders are less complicated and more a matter of organization.

The main difference among the standards is that the Bonsucro production standard has already been implemented in Brazil for sugarcane based biofuels, while RSB and ISCC have not. Therefore, while Bonsucro's gap is for the expansion of certification, the others are for the implementation of the certifications.

In addition to identifying gaps between the contents of a standard, it is critical to choose a standard based on good governance. Not all standards are governed or audited in an equal fashion. A quality standard is created through a transparent, multi-stakeholder process representing the full value chain and civil society. After such a credible standard setting process, the auditing process must be rigorous and capable of demonstrating thorough analyses of the relevant processes and data as well as thorough interviews with relevant stakeholders, such as field laborers. Currently, not all standards in the marketplace fulfill the credibility criteria of multi-stakeholder development processes and robust auditing. ISEAL is a good reference point to determine such credibility.

## 2. Introduction<sup>1</sup>

The global concern with climate change, combined to the world dependence on fossil fuels, higher price volatility and the increasing uncertainties on oil supply have motivated a growing interest for renewable energy sources, particularly in the form of biofuels. This can be extended to the aviation sector, which has few alternatives to the conventional fuel due to its dependence on liquid fuels with high energy density. According to IPCC (2007), estimates of CO<sub>2</sub> emissions from global aviation increased by a factor of about 1.5, from 330 MtCO<sub>2</sub>/yr in 1990 to 480 MtCO<sub>2</sub>/yr in 2000, and accounted for about 2% of total anthropogenic CO<sub>2</sub> emissions. Since aviation CO<sub>2</sub> emissions are projected to continue to grow strongly, the use of biofuels has been encouraged, among other options, as a way to reduce the impacts on the climate.

Considering this, the aviation industry became concerned in assessing two central sustainability aspects related to biojet fuels: GHG reduction potential and the capacity of the supply chain to comply with sustainability standards. Biofuel producers are also strongly interested in both issues.

Sugarcane, which is one of the most widely used agricultural feedstock in the fuel market in Brazil, is probably the most efficient plant currently available in scale production capable of converting solar energy into biofuels. It is also the most fast paced agricultural-based feedstock in adopting sustainability requirements and with the highest GHG emissions reduction compared to fossil fuels.

However, the agricultural sector in general and biofuel production, specifically, have been widely criticized and accused of non-sustainable practices related to social and environmental issues. There is increasing pressure, especially from the European market, for the adoption of more sustainable practices in biofuel operations.

Due to this, private sustainability standards and certifications, developed by initiatives such as Bonsucro, the Roundtable on Sustainable Biofuels (RSB) and the International Sustainability and Carbon Certification (ISCC) became common over the past years, as a way of improving the sustainability of products.

These sustainability certifications are focused especially on GHG emissions reductions, other environmental impacts, and minimization of socio-economic impacts. The standards and certifications processes are complex and require adaptations of the sector. While they may generate benefits for producers and processors, they may also generate additional costs and hurdles. Furthermore, the legitimacy of such initiatives is closely associated to the processes they follow to develop standards and provide sustainability certificates.

In 2011, the European Union Renewable Energy Directive recognized seven biofuel sustainability certifications as proof of compliance with the directive. Among these initiatives are Bonsucro, RSB and ISCC, although Bonsucro did not receive full recognition. This has increased even more the importance of assessing the complexities of these standards and the viability of their implementation. For this reason, we developed this analysis to capture the requirements of each standard for production and chain of custody, as well as a governance assessment of the initiatives. The three certifications were selected due to their scope (products

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<sup>1</sup> The authors are grateful for the ideas and comments provided by Edegar O. Rosa (WWF Brazil), Kevin Ogorzalek (WWF US), Laszlo Mathe (WWF), Nicolas Viart (Bonsucro), Matthew Rudolf (RSB), Sébastien Haye (RSB), Norbert Schmitz (ISCC) and Lydia Pforte (ISCC).

and feedstocks) and also since they are global initiatives that have been implemented or had pilot projects in Brazil. The Inter-American Development Bank (IDB) scorecard was included because it is based on the RSB standard and is a useful self-assessment tool that outlines the general criteria for sustainable biofuel production.

The present document details the findings of the benchmark phase of the project. This phase includes the following analysis:

- a) Benchmarking protocol: assessment of the principles, criteria and indicators for Bonsucro, ISCC, and RSB, as well as a separate assessment of the IDB scorecard, which is a self-assessment tool based on the RSB standard. Such analysis will result in the generation of an independent checklist for cross referencing between certification programs, as well as a list of specific information required from the standard setting bodies. This was developed in cooperation with Bonsucro, ISCC, RSB and IDB staff personnel to ensure appropriate coverage of critical aspects of each standard.
- b) Qualitative assessment of existing gaps between the standards and current production practices along the chain of custody in a selected group of Brazilian cane producers (mill and feedstock grower activities) and identification of barriers preventing the adoption of the standards proposed by the certification schemes.
- c) Analysis to compare Bonsucro, ISCC, and RSB certification processes that will result in a comparison of the challenges of standard assessment, the comprehensiveness of the audit requirements, and the consistency of the audit activities relative to the Standards and Principles. This will include an analysis of the conformity assessment procedures and of the audit process through conversations with companies/producers that are seeking to obtain the sustainability certifications, companies that carry out the audits (certifiers), organizations that have developed the standards and through the project teams' knowledge regarding Brazilian legislation requirements and the different standards requirements and audit guidance processes.

This report describes and compares the general characteristics, sustainability criteria (production and chain of custody), governance structures and system operations of the analyzed initiatives and standards and also presents the results of the interviews with producers and other supply chain actors and certifiers. The comparison of governance structures and system operations was included after conversations with standard representatives, whom pointed out that it was important to go beyond the comparison of production and chain of custody standards. The criteria were also benchmarked against the Brazilian legislation to assess which aspects in the standards are covered and which are not by the law. This allows an understanding of the degree to which compliance with the law is or is not enough to ensure compliance with the analyzed certifications. It is important to note, however, that we only considered major federal laws and other relevant laws in terms of the scope of the project.

The document is divided as following: Section 2 presents the analyzed initiatives and its general characteristics; Section 3 explains the methodological aspects for this qualitative assessment of the sustainability standards; Section 4 presents the benchmark results for the

standards analyzed; Section 5 summarizes the findings and recommendations; and Section 6 has some support information about the aggregation of the criteria.

### **3. Presentation of analyzed initiatives**

As previously mentioned, the initiatives analyzed in this study are: Bonsucro, the Roundtable on Sustainable Biofuels (RSB), International Sustainability and Carbon Certification (ISCC) and the Inter-American Development Bank Biofuels Sustainability Scorecard (IDB Scorecard). It is important to mention that each initiative has specific certification criteria for the European Union (EU), in order to comply with the European Renewable Energy Directive standards for biofuel use (besides the IDB scorecard, which is a self-assessment tool and not a certification).

Bonsucro is a global multi-stakeholder association, initiated by farmers, industrials and end-user partners, to reduce the environmental and social impacts of sugarcane production. The Bonsucro headquarters are located in London, UK. The certification system was launched in 2011 and has already issued 17 certificates in Brazil for sugar and ethanol produced from sugarcane. Also in 2011, Bonsucro-EU certification was accepted as proof of sustainability for the EU Renewable Energy Directive, although without including the concept of highly biodiverse grassland, as it is awaiting the final EU definition, while it has incorporated the other EU specific criteria. It is only MSI focused solely on sustainability of the sugarcane sector.

Since 2007, the RSB is also a global multi-stakeholder initiative – coordinated by the Energy Center at the “École Polytechnique Fédérale de Lausanne” (EPFL) in Lausanne, Switzerland – concerned with ensuring the sustainability of biofuels production and processing. The RSB has more than 100 members in more than 30 countries, representing a wide range of stakeholders, including industry leaders and important NGOs. RSB is a member of the ISEAL Alliance and complies with ISEAL codes of conduct for standard setting. The RSB certification system was launched in 2011 and since then has issued one certificate to an Australian group for bioethanol produced from wastewater. There is one producer in Brazil currently in the process of obtaining RSB certification. The RSB-EU standard was also recognized under the EU Renewable Energy Directive as proof of sustainability.

ISCC is a global initiative, based in Germany. It has been supported by the German Federal Ministry of Food, Agriculture and Consumer Protection. The certification system has been operational since the beginning of 2010 and has issued more than 1,300 certificates for biomass in sixty countries, including Brazil. The ISCC-EU standard was fully recognized by the EU Commission as proof for the Energy Directive. ISCC currently runs two schemes for the biofuels sector, ISCC-DE and ISCC-EU and another scheme – ISCC PLUS – for all other applications (feed, food, chemicals, solid biomass, etc.).

The IDB Biofuels Sustainability Scorecard was created by the Sustainable Energy and Climate Initiative (SECCI) and the Structured and Corporate Finance Department (SFC) of the IDB based on the sustainability criteria of the RSB. The objective of the Scorecard is to serve as a



self-assessment tool to guide the development of biofuel projects towards a more sustainable path. Also, its results serve as a base for the IDB to determine eligibility for financing of projects.

Table 1 below summarizes other general characteristics of the initiatives, except the IDB scorecard since it is not a certification system. The validity of the certificates varies between the standards. The Bonsucro certificate is valid for three years, the ISCC certificate is valid for one year and the RSB certificate for up to two years, depending on the risk class attributed to the certified operations (discussed in more detail in the systems operation benchmark). Bonsucro surveillance audits are carried out annually after the initial certification audit. For ISCC, audits are also annual since the certificate is only valid for one year. For RSB, audit frequency depends on the risk class attributed to the certified operations. The risk class determines the interval between audits, audit type (i.e., desk, office, field) and the audit team.

The certification of all three initiatives works through an accreditation system of approved certification bodies. ISCC has 19 recognized certification bodies, Bonsucro has seven and RSB has three. An important difference between the standards is that only Bonsucro requires all certified parties to become members of the organization. In RSB and ISCC, this is not a requirement. Certified parties may become members if they wish to take part in decision making and standard discussions, but are not obligated to do so if they only wish to become certified.

**Table 1. General characteristics of initiatives**

	Bonsucro	RSB	ISCC
<b>General characteristics</b>			
Biomass coverage	sugarcane and ethanol	all kinds	all kinds
Validity of certificate	3 years	up to 2 years**	1 year
Audit Frequency	Annual	Varies	Annual
Number of accredited certifiers	7	3	17
Certification conditional on membership	Yes	No	No
N° certifications - Total	17	1	519
Group Certification	No*	Yes	Yes

\*Group certification is only allowed for chain of custody certification.

\*\*Depends on risk class attributed to operations.

**4. Methodology**

The benchmarking of the production and chain of custody principles, criteria and indicators, governance models, as well as other system operations characteristics was performed for Bonsucro, the International Sustainability and Carbon Certification – ISCC, and the Roundtable on Sustainable Biofuels – RSB. A separate assessment was carried out of the IDB scorecard.

There is not one well known and widely used methodology for benchmarking sustainability standards. Many comparisons have been done, however, using different methodologies and approaches. Therefore, to carry out the benchmark of the standards in this study, we used previously established frameworks and methods, as well as our own methods based on the objectives of the study.

Throughout the process of carrying out this benchmark, standard representatives and other experts in the sector were consulted in order to validate the methodology and the results and to guarantee that the assessment of the standards was accurate. Both the preliminary report and the final report were sent to representatives from Bonsucro, RSB and ISCC, whom provided valuable feedback. Their comments were incorporated in the report. In cases where there were significant disagreement points, footnotes were added to include the viewpoint of the standard representatives. The report, however, reflects ICONE's assessment of the standards and gaps in Brazil.

It is important to mention that Bonsucro is the only sustainability standard that considers sugar and ethanol, while all others focus on biofuels in general<sup>2</sup>. For the analysis proposed, we intend to focus on sugarcane-based biofuels, more specifically cane-derived biojet fuels.

#### **4.1. Definition of comparison criteria and framework for benchmark of Production standards**

The benchmark of the production standards was carried out using a framework based on previously published studies to review and analyze sustainability standards and initiatives. The first reference was an analysis done by the Food and Agriculture Organization of the United Nations under the Bioenergy and Food Security Criteria and Indicators (FAO/BEFSCI) study about "Sustainability Aspects/Issues addressed under the Initiatives reviewed" (Ismail et al., 2011). The initiatives reviewed by the FAO included regulatory frameworks (such as the EU Renewable Energy Directive), as well as voluntary standards and certification schemes (such as Bonsucro, the International Sustainability and Carbon Certification - ISCC, the Roundtable on Responsible Soy - RTRS and the Roundtable on Sustainable Biofuels - RSB) and scorecards (such as the IDB scorecard). This served as a good base since all the standards included for the purpose of this study were also benchmarked in the FAO analysis (i.e., ISCC, RSB and Bonsucro and the IDB scorecard). In the FAO benchmark, four main categories were used to classify the criteria: environmental, socio-economic, governance and food security.

Based on the FAO benchmark and considering the specific objectives of the present study, the main benchmark categories were established as: environmental aspects, land use aspects, GHG emissions aspects, socio-economic aspects and food security aspects. We separated the land use and GHG emissions issues due to their importance for the life-cycle analysis phase of this project. The categories were chosen based on the most important topics in terms of biofuels produced from an agricultural feedstock and also considering the objective of the aviation industry with the adoption of biojet fuels. The categories above include the production/processing standards of the initiatives.

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<sup>2</sup> Although ISCC is in the process of establishing ISCC Plus, a standard to certify food, feed and material use.

The FAO analysis divides the main topics into sub-topics, which were also used as a reference for the present benchmark, with some adaptations based on the objectives of the present study (as will be shown below).

Next, we reviewed “The state of sustainability initiatives review 2010: sustainability and transparency” produced by the International Institute for Sustainable Development (IISD) and the International Institute for Environment and Development (IIED), which is an overview of the system characteristics and market trends regarding ten of the most mature voluntary sustainability initiatives in the forestry, coffee, tea, cocoa and banana sectors. Despite the fact that this report is not related to biofuel criteria, it served as a reference for the benchmark framework and organization, as well as for the systems operations benchmark (Potts, Meer and Daitchman, 2010).

Also, we consulted the paper “Recent developments of biofuels/bioenergy sustainability certification: a global overview” by Scarlat and Dallemand (2011). This paper provides a detailed review of the main certification initiatives and approaches for biofuels and/or bioenergy, including schemes for crops used as feedstocks for biofuels. The analysis includes Bonsucro, ISCC and RSB, as well as the Roundtable for Responsible Soy and the Roundtable on Sustainable Palm Oil. However, it also includes regulatory frameworks, such as the Renewable Transport Fuels Obligation, the US Renewable Fuel Standard and the California Low Carbon Fuel Standard. The approach in the paper is different from the one used in the present study in the sense that it is more like a general overview of these initiatives and not a benchmark *per se*.

In Scarlat and Dallemand (2011) the main topics analyzed were: general requirements, environmental aspects, GHG emissions calculations, socio-economic aspects, and monitoring and reporting requirements. The authors created subdivisions within the topics and defined criteria to analyze within these topics. We referenced the subdivisions and criteria created by the authors for the environmental aspects, GHG emissions and socio-economic aspects for this study.

Based on the FAO study and on the Scarlat and Dallemand (2011) paper, 16 sub-topics were defined for the benchmark. They are very similar to the FAO analysis, as can be seen in tables 2 and 3 below.

**Table 2. Environmental aspects, land use and GHG emissions (sub-topics)**

Environmental Aspects, land use and GHG emissions (Scarlat and Dallemand, 2011)	Environmental Aspects, land use and GHG emissions (Ismail et al., 2011) (FAO)	Environmental Aspects, land use and GHG emissions (ICONE)
Carbon Conservation (includes GHG emissions and land use changes)	Land use changes (direct and indirect)	Direct land use changes
Biodiversity conservation	Biodiversity and ecosystem services	Biodiversity
Soil conservation*	Productive capacity of land	Soil

Sustainable water use	Crop management and agrochemical use	Crop management and agrochemical use
Air quality	Water availability and quality	Water
	GHG emissions	GHG emissions
	Air quality	Air
	Waste Management	Waste
	Environmental Sustainability	Environmental sustainability

\* The authors include waste management and agrochemical use in the soil conservation sub-topic.

**Table 3. Socio-Economic and Food security (sub-topics)**

Socio-Economic and Food security aspects (Scarlat and Dallemand, 2011)	Socio-Economic and Food security aspects (Ismail et al., 2011) (FAO)	Socio-Economic and Food security aspects (ICONE)
Economic development	Land tenure/access and displacement	Land, water and resources
Social aspects	Rural and social development	Rural and social development
Labor conditions	Access to water and other natural resources	Human rights and labor rights
	Employment, wages and labor conditions	Employment, wages and labor conditions
	Human health and safety	Human health and safety
	Energy security and access	Economic development
	Good management practices and continuous improvement	Food security
	Social sustainability	
	Food security	

The 16 subtopics were further divided into 36 comparison criteria. To define the criteria we referenced Scarlat and Dallemand (2011), but we changed some of the aggregations, based on what we considered plausible and most relevant for the purpose of the present study. Also, the previous definition of the sub-topic guided the definition of the comparison criteria, as well as the standards themselves.

To summarize, the 16 topics (underlined) and 36 sub-topics (numbered) are listed below and described in detail in Section 6:

Under Environmental, Land use and GHG emissions:

- Biodiversity: 1) biodiversity and 2) genetically modified organisms.
- Soil: 3) productive capacity of the soil and 4) use of by-products.
- Crop Management and Agrochemical Use: 5) fertilizer, 6) integrated plant management, 7) agrochemical use.
- Water: 8) quality of surface and groundwater and 9) quantity of surface and groundwater/Irrigation.

- Air: 10) air pollution and 11) open air burning.
- Waste: 12) reduce waste/waste management/disposal
- Environmental Sustainability: 13) energy, 14) efficiency and 15) incorporation of sustainability into new projects.
- Direct land use changes: 16) restriction/baseline for LUC.
- GHG emissions: 17) emission reduction and 18) GHG calculations.

Under Socio-Economic and Food Security:

- Laws and International Conventions: 19) compliance with relevant applicable laws.
- Land, Water and Resources: 20) land rights and land use rights, 21) water rights.<sup>3</sup>
- Human Rights and Labor Rights: 22) labor conditions and 23) contractor and suppliers.
- Employment, Wages and Labor Conditions: 24) wages/per unit wages, 25) work hours/breaks/overtime, 26) contracts and 27) communication/complaints/mediation mechanisms.
- Human Health and Safety: 28) conditions of occupational health and safety for workers, 29) social impact assessment.
- Rural and Social Development: 30) social development and 31) women, youth, children and indigenous communities.
- Economic Development: 32) production and processing efficiency, 33) economic viability, 34) good management practices and 36) engagement and communication with stakeholders.
- Food Security: 36) assess food security impacts.

Lastly, to validate the comparisons and the defined criteria, we consulted the “standards map” tool, developed by the International Trade Centre (ITC, 2011), which includes all three of the analyzed standards. This is a benchmark tool that allows users to compare different criteria within standards.

After the definition of the criteria, we compared the production standards based on two indicators: a) relevance of requirement<sup>4</sup> and b) as having explicit or not explicit specifications.

a) Relevance of requirement: classify standards as having major requirements, minor requirements or no requirements in each category in order to highlight the relevance of issues in each standard.

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<sup>3</sup> In the first edition of the report, there was a 3<sup>rd</sup> sub-topic within this category named “access to resources”. It was excluded because after consultation with standard representatives, it was concluded that it was redundant since there are individual categories for the issues included in this topic (i.e., water rights, land rights and food rights/access).

<sup>4</sup> This indicator was previously named “timing of requirement” and standards were classified as having “immediate requirements”, “not immediate requirements” and “not required”. After consultation with standard representatives, this was changed since they expressed a concern that the previous terminology would create confusion regarding the requirements for certification.

- For Bonsucro: major requirements were considered to be the five core criteria required for certification: applicable laws, International Labor Organization - ILO labor conventions, minimum wage, assess impacts of sugarcane enterprises on biodiversity and ecosystem services, and greenfield expansion. Minor requirements were considered to be all the others. However, for certification the producer needs to comply with the core criteria along with 80% of the total indicators, besides from 100% of chain of custody requirements and additional 100% of Bonsucro EU criteria (when intended for EU market).
  - For RSB: major requirements were considered to be all minimum requirements, which must all be met necessarily for certification, along with chain of custody requirements. Minor requirements were considered to be all progress requirements.
  - For ISCC: major requirements were considered to be all criteria classified as “major musts” in the standard, which must all be met necessarily for certification, in addition to 60% of minor musts and chain of custody requirements. Minor requirements were considered to be all the “minor musts” defined in the standard.
  - For IDB: this was not applied to IDB, as it is a scorecard (self-assessment tool) and not a standard like the others.
- b) Explicit specification: classify criteria as being an explicit specification or not.
- The criteria was classified as being an explicit specification in two cases: 1) if there was a quantitative measure or indicator to verify compliance with the criteria; 2) if there was a qualitative, but detailed description of how to verify compliance with the criteria.
  - The criteria were classified as not being an explicit specification if it did not present a detailed description or way to verify compliance with the criteria.
  - The ‘not applicable’ classification was used in cases where the issue is not a requirement in the standard.

Lastly, the requirements of the standards were compared to Brazilian legislation based on the question: Is the criteria covered by Brazilian legislation? (Yes or No).

#### **4.2. Definition of comparison criteria and framework for benchmark of Chain of custody Standards**

The chain of custody criteria for comparison of standards were defined mainly based on the “standards map” tool (ITC, 2011) and also based on the standards themselves. Scarlat and Dallemand (2011) briefly touch on this topic and classify chain of custody requirements as administrative and technical. In the “standards map” analysis, the criteria used are very broad. In the present study, we tried to disaggregate the broad categories to provide a more detailed comparison. The requirements were divided into three broad categories: 1) Administrative requirements for tracking certified products; 2) Information requirements for tracking certified products; 3) Models used for traceability/technical requirements. We also included a category to compare the mass balance methodologies of the standards, since it is the most commonly used for traceability of certified products along the supply chain.

After the criteria were defined, we assessed which standards required each criterion on a yes/no basis. For the EU market specific standards, additional criteria were also identified. A qualitative assessment of the differences was also carried out following the result presentation in tables.

#### **4.3. Definition of comparison criteria and framework for benchmark of governance, transparency and public disclosure of information**

The governance models of the analyzed initiatives were described and compared based on organizational structure, standard-setting and certification processes. Also, as a way of assessing transparency in the initiatives, we carried out a benchmark of public disclosure of information of the standards based on the model presented in Potts, Meer and Daitchman (2010) and also on the “standards map” tool, developed by the International Trade Centre (ITC, 2011). The criteria for comparison were divided in three broad categories: 1) information related to decision makers; 2) information related to decisions and; 3) information related to documents of meetings and processes. The first category includes the availability of documents with information on who are board, committee and technical group members. The second category includes the availability of information regarding decisions, such as compliant enterprises, complaints, appeals and resolutions, and certification decisions. The last category includes the availability of documents related to records and processes. These categories were further divided into more detailed sub-categories.

After the criteria were defined, we assessed the standards availability of information in each category on a yes/no basis (presented in a table), and also carried out a qualitative assessment of the comparison.

#### **4.4. Definition of comparison criteria and framework for benchmark of system operations**

Within this category, system operation characteristics were compared and analyzed, including conformity assessment and risk assessment. The comparison criteria for the conformity assessment benchmark were defined based on the previously mentioned publications, especially Potts, Meer and Daitchman (2010), the “standards map” tool, and also a benchmark carried out by a consulting firm for the UK Department of Transport (Ecofys, 2011). These two publications served as a good starting point to define comparison criteria for conformity assessment. For risk assessment, we defined three comparison criteria based on the standards themselves, since none of the publications we consulted treat this issue in detail. We defined three criteria to be compared on a yes/no basis: 1) whether the standard has specific guidelines/standard for risk assessment; 2) whether the standard requires a self-risk assessment and; 3) whether the risk level affects the audits. We also carried out a qualitative analysis of this issue and differences between the standards.

#### **4.5. Compilation of results and notes on presentation of results**

The results were compiled and are presented in tables, followed by a qualitative analysis of the comparisons. It is important to highlight that the initiatives have different standards for certification of products to be in compliance with the European Union Renewable Energy Directive (RED). Production standards differ in EU requirements only regarding environmental, land use and GHG emissions criteria and, therefore, only these sections will make this distinction.

The differences between the “original” standards and EU directed standards are summarized below:

- RSB-EU: criteria 3a and 7a are different from RSB.
- Bonsucro-EU: Principle 6 is a principle supplements the original Bonsucro standard.
- ISCC-EU: Criteria 1.3, 1.4, 2.3, are different from ISCC-DE. ISCC-EU Criteria 2.4.5, 2.5.3, 2.5.4, and 2.5.5 are new. ISCC requested that only the ISCC-EU standard be included in the analysis because they intend to maintain only this standard in the near future. Therefore, the ISCC-EU standard will be referred to as only ISCC from now on for the purpose of this study. In the benchmark results, the only standard considered is ISCC-EU.

It is also important to note that the IDB Scorecard is not per se a standard and, therefore, receives special treatment in the benchmarking. This means that it was not compared to the certification systems and that a qualitative assessment of the categories included was carried out in a separate section of the report.

### **5. Benchmark results**

The results of the comparisons are summarized in tables 1 through 8. The results are divided in benchmark of environmental, land use and GHG emissions requirements followed by environmental, land use and GHG emissions requirements benchmark against Brazilian legislation. Next, the same is presented for socio-economic and food security requirements; for chain of custody standards; governance, transparency and public disclosure of information; and system operations. The last sub-section is dedicated to the assessment of the IDB scorecard.

#### **5.1. Production Standards: Environmental, Land Use and GHG Emissions**

For the production standards the following topics were analyzed separately: biodiversity, genetically modified organisms, productive capacity of the soil, use of by-products, fertilizer, integrated plant management, agrochemicals, quality of surface and groundwater, quality of surface and groundwater/irrigation, air pollution, open air burning, reduce waste/waste management/disposal, energy, incorporate sustainability in new projects, restriction/baseline for Land Use Change – LUC, emissions reductions and GHG calculations. The qualitative assessment for the different standards is summarized in Table 4 (original standards) and Table 5 (EU standards). Table 6 compares if the principles and criteria are covered by the Brazilian legislation.



## **Biodiversity**

This category includes biodiversity, ecosystem services and invasive species. Biodiversity includes plants, animals, other organisms and ecosystem. Ecosystem services are the goods and services that biodiversity provides. Invasive species can pose a threat to biodiversity if it is not well handled. All the standards treat biodiversity as a major requirement and present explicit specifications. All standards have detailed criteria about land with High Conservation Value (HCV), land with high biodiversity value or high carbon stock. These criteria fulfill a requirement from the EU Directive 28/09/EC.

Bonsucro and Bonsucro-EU have a general approach in their criteria. The efforts related to biodiversity are concentrated in the criterion about land with HCV and the criterion about the need to have and implement an environmental management plan (EMP). The EMP stipulates the protection of riparian areas along with other issues. ISCC also has a general approach and all concepts related to biodiversity are treated in the criteria about use of the land with high biodiversity value or high carbon stock and protection of HCV areas. An important point is that ISCC requires that all other production areas of the farm/ plantation comply with these criteria. RSB and RSB-EU have more detailed criteria. They divided the subject into different criterion, this methodology allows for more detailed requirements, for instance on preserving ecosystem services and functions. Special attention is paid to the concept of buffer zone inside the production site to intercept pollutants and manage other environmental concerns. The other standards do not have this concept.

The Brazilian legislation related to these issues are Decree Nº 4.339/2002 (National Policy for Biodiversity), Law Nº 4.771/1965 (Forest Code) and Decree Nº 6.514/2008. The Brazilian legislation protects land with high biodiversity value, but it does not prohibit the conversion of such lands. There is legislation in place that allows the conversion of specific areas. The legislation is not specific regarding the conservation of land with highly biodiverse grassland, land with high carbon stock and peat land. To comply with the requirements of EU directive 28/2009 no conversion of land with high biodiversity value, land with highly biodiverse grassland, land with high carbon stock and peat land no conversion is allowed. Brazil does not have a specific legislation about buffer zone (as considered by RSB and RSB-EU) within the production site. However, some requirements in the Brazilian Forest Code can be considered similar to it, such as Permanent Protected Areas with riparian natural vegetation, and the Legal Reserve (a percentage of the farm which needs to be preserved with natural vegetation). Ecosystem services are recognized in the Brazilian legislation.

The Decree Nº 6.514/2008 considers as crime infractions against the fauna and flora, infractions that promote pollution and other environment infractions. It can be considered more restrictive than the standards requirements.

## **Genetically modified organisms**

This category includes all criteria related to genetically modified organisms (GMO). The use of GMOs is allowed, but actions shall be taken to minimize the risk of damages to the environment and people, and to improve environmental and/or social performance over the long term. Brazil is a signatory of the Cartagena Protocol on Biosafety and uses the Biosafety Clearinghouse. Only the RSB and RSB-EU standards have major requirements for GMOs, which shall demonstrate positive environmental and/or social benefits, with appropriate measures of containment and monitoring. However they are not prohibited by the RSB. The certification scheme had a GMO Expert Group that worked to improve RSB guidelines for risk mitigation regarding GMOs. Brazil does not use GMO crops for sugarcane. But Amyris' industrial process to obtain biojet fuel does use GMOs.

Aside from being a signatory of the Cartagena Protocol on Biosafety, Brazil has a legislation that goes beyond the required to fulfill the RSB and RSB-EU criteria about GMOs. The law 11.105/2005, Decree 5.591/2005 establishes norms of security, inspection, disposition and release in the environment. There are severe penalties, including one to four years reclusion for illegal disposal or release of GMOs into the environment.

## **Productive capacity of the soil**

This category includes all criteria related to soil as a factor for feedstock production and the environment. For this reason, the soil quality (physical, chemical and biological) must be improved and/or maintained. Soil erosion and soil structure are analyzed within this topic as well. All the standards have explicit specifications regarding this issue, although they adopt different criteria to analyze it.

Bonsucro and Bonsucro-EU have measurable values for soil ph, soil carbon content and to minimize the opportunity of erosion to occur. Additionally, Bonsucro addresses the percent of soil tilled and covered to conserve soil health and reduce erosion.

ISCC has detailed criteria to minimize soil erosion, to manage vulnerable soil, to assess the balance of organic soils, and techniques to maintain the soil structure. The standard has a restriction on burning as part of the productive process and do not allow burning as part of the land clearing process. ISCC has a specific criterion for soil management planning.

RSB and RSB-EU have specific procedures for this subject. Requirements are to minimize soil erosion, adopt practices to maintain or enhance soil organic matter and to conduct a screening of soil conditions. If necessary, after the screening, a Soil Impact Assessment should be conducted in accordance with the guidance.

The Program of Hydrographic Basin and Conservation of Soil concentrate the actions for soil conservation in Brazil. Conama Resolution Nº 420/2009, and Decree Nº 94076/1987. The individual states can have their own legislation for soil use and conservation.

These standards also have a restriction on burning as part of the productive process, but do not prohibit the burning. The issue of burning is discussed in more detail in the "Open air burning" section.

## **Use of by-products**

This category includes all criteria related to the use of agricultural by-products. This is an explicit criterion for all standards and a major requirement as well. These criteria address the consequence for the soil of the use of agricultural by-products from the feedstock production. In addition, the RSB is developing a specific certification regime for biofuel producers using agricultural, forestry or industrial by-products.

## **Fertilizer**

This category concentrates all aspects of fertilizer utilization, including storage, handling and disposal. Only ISCC fully describes the good practices for fertilizer use, including the use of machinery. But it is a major requirement for all the standards. Bonsucro and Bonsucro-EU have detailed criteria for the application rates of fertilizers, which pay special attention to the potential effects on eutrophication caused by the use of nitrogen and phosphorus fertilizer, as well as greenhouse gas impacts. RSB and RSB-EU treat fertilizers as a chemical and has a list of prohibited substances (Principle 11).

Brazil does not have a legislation that controls the use of fertilizers, but has legislation about handling these products. It covers the production, importation, commercialization and inspection. The normative instruction specifies the norms for registry, packaging and labeling of fertilizers. Decree Nº 4954/2004, MAPA/SDA Normative Instruction nº 27 /2006; MAPA Normative Instruction nº 5 /2007; MAPA/SDA Normative Instruction nº 25 /2009.

## **Integrated Plant Management (IPM)**

IPM is a potentially more sustainable way to manage invasive plants and pests through prevention, observation and monitoring, and intervention. In the intervention phase, non-chemical approaches must be considered. Only ISCC has criteria related to this subject, but they are not impeditive (not major requirements) for certification.

## **Agrochemicals**

This category concentrates all aspects of agrochemicals utilization, including storage, handling and disposal. This subject is a major requirement for all the standards and all of them have explicit specifications for it. ISCC has more detailed criteria for use, handling, storage and disposal, than the other standards. RSB, RSB-EU, Bonsucro and Bonsucro-EU do not allow the use of chemicals recorded in the World Health Organization (WHO)'s 1a and 1b lists. For Bonsucro and Bonsucro-EU, the only exception is when the use of these chemicals can be proven to be in compliance with local and international legal requirements. RSB and RSB-EU establish a phase-out program for the use of chemicals recorded in Annex III of the Rotterdam Convention and in the Stockholm Convention on Persistent Organic Pollutants (POPs). Bonsucro, Bonsucro-EU, and ISCC have criteria that state that only locally approved agrochemicals should be used. Bonsucro, however, limits the amount of pesticide active ingredients to 5kg/ha. Bonsucro and Bonsucro-EU criterion require producers to follow the Stockholm Convention on POPs. Brazil is a

signatory of both the Rotterdam Convention and the Stockholm Convention, as a member of the WHO. However, being a signatory or member does not mean that Brazil does not allow the use of the chemicals listed in the RSB and RSB-EU standards.

The legislation includes research, experiments, production, packaging, labeling, transportation, storage, commercialization, marketing, utilization, importation, export, final destination of residues and packages, register, classification, control, and inspection of agrochemicals. Brazilian legislation covers the points established by the standards in their criteria. Brazil is a member of the WHO and a signatory of Rotterdam Convention and the Stockholm Convention. However, being a signatory to these conventions does not mean that the agrochemicals listed in WHO's 1a and 1b lists are not used in Brazil. The relevant national laws are Law nº 7802/1989, Decree Nº 4074/2002, and IBAMA Normative Nº 84, de 15 of October 1996.

### **Quality of surface and groundwater**

This subject is related to all criteria that treat water as an important factor for production and the environment. For this reason, water quality (physical, chemical and biological) must be improved and/or maintained during all or part of the biofuel productive process. This is a major requirement and all standards have explicit specifications for it. Bonsucro and Bonsucro-EU include water for industrial use and for agricultural use. Bonsucro also addresses water quality from the farm level through the nutrient input and EMP indicators. ISCC focuses only on agriculture usage of water. RSB and RSB-EU include the usage of water both at the agricultural and industrial stages of the supply chain. ISCC has criteria for maintaining or re-establishing the natural vegetation near water bodies, as does Bonsucro and Bonsucro-EU. The RSB and RSB-EU require establishing buffer zones where needed in order to avoid degradation of water bodies. RSB and RSB-EU have a Water Assessment if the screening exercise indicated the need for it.

The relevant national laws regarding this issue are CONAMA Resolution Nº 420/2009; CNRH Resolution No 92/2008; Law Nº 9433/1997; Decree Nº 6514/2008. Law Nº 9433/1997 states that the Federal Executive may delegate to the States and the Federal District the authority to grant license or right of use of water resources under federal domain. The Hydrographic Basin Committee is responsible for the management of hydric resources. It can be federal-level, if the river crosses a State border, or state-level if the river flows within the State. The States can have their own legislation for water, especially for rivers that only flow within the state.

Law Nº 4771/1965 (Forest Code) establishes that the riparian vegetation has to be maintained or re-established. Brazilian legislation treats as an environmental crime water pollution. It can be considered more restrictive than the standards requirements.

### **Quantity of surface and groundwater/irrigation**

This category complements the previous one. The quantity of surface and groundwater can be affected by unsustainable use. All standards have explicit specifications about this topic, but only RSB and RSB-EU treat it as a major requirement. RSB and RSB-EU have specific Water Assessment guidelines related to depletion and contamination of water resources, including the water used for irrigation. Bonsucro and Bonsucro-EU have criteria to reduce water consumption, specifically for irrigation. ISCC has a specific criterion to justify irrigation considering water conservation. Also, ISCC requires a water management plan aimed at efficient water usage.

The relevant national laws regarding this issue are CONAMA Resolution nº 396 /2008; CNRH Resolution Nº 5/2000; DECREE Nº 89.496/1984; Decree Nº 2.178/1997; and Decree Nº 6.514/2008. The Federal Law governs the irrigation, but states can have their own legislation for irrigation. The Hydrographic Basin Committee is also involved with this subject. The pollution of groundwater is treated by the CONAMA Resolution nº 396 /2008 considering the prevention and control of pollution. The Brazilian legislation is more detailed and restrictive than the standards requirements.

### **Air pollution**

Only RSB and RSB-EU have major requirements related to air pollution. They require the implementation of an air management plan, which identifies major air pollutants and indicates strategies to mitigate air pollutants. Bonsucro and Bonsucro-EU have a threshold for atmospheric acidification and air and air pollution is an issue that should be addressed in the Environmental Management Plan. ISCC only mentions explicit air conservation in the main title of Principle 2 and in the criterion related to open air burning, which will be discussed below.

The relevant national laws regarding this issue are CONAMA Resolution Nº 005/1989; and Decree Nº 6514/2008. Brazilian legislation treats as an environmental crime air pollution. The legislation fulfills the requirements from the standards, but Brazilian legislation does not require farmers to have an air management plan. The States can have their own legislation for air pollution.

### **Open air burning**

This category includes all criteria related to open air burning as part of the production cycle. Only Bonsucro and Bonsucro-EU do not have criteria for it, however, they call for a burning plan through the EMP. Additionally, both standards account for GHG emissions, soil organic matter, and ground cover in different aspects of the standard. As Bonsucro is metric based it does not prescribe management practices. All the other standards treat this subject as a major requirement. ISCC has a restriction on burning as part of the productive process and does not allow burning as part of the land clearing process. This restriction allows the use of burning only when this use is authorized by environmental license. RSB and RSB-EU require that burning of sugarcane for harvest be minimized, but do not prohibit the burning under specific

conditions, e.g. when workers health and safety is at stake or when no viable alternative is available.

The restriction on burning is an important issue for Brazilian sugarcane producers because burning is an optional procedure for sugarcane harvesting. Even in this scenario, Brazilian legislation already covers this issue, and São Paulo state (the most important for sugarcane production) has specific legislation that establishes the extinction of burning in 2031, but the Agricultural-Environmental Protocol for the Sugar/Energy Sector firmed between the State of São Paulo and the sector, anticipated the extinction of burning to 2017. In addition, many municipalities have their own legislation that prohibits burning for harvesting.

The relevant national laws regarding this issue are Decree Nº 2661/1998; Decree Nº 6.514/2008. Brazilian legislation treats as an environmental crime burning of solid residues and burning for clearing areas. States and municipalities have their own legislation that can be more restrictive than the federal legislation. Also, the Decree Nº 6961/2009 establishing the Agro-Ecological Zoning imposes that sugarcane burning will be forbidden nationally in 2017. The Brazilian legislation is more restrictive than the standards requirements.

### **Reduce waste/waste management/disposal**

This topic is related to reduction/treatment/disposal of waste in order to avoid environmental contamination. It is a major requirement only for RSB and RSB-EU, but ISCC, RSB and RSB-EU have explicit specifications regarding this issue. ISCC has a farm waste management plan. The RSB and RSB-EU have criteria to manage the waste, minimize waste and avoid contamination of the environment. Bonsucro and Bonsucro-EU have criteria to reduce emissions and effluents, but do not address the issue of waste disposal or waste management.

The relevant national laws regarding this issue are CONAMA Resolution Nº 430/2011; Law Nº 12305, /2010; and Decree Nº 6514/2008. Brazilian legislation treats as an environmental crime pollution promoted incorrect disposal of waste, also the incorrect disposal of waste. Brazilian legislation does not require farmers to have a waste management plan. The federal legislation says that states must have a state law for solid residues. The state legislation can be more rigorous than the federal legislation.

### **Energy**

The use of energy can have impacts on environmental sustainability, for that reason it is taken into consideration when planning the use of energy for the biofuel project. Bonsucro and Bonsucro-EU have criteria that require reduction of energy consumption through the entire chain of production.

### **Efficiency**

Like energy, efficiency can have impacts on environmental sustainability. Only Bonsucro and Bonsucro-EU have explicit requirements related to this, but they are not major requirements. The efficiency criteria are related to total raw materials used per kg of product,

sugarcane yield, working hours lost/working hour and others related to mill and industrial performance.

### **Incorporate sustainability in new projects**

All the standards have explicit specifications for this issue, and it is a major requirement as well. The environmental sustainability is considered in all aspects of the project, and all objectives consider the impact they have on the environment.

Brazilian legislation has the instrument EIA/RIMA (study of environmental impact/report of environmental impact) implemented by CONAMA Resolution Nº 001/1986, to be submitted by the biofuel project to the environmental organ responsible (states and/or federal). The EIA/RIMA is more detailed than the standards and as restrictive as the standards, because if a project doesn't have the EIA/RIMA, it is not authorized to be implemented.

### **Restriction/Baseline for Land Use Change - LUC**

RSB-EU and ISCC have a restriction on conversion of land that fulfills the EU directive 28/2009. The original standards have restrictions on conversion but that do not necessarily meet the EU directive 28/2009. Bonsucro-EU does not meet the sustainability requirement of Article 17(3)(c) on highly biodiverse grassland of the Directive. The Bonsucro-EU standard states that HCVA should be defined nationally and that in the absence of such definition producers should prove that no HCVA's have been converted after 2008. The GHG emissions due to land use change must be added to the carbon footprint for all the standards. Bonsucro and Bonsucro-EU consider direct land use change as a change from the original state of the land to use for sugarcane production. Bonsucro also focuses on RAMSAR and UNESCO Heritage Sites through indicator 1.1. RSB, RSB-EU, ISCC consider the direct land use change for production of any feedstock for biofuel/bioliquid. RSB has a concept of "no-go areas" for areas that should not be used for feedstock production. There is also a restriction to conversion of areas that contain identified conservation values of global, regional or local importance. RSB-EU is more detailed defining the "no-go areas" and adding the definitions of UNESCO's World Heritage Site, Ramsar Site and Alliance for Zero Extinction areas. More than that, the standard has a concept of "no-conversion areas" that fulfills the EU directive 28/2009 and includes HCV Areas, Key Biodiversity Areas, Natura 2000 Sites, etc. While "no-go" areas cannot be used for any biofuel operation, "no-conversion" areas can be used for biofuel operations as long as their conservation status is maintained and that none of their conservation values is lost due to biofuel operations. RSB and RSB-EU calculate the emissions by subtracting the carbon content of the implemented biofuel system from the carbon content of the land use at the baseline date. RSB has a baseline date of 01/01/2009, and a baseline date of 01/01/2008 for RSB-EU. RSB and RSB-EU use IPCC land categories: forest land; cropland; grassland; wetlands; settlements; other land.

ISCC has definitions for land with high biodiversity value or high carbon stock. The principles are in accordance with the EU directive. ISCC uses several definitions such as: UNESCO world heritage site, Ramsar site, Alliance for Zero Extinction, Harmonized world soil database,



WDBA, IBAT, and national documents. The ISCC states that no national law and regulation can violate any requirements of ISCC and the EU Directive 28/2009. ISCC considers the IPCC categories of land use plus a seventh category for perennial crops. If after 01/01/2008 (the baseline) a change occurs from one category to another, then there is a need to calculate the emissions from carbon stock changes. Only when Principle 1 is not violated, a land use change can take place and then carbon stock change has to be calculated. Bonsucro definitions of high conservation value areas state that National definitions of HCVA shall take precedence over international when both exist. Bonsucro-EU adds the definitions from the EU directive 28/2009 and establishes that the definitions from the EU directive are proprietary, although Bonsucro-EU does not meet the sustainability requirement of Article 17(3)(c) on highly biodiverse grassland of the Directive. Bonsucro and Bonsucro-EU state that the table of IPCC default land use change values for selected countries published in the PAS 2050 is used in the footprint calculation. Bonsucro considers the date 01/01/2008 as baseline.

Brazil has an Agricultural-Environmental Zoning for sugarcane (ZAE – CANA - Figure 1), implemented by Decree Nº 6961/2009. The ZAE – CANA guides the expansion of sugarcane through a combination of public policies and access to credit. The Zoning considers: vulnerability of land, climate risk, potential for sustainable agricultural production and the present environmental legislation. More than that, the Zoning excludes from possible sugarcane expansion: 1. land with a slope superior to 12%, considering the premise of mechanical harvest, without burning for the expansion areas; 2. areas with native vegetation; 3. the Amazon and Pantanal biomes and Alto Pantanal watershed; 4. areas of environmental protection; 5. Indigenous land; 6. dunes; 7. mangrove; 8. cliffs and rocks outcrops; 9. reforestation areas; 10. urban areas and mining areas. For the Center-South states (GO, MG, MT, MS, PR and SP), areas that already had sugarcane plantation in the crop year 2007/2008 were excluded. The areas appointed for the expansion of sugarcane production under the Agricultural-Environmental Zoning are those areas that are already under intensive agricultural production, semi-intensive agricultural production, special crop production (perennials, annuals) and grassland. This areas were classified into three groups according to their potential (high, medium and low) further discriminated by current type of use (Ag – Agriculture/Livestock, Ac – Agriculture and Ap – Grassland) based on the map for remaining forest in 2002, published by Probio-MMA.



Figure 1- Agricultural-Environmental Zoning for sugarcane – suitable areas in Brazil



Source: Embrapa (2009)

### Emissions reduction

The EU directive 28/2009 requires an immediate minimum reduction of 35% of lifecycle greenhouse gas emissions relative to the fossil fuel baseline. The EU has progressive requirements for emissions reductions, up to 60% in January 2018. This requirement also applies to bio jet fuel. The fossil fuel equivalent product has an emission value of 83.8 gCO<sub>2</sub>eq/MJ.

RSB and RSB-EU require a 50% reduction at the blending stage, which can be obtained by blending biofuels with different GHG performances (e.g. blending equal volumes of a biofuel achieving 60% GHG savings and a biofuel achieving 40% GHG savings), while ISCC requires a 35% reduction initially, which progressively rises to 60% within certain time. Bonsucro requires the emissions from ethanol production to be less than 24 gCO<sub>2</sub>eq/MJ, while Bonsucro-EU has to be less than 50 gCO<sub>2</sub>eq/MJ. The difference of values is due to the fact that the EU RED has a default value for sugarcane ethanol of 24 gCO<sub>2</sub>eq/MJ plus the value of direct land use change, and for this default value the threshold of 50 gCO<sub>2</sub>eq/MJ is equal to a reduction of 40%.

## GHG calculations

When studying GHG calculation methodology, it is necessary to consider the unit of measure, the system boundaries, the allocation of GHG of co-products and finally the methodology itself. GHG calculation is a major requirement in all standards and they all have explicit specifications. RSB, RSB-EU, and ISCC have a document with their GHG calculation methodology. Bonsucro and Bonsucro-EU treat the methodology in Appendix 3 of its standard. The unit of measure of the GHG emissions from biofuels in all standards is gCO<sub>2</sub>eq/MJ.

RSB and RSB-EU have a system boundary from cradle (biofuel blending) up to, but not including, use of the fuel in an engine. It includes theoretical emissions from fuel combustion. Bonsucro and Bonsucro-EU system boundary include growing and processing of sugarcane. The system includes the energy embedded in the manufacture and supply of all fertilizers and chemicals, but excludes the energy of agricultural and milling capital equipment. ISCC system boundary includes from farm/plantation to relevant market player. Relevant market player is the final element in the supply chain, the economic operator who brings biofuels into the market. This system does not include infrastructure.

Co-product is one out of multiple products coming from the same production process and for which an allocation takes place. The allocation of GHG of co-products can be based on property, such as mass, energy and economic value. The EU RED accepts the allocation due to energy content. Bonsucro and Bonsucro-EU accept two approaches to deal with co-product, one called “substitution”, and another called “allocation”. Bonsucro and Bonsucro-EU are aligned with the EU RED. ISCC adopts the allocation based on energy content of the co-products. RSB allocation is based on economic value. RSB-EU uses both allocation based on energy content and economic value.

In terms of GHG calculations, ISCC accepts three forms of calculations: 1) Default value: as established by the EU Directive 2009/28/EC; 2) Individually calculated values (“actual value”): individually calculated value for specific elements can be used even if there is default value for the elements; 3) Combination of default value and “actual value”: an element can have a value that is a combination of these values, and it is possible to have a combination of different elements of the supply chain. The RSB has developed an online GHG Calculator to help customer calculate their GHG emissions. The RSB GHG calculator allows operators to input actual data about their production process and calculate their GHG emissions using either the RSB GHG methodology, and/or the EU GHG methodology given the specific parameters used by the RSB GHG calculator. Specific details of the RSB methodology are publicly available on their website.

Bonsucro’s approach for the calculation is similar to that used in the EBAMM model, which is similar to the GREET model. This model had to be modified for sugarcane. In the Bonsucro-EU, to comply with criteria 6.1, GHG emissions from production of sugarcane ethanol must be calculated following the disaggregated default values provided in point D of the annex V of the EU Directive 2009/28/EC. The calculation of actual values is not currently permitted, but in future revisions it can be included. The methodology to calculate actual values will follow the

rules established by the EU Directive and procedures will have to be submitted to the European authorities for formal approval.

The modifications in the EBAMM model for Bonsucro and Bonsucro-EU's sugarcane model are the following: 1) Modifications to incorporate sugar manufacture as the major activity. This includes power, fuels and lubricants; 2) Emissions due to cane burning. This is based on IPCC emission factors for burning biomass of 0.07 kg N<sub>2</sub>O/t dry matter and 2.7 kg CH<sub>4</sub>/t dry matter; 3) Allowance for N<sub>2</sub>O emissions from filter cake, vinasse and cane residue left in the field. This assumes 1.225 % of N in the residue is converted to N in N<sub>2</sub>O; 4) Emissions of CH<sub>4</sub> and N<sub>2</sub>O in burning bagasse in sugar mill boilers, values of 30 and 4 g /1000 MJ energy in bagasse respectively are used; 5) Energy value of process chemicals; 6) A credit for molasses (where produced) based on its economic value relative to that of sugar; 7) Emissions from anaerobic treatment of effluent in the case that methane is not captured and used as a fuel. IPCC guidelines suggest 0.21 t CH<sub>4</sub> produced per t COD removed; 8) Allowance for any imports of molasses, bagasse and/or other biomass.

Brazil has a voluntary goal for reduction of total GHG emissions between 36.1% and 38.9% relative to the projected emissions for Brazil in 2020. Biofuels have a major role in "Alternative source of energy" category for mitigation, but it does not have a reduction of GHG emissions calculated in the same way that the EU directive 28/2009, i.e. the reduction is not measured related to a fossil fuel. The GHG reduction for this category is estimated between 26 and 32 million tons of carbon until 2020. Relevant laws that create the voluntary goals are: Decree 7390/2010 that regulates the national policy for climate change and law 12.187/2009 – that creates the National Policy for Climate Change.

Table 4 summarizes the categories described above and compares the sustainability criteria for environmental, land use and GHG emissions for the standards under analysis. The same idea is in Table 5, but specifically for the European Union directed standards.

Table 6 summarizes the qualitative assessment for benchmarking the sustainability criteria relative to the Brazilian legislation.

**Table 4. Environmental, land use and GHG emissions**

	Bonsucro		RSB		ISCC	
	Relevance of requirement	Explicit specification	Relevance of requirement	Explicit specification	Relevance of requirement	Explicit specification
<b>Biodiversity</b>						
Biodiversity	MA	Y	MA	Y	MA	Y
Genetically modified organism	NR	NA	MA	Y	NR	NA
<b>Soil</b>						
Productive capacity of the soil	MA	Y	MA	Y	MA	Y
Use of by-products	MA	Y	MA	Y	MA	Y
<b>Crop management and agrochemical use</b>						
Fertilizer	MA	Y	MA	N	MA	Y
Integrated Plant Management	NR	NA	NR	NA	MI	Y
Agrochemicals	MA	Y	MA	Y	MA	Y
<b>Water</b>						
Quality of surface and groundwater	MA	Y	MA	Y	MA	Y
Quantity of surface and groundwater/Irrigation	MI	Y	MA	Y	MI	Y
<b>Air</b>						
Air pollution	MI	Y	MA	Y	MI	N
Open air burning	NR	NA	MA	Y	MA	Y
<b>Waste</b>						
Reduce waste/Waste management/Disposal	MI	N	MA	Y	MI	Y
<b>Environmental sustainability (cross-cutting)</b>						
Energy	MI	Y	NR	NA	NR	NA
Efficiency	MI	Y	NR	NA	NR	NA
Incorporate sustainability in new projects	MA	Y	MA	Y	MA	Y
<b>Direct Land use changes</b>						
Restriction/Baseline for LUC	MA	2008	MA	2009	MA	2008
<b>GHG emissions</b>						
Emission reduction	MI	Y	MA	Y	MA	Y
GHG calculations	MA	Y	MA	Y	MA	Y

**Relevance of requirement: MA = major; MI = minor; NR= not required. Explicit specification: Y = yes; N = no**

Obs: ISCC refers to ISCC-EU as mentioned in section 2.4.

**Table 5. Environmental, land use and GHG emissions (EU-standards)**

	Bonsucro-EU		RSB-EU		ISCC	
	Relevance of requirement	Explicit specification	Relevance of requirement	Explicit specification	Relevance of requirement	Explicit specification
<b>Biodiversity</b>						
Biodiversity	MA	Y	MA	Y	MA	Y
Genetic modified organism	NR	NA	MA	Y	NR	NA
<b>Soil</b>						
Productive capacity of the soil	MA	Y	MA	Y	MA	Y
Use of by-products	MA	Y	MA	Y	MA	Y
<b>Crop management and agrochemical use</b>						
Fertilizer	MA	Y	MA	N	MA	Y
Integrated Plant Management	NR	NA	NR	NA	MI	Y
Agrochemicals	MA	Y	MA	Y	MA	Y
<b>Water</b>						
Quality of surface and groundwater	MA	Y	MA	Y	MA	Y
Quantity of surface and groundwater/Irrigation	MI	Y	MA	Y	MI	Y
<b>Air</b>						
Air pollution	MI	Y	MA	Y	MI	N
Open air burning	NR	NA	MA	Y	MA	Y
<b>Waste</b>						
Reduce waste/Waste management/Disposal	MI	N	MA	Y	MI	Y
<b>Environmental sustainability (cross-cutting)</b>						
Energy	MI	Y	NR	NA	NR	NA
Efficiency	MI	Y	NR	NA	NR	NA
Incorporate sustainability in new projects	MA	Y	MA	Y	MA	Y
<b>Direct Land use changes</b>						
Restriction/Baseline for LUC	MA	2008	MA	2008	MA	2008
<b>GHG emissions</b>						
Emission reduction	MA	Y	MA	Y	MA	Y
GHG calculations	MA	Y	MA	Y	MA	Y

**Relevance of requirement: MA = major; MI = minor; NR= not required. Explicit specification: Y = yes; N = no**

Obs: ISCC refers to ISCC-EU as mentioned in section 2.4.

**Table 6. Environmental, land use and GHG emissions – Original and EU Standards (Benchmark against Brazilian legislation)**

	Bonsucro	RSB	ISCC
<b>Biodiversity</b>			
Biodiversity	Y	Y	Y
Genetic modified organism	-	Y	-
<b>Soil</b>			
Productive capacity of the soil	Y	Y	Y
Use of by-products	N	N	N
<b>Crop management and agrochemical use</b>			
Fertilizer	Y	Y	Y
Integrated Plant Management	-	-	N
Agrochemicals	Y	Y	Y
<b>Water</b>			
Quality of surface and groundwater	Y	Y	Y
Quantity of surface and groundwater/Irrigation	Y	Y	Y
<b>Air</b>			
Air pollution	Y	Y	Y
Open air burning	Y	Y	Y
<b>Waste</b>			
Reduce waste/Waste management/Disposal	Y	Y	Y
<b>Environmental sustainability (cross-cutting)</b>			
Energy	N	N	N
Efficiency	N	N	N
Incorporate sustainability in new projects	N	N	N
<b>Direct Land use changes</b>			
Restriction/Baseline for LUC	N	N	N
<b>GHG emissions</b>			
Emission reduction	N	N	N
GHG calculations	N	N	N

**Criteria covered by Brazilian legislation: Y = Yes; N = No**

## **5.2. Production Standards: Socio-Economic and Food Security**

The production standards' socio-economic sustainability criteria were analyzed in detail and divided into the following topics: land rights and land use rights, water rights, labor conditions, contractors and suppliers, wages/per unit wages, work hours/breaks/overtime, contracts, communication/complaints/mediation mechanisms, conditions of occupational health and safety for workers, social impact assessment, social development, women, youth, children and indigenous communities, production and processing efficiency, economic viability, good management practices, engagement and communication with stakeholders.

Food security was treated as a separate topic due to its relevance in the standards.

The qualitative assessment of all these criteria for each standard is summarized in Table 7 (original and EU standards) and Table 8 (comparing the criteria with the Brazilian legislation).

### **Land rights and land use rights:**

Land rights and land use rights are related to providing clear titles to land or use of land and also to the legitimacy or the process of land transfers, acquisitions, etc. (mainly proved through appropriate documentation). Both RSB and ISCC have major requirements on this issue. Bonsucro has a minor requirement. Bonsucro mentions two International Labor Organization (ILO) conventions: conventions 117 (Social Policy) and 169 (Indigenous and Tribal Peoples) as the base for this criterion. Also, through principle 1.1, Bonsucro recognizes the UN Declaration of Indigenous Peoples as well as the UN Convention on Biological Diversity. Brazil has ratified both. RSB refers to the same ILO and UN conventions and has an additional criteria related to the process of acquisition, compensation or voluntary relinquishment of land, which should be based on prior, free and informed consent (FPIC). This criterion is intended to help operators to avoid land disputes with local communities and guarantee that any form of land transfer is legitimate and not forced.

The requirements in all standards are already covered by several Brazilian federal laws related to land rights, indigenous communities and the landless movement (such as MST). The requirements related to proving the rights to the land or land use are included in Chapter II of the Brazilian Civil Code (Código Civil Brasileiro) and in the Public Register Laws 6015 of 73 and 6126 of 1975 (Lei dos Registros Públicos). There are other relevant laws related to land tenure and disputes, such as the 1964 Land Statute (Estatuto da Terra 1964); Law of lands 11952 of 2009 (Lei de Terras de 2009) – regularization of land; Federal Constitution (Constituição Federal), Chapter III. These are mostly related to the agrarian reform and to the social function that the land must serve to its owners/users. Also, the issue related to adverse possession of land (Usucapião da Terra) is regulated by Chapter II of the Brazilian Civil Code (Código Civil Brasileiro). Other issues of land conflicts and tenure are related to indigenous people, which are regulated by Decree 1775/1996 (delimitation of indigenous lands). Other laws regarding indigenous lands and rights (Decree 1141/1994,

Federal Constitution - articles 231, 232, 210 paragraph 2o, 215 e 216). Also, Brazil ratified ILO conventions 117 (Social Policy) and 169 (Indigenous and Tribal Peoples).

### **Water Rights**

This category is sought to address the issue of the impacts of operations (through the use of water for irrigation or other uses) on local communities' basic rights to water access and use. ISCC and RSB both have major requirements on water rights, although with different focuses. Bonsucro does not have requirements regarding water rights. The ISCC criterion is more general and addresses the issue of respecting water rights (both formal and customary) if ground water is used for irrigation in biofuel operations. It requires the producer to follow local legislation regarding water rights, and is, therefore, specific as this issue is present in Brazilian legislation. The RSB criterion is more specific and requires operators to identify and protect existing water rights. The scorecard requires a screening of water availability within the community and any disputes for water sources. If necessary, requires carrying out a "Water Assessment" in accordance with the guidance documents provided.

The Brazilian law covers water rights as described in the standards. Law nº 9433 of January 8, 1997 – Law of Water (Leis das Águas) related to exercising rights to water access. The law states that in situations of water scarcity, priority should be given to human consumption and for animals. Arbitration of conflicts related to water disputes is regulated by this law and also related to Law Nº 9984 of 2000, regarding the creation of the National Water Agency (ANA). This agency is responsible for arbitrating conflicts related to water disputes.

### **Labor conditions**

This category includes criteria related to respecting human rights and labor conditions. RSB, Bonsucro and ISCC include major requirements on labor conditions related to compliance with core International Labor Organization (ILO) labor conventions: freedom of association and the effective recognition of the right to collective bargaining (Conventions 87 and 98); elimination of all forms of forced or compulsory labor (Conventions 29 and 105); effective abolition of child labor (Conventions 138 and 182); elimination of discrimination in respect of employment and occupation (Conventions 100 and 111). Brazil ratified all of these conventions, with the exception of convention 87 (Freedom of Association and Protection of the Right to Organize, 1948). Besides from the basic requirements mentioned above, ISCC additionally requires farm management and employees to sign a self-declaration on good social practices and human rights.

Brazil ratified all ILO conventions relevant for the standards, besides from 87 (Freedom of Association and Protection of the Right to Organize Convention, 1948). However, these issues are also covered by federal Brazilian laws. The issue of slave and forced labor is included in article 149 of the Penal Code (Código Penal Brasileiro) and the



Federal Constitution of 1988 (Constituição Federal de 1988). The child labor issue is included in the Child and Teenager Statute (Estatuto da Criança e do Adolescente) and in the Consolidation of Work Laws (Consolidação das Leis do Trabalho – CLT). According to the law, the minimum age to work is 16, unless as an apprentice at age 14. The discrimination issue is included in article 7 of the Federal Constitution of 1988 (Constituição Federal de 1988). Freedom of association is included under Title V – Union Organization of the CLT law.

### **Contractors and suppliers**

This category includes criteria related to requiring contractors and/or suppliers to comply with human rights and labor standards. Bonsucro and RSB have minor requirements regarding the application of labor condition and human rights standards to contractors and suppliers. ISCC does not have a specific requirement in this category, but requires subcontractors to comply with all ISCC standards, which also covers the aspect of labor conditions and human rights. This issue is also covered in the criteria related to good social practices regarding human rights, which requires, among other things, fair contract farming arrangements. Therefore, ISCC has a major requirement related to this issue. The RSB criterion applies only to third party labor contracting, while the Bonsucro criterion applies to both suppliers and contractors. Bonsucro has a very specific requirement that more than 95% of the sampled contractors and suppliers be in compliance with human rights and labor standards. This is an important point because there are still some issues related to labor conditions in sugarcane production, especially due to third party contracting.

The issue of applying labor and human right standards to contractors and suppliers is partially covered by the national legislation. The Law of Rural Work nº 5889 of 73 (Lei do Trabalho Rural) regulates the issue of third party labor, requiring the company receiving the services to be responsible for the labor obligations of the contracted company/employees. For Bonsucro, this law covers the criteria partially, since the standard also applies to suppliers (which are not covered by the law). The RSB and ISCC criteria are only related to third party labor contracting and, therefore, are covered by the law.

### **Wages/per unit wages**

This category includes criteria related to wages and per unit wages paid to workers and conformity of pay slips to legislation. All three standards (RSB, Bonsucro and ISCC) have major requirements related to the payment of at least the national minimum wage or compliance with industry standards, legal requirements or collective agreements. In the absence of a legal requirement, Bonsucro indicates the use of ILO convention 131 (Minimum Wage Fixing) as a guide, while RSB requires that the wage paid be either the national minimum wage, if any, or negotiated and agreed upon on an annual basis with the worker. Brazil ratified ILO convention 131. RSB and ISCC have major requirements related to payment based on units or production, rather than hours. Criteria require that employees be

able to gain at least the national minimum wage based on an eight hour workday. Bonsucro does not have specific requirements related to the payment of per unit wages.

The Law of Rural Work (Lei do Trabalho Rural 5.889/73) regulates payments of minimum wages, professional wages, family wages and payment for unhealthy work. Article 7 of the Federal Constitution of 1988 (Constituição Federal de 1988) states that no worker shall receive a wage inferior to the minimum wage, including those who receive variable payment or payments per unit. All workers must be able to gain at least the minimum wage working regular hours (8 hours per day or 44 hours per week). If at the end of the month, the worker has not achieved the minimum wage through production, his/her wage shall be complemented to at least the minimum wage. Therefore, the Brazilian legislation covers the requirements in the standards regarding wages and per unit wages.

### **Work hours/breaks/overtime**

RSB is the only standard that has a major requirement related to work hours and overtime. ISCC has a minor requirement related to this issue and Bonsucro does not have requirements related to this issue, but it is treated through recognition of local labor laws and ILO convention C29 (Forced Labor Convention). RSB specifies that work hours should not exceed 48 hours per week and overtime shall be voluntary and not exceed 80 hours per week. ISCC specifies that work hours should not exceed 48 hours per week and has no specifications on overtime limits, only that it should be voluntary and that there should be a premium for it. Also, ISCC requires a time recording system to record working time and overtime and that work hours, breaks and rest days are documented and in line with legislation.

Compliance with national law would cover these issues as the Brazilian law specifies the following (Law of Rural Work – Lei do Trabalho Rural 5889/73): in rural work, work hours should not exceed 44 hours per week and 220 hours monthly and that daily work hours cannot exceed 8 hours. Regarding breaks, the law specifies that workers should have a 1 hour break for continuous work above 6 hours and 11 consecutive hours between each work day and also weekly paid breaks of 24 consecutive hours, preferably on Sundays and holidays. Regarding overtime, the law specifies that it should not exceed 2 hours per day extra and the bonus paid per hour should be 50% more than the normal hourly pay. There is a divergence, therefore, between the law and the RSB and ISCC standards regarding the maximum per week work hours. The Brazilian law is more restrictive than the standards, as it limits work hours to 44 per week, whereas RSB and ISCC establish 48 hours per week. Night work is prohibited for workers under the age of 18. Night work should be paid 25% minimum more based on regular day working hours. None of the standards address the issue of night work. Overtime payment is restricted to a maximum of two hours per day and must be compensated for with at least a 50% higher payment than the normal hourly pay. Only RSB and ISCC have criteria related to overtime and work hours, but these issues are already covered by the national legislation.

## **Contracts**

This category includes criteria related to the provision of contracts (or equivalent) to document basic information, such as hours of work, overtime payment, notice, holidays, wages, and mode of payment. Both Bonsucro and ISCC have minor requirements related to providing workers with contracts. Bonsucro requires provision of clear, equitable and comprehensive contracts or equivalent document (such as the national working card) in accordance with ILO conventions 95 (Protection of Wages Convention) and 110 (Plantation Convention). ISCC also requires provision of fair legal contracts to all employees in accordance with ILO convention 110 and copies of all contracts to be provided.

The Law of Rural Work (Lei do Trabalho Rural 5889/73) requires the national working card (carteira de trabalho e previdência social) for all workers, even for temporary workers. However, the law does not necessarily require a written contract. There is a potential conflict between the law and the standards requirements (especially ISCC) regarding this issue, since written contracts are not necessarily required by the Brazilian law. For Bonsucro requirements, Brazil ratified ILO convention 95 and 110, but denounced from convention 110 in 1970. That is, Brazilian legislation does not fully address the Bonsucro standard.

## **Communication/complaints/mediation mechanisms**

This category includes criteria related to worker representation within the property (excluding unions), existence of meetings between workers and management to discuss issues related to worker health, safety and welfare and the existence of complaint forms or mechanisms for workers. ISCC and Bonsucro have minor requirements related to this issue, which includes: worker representation within the property (excluding unions), existence of meetings between workers and management to discuss issues related to worker health, safety and welfare and the existence of complaint forms or mechanisms for workers. ISCC requirements are explicit and Bonsucro's are not explicit.

The Law of Rural Work (Lei do Trabalho Rural 5889/73) through the Regulating Norm 31 (NR-31) regulates work safety and health in Agriculture and Livestock production. NR-31 includes requirements related to handling and storage of agricultural chemicals, empty containers, emergency procedures, provision and use of personal protective equipment, training, occupational health programs, clean water for workers, housing conditions, first aid kits, CIPA (for properties with more than 20 workers), dining halls, etc. The ISCC criteria are the most specific, but all requirements are covered by the law. RSB establishes a requirement for employees to comply with internationally-recognized standards. In the guidance documents, the guidelines reference the ILO Convention on occupational health and safety (155). Brazil ratified convention 155.

## **Conditions of occupational health and safety for workers**

This category includes criteria related to worker health and safety, including training, provision of personal protection equipment, housing, clean water, handling hazardous substances, etc. RSB and ISCC have major requirements regarding this issue, and Bonsucro has a minor requirement. The Bonsucro criterion is general (provide a safe and healthy working environment in work place operations), although there are specific indicators to measure/assess compliance. RSB requires compliance with internationally-recognized standards for occupational health and safety, such as ILO's Occupational Safety and Health Convention (No. 155) and the ILO's Safety and Health in Agriculture Convention (184). RSB also includes a specific criteria related to housing provided to workers. Brazil ratified convention 155, but not 184. ISCC includes two main criteria to address this issue: one related to safe working conditions and one specific for plant protection product (chemicals) handling. Both include a range of specific requirements. This issue is extensively treated in Brazilian legislation through the Regulating Norm 31 (NR-31), which includes training, provision of personal protection equipment, housing, clean water, handling hazardous substances, etc. Therefore, compliance with the law would cover this issue.

## **Social impact assessment**

A social impact assessment generally includes the processes of analyzing, monitoring and managing the social impacts (positive or negative) and any social changes that may occur as a result of planned interventions (policies, projects, etc). Bonsucro and RSB both have major requirements regarding this issue. ISCC has minor requirements regarding this. Bonsucro requires an ESIA only for greenfield expansion or new sugarcane projects, which should be carried out through a participatory process and cover all aspects related to baseline surveys and assessments, implementation, mitigation, monitoring and evaluation plans as required. RSB requires new and existing biofuel operations to carry out a screening based on the guidelines for screening that they provide. The screening is intended to determine if an ESIA or a Rapid Environmental and Social Assessment (RESA) is required. If necessary, operators shall conduct an ESIA or a RESA according to impact assessment guidelines, RESA guidelines and ESIA guidelines, as determined by the scale and intensity of operations. ISCC requires carrying out a participatory social impact assessment and a public report of it to be available in appropriate language to surrounding communities.

## **Social development**

This category includes criteria related to the provision of social benefits to employees and social surroundings and implementing actions to promote social development. Contribution to social development is a major requirement only in RSB. ISCC has minor requirements related to this issue. Bonsucro does not have requirements related to social development. RSB requires that biofuel operations in regions of poverty contribute to the improvement of socioeconomic status of local stakeholders. Requirements and guidelines

are specified in a specific document (RSB Social Impact Assessment Guidelines). ISCC requires employers to offer employees, their families and the community other forms of social benefits, such as incentives for good working performance, bonus payment, support of professional development, family friendliness, medical care/health provisions. However, there is no specification on the quantities or cases for achieving compliance, which is why it was classified as not being explicit.

### **Women, youth, children and indigenous communities**

This category includes criteria related to assessing the impacts of operations for these communities/groups and applying special measures that benefit and encourage their participation in biofuel operations and also to guarantee good quality education for all children living on the farm. RSB and ISCC have major requirements related to this issue. Bonsucro has minor requirements related to this issue. In RSB, there is a criterion related to encouraging the design and implementation of special measures that benefit and encourage participation of women, youth, indigenous communities and the vulnerable in biofuel operations. Also, among the social benefits to be provided for the community are building schools. The immediate requirement is that data for rural poor women in regions of poverty be disaggregated in the baseline social surveys to assist with the design of special programs for the targeted people. ISCC requires that all children living on the farm have access to quality primary school education. There are no specific requirements for indigenous communities or women. Bonsucro requirements are related to assuring that all agreements and multi-stakeholder engagement processes related to the mill or agricultural activity are consensus-driven and participative (including all stakeholders: gender sensitive and indigenous communities). Other impacts on indigenous communities are assessed through the land rights/use sections of the standards.

There are several laws in Brazil to protect indigenous rights, culture and property. The Brazilian law only covers the child education and indigenous community requirements, partially complying with RSB and with all requirements in ISCC. The issue of children's access to education is regulated by Article 16 of the Law of Rural Work (Lei do Trabalho Rural 5889/73). The indigenous communities are protected by several Brazilian laws: Federal Constitution - articles 231, 232, 210 paragraphs 2nd, 215 and 216, Law 6.001/1973 (Indigenous Population Statute), regulation 693/2000 of National Indian Foundation (Cultural patrimony), regulation 70/2004 of the National Health Foundation (Fundação Nacional da Saúde - Funasa) on indigenous health and on protection and support to indigenous communities. Furthermore, the issue of women, youth and indigenous communities are widely addressed by international conventions related to non-discrimination, protection of children and fair representation and participation of indigenous and tribal people. All three standards mention these conventions in the standards.

### **Production and processing efficiency**

Efficiency in this context is related to using all resources efficiently, using less inputs to generate more outputs. Only Bonsucro has minor requirements related to production and processing efficiency. ISCC and RSB do not address this issue, although it is partially addressed through the GHG emissions criteria since production and processing efficiency are major impact factors. In Bonsucro criteria, indicators for efficiency include: for agriculture – sugarcane yield; for processing and milling - total raw materials used per kg product, working hours lost as percent of total hours worked, mill overall time efficiency, factory performance index, industrial efficiency.

### **Economic viability**

Only RSB has major requirements related to economic viability. Bonsucro has minor requirements related to this issue. The Bonsucro criterion is presented as economic sustainability; however it seeks to address the same issue as the RSB criterion, which is to promote long term economic viability of the business. Bonsucro has a specific measure (value added/tonne cane). RSB only requires the implementation of a business plan.

### **Good management practices**

Classification in this category was based on criteria that in some way related to good management practices and continuous improvement. RSB and ISCC have major requirements in this category. Bonsucro has minor requirements. Bonsucro criteria in this section require fostering effective and focused research, development and extension expertise and continuous improvement of the quality of products. RSB criteria require keeping records of all technologies used and making such information available. ISCC requirements are related to keeping records of production, areas used and employees. Also, ISCC requires that all subcontractors comply with the standards.

The Brazilian CLT Law requires that in all activities the employer must keep records of all workers through books, electronic systems or others as regulated by the Ministry of Labor (Law nº 7855, of 10/24/1989). This is addressed in the ISCC standard. However, none of the other requirements of the standards are comprised in the Brazilian legislation.

### **Engagement and communication with stakeholders**

This category involves all requirements in the context of implementing processes or structures (governance) to guarantee multiple and relevant stakeholder participation throughout stakeholder consultation phases and certification process. RSB has major requirements related to stakeholder engagement and participation. Bonsucro and ISCC have minor requirements related to this issue. RSB requires that free, prior and informed consent (FPIC) shall form the basis for the process to be followed during all stakeholder consultation, which shall be gender sensitive and result in consensus-driven negotiated agreements. ISCC

requires continuous dialogue and meetings with communities. There are no laws related to this issue in the Brazilian legislation, therefore, it is a requirement beyond the legislation.

### **Assess food security impacts**

The food security criteria are related to assessing the impacts that biofuel production/processing may have on the production, availability, prices, etc. of food. Producers and processors may use food or land that could be used to grow food to produce biofuels. RSB has major requirements related to this issue. ISCC has minor requirements and Bonsucro does not have any requirements related to this. One of the RSB criteria relates to assessing the food security level in the area of operations, the impacts of operations on food security and mitigating any negative impacts in accordance with the guidelines presented in the RSB food security assessment guidelines document. RSB has a second criterion related to food security, which requires biofuel operations to enhance the local food security of directly affected stakeholders in food insecure regions. The ISCC requirement is that biofuel operation do not replace staple crops, does not impair food security and does not cause local food prices to rise. The first RSB criterion and the ISCC criterion are very similar as they require producers/processors to assess and mitigate any negative impacts that biofuel operations may have on the price and availability of food. However, only RSB provides specific guidance on how to evaluate local food security and enhance it.

Table 7 summarizes the analyzed criteria for socio-economic and food security comparison among the different certification standards. Table 8 includes the Brazilian legislation compliance analysis for the sustainability criteria required by the certification standards.

**Table 7. Socio-Economic and Food Security - Original and EU Standards**

	Bonsucro		RSB		ISCC	
	Relevance of requirement	Explicit specification	Relevance of requirement	Explicit specification	Relevance of requirement	Explicit specification
<b>Laws and International conventions</b>						
Compliance with relevant applicable laws	MA	Y	MA	Y	MA	Y
<b>Land, water and resources</b>						
Land rights and land use rights	MI	Y	MA	Y	MA	Y
Water rights	NR	NA	MA	Y	MA	Y
<b>Human rights and labor rights</b>						
Labor Conditions	MA	Y	MA	Y	MA	Y
Contractors and suppliers	MI	Y	MI	Y	MA	Y
<b>Employment, wages and labor conditions</b>						
Wages/per unit wages	MA	Y	MA	Y	MA	Y
Work hours/breaks/overtime	NR	NA	MA	Y	MI	Y
Contracts	MI	Y	NR	NA	MI	Y
Communication/complaints/mediation mechanisms	MI	N	NR	NA	MI	Y
<b>Human health and safety</b>						
Conditions of occupational safety and health for workers	MI	Y	MA	N	MI <sup>2</sup>	Y
Social impact assessment	MA	Y	MA	Y	MI	Y
<b>Rural and social development</b>						
Social development	NR	NA	MA	Y	MI	N
Women, youth, children and indigenous communities	MI	N	MA <sup>1</sup>	N	MA	Y
<b>Economic development</b>						
Production and processing efficiency	MI	Y	NR	NA	NR	NA
Economic viability	MI	Y	MA	N	NR	NA
Good management practices	MI	Y	MA	Y	MA	Y
Engagement and communication with stakeholders	MI	Y	MA	Y	MI	N
<b>Food security</b>						
Assess food security impacts	NR	NA	MA	Y	MI	N

<sup>1</sup> The minimum requirement is related to criteria 5b1. Criteria 5b2 is a progress requirement.

<sup>2</sup> Major musts are only two sub-criteria: 3.1.3 (protective clothing) and 3.1.6 (certificates of competence or demonstration of qualifications for dealing with hazardous substances).

**Relevance of requirement: MA = major; MI = minor; NR= not required. Explicit specification: Y = yes; N = no**



**Table 8. Socio-Economic and Food Security – Original and EU Standards (Benchmark against Brazilian legislation)**

	Bonsucro	RSB	ISCC
<b>Laws and International conventions</b>			
Compliance with relevant applicable laws	-	-	-
<b>Land, water and resources</b>			
Land rights and land use rights	Y	Y	Y
Water rights	-	Y	Y
Access to resources	-	-	-
<b>Human rights and labor rights</b>			
Labor Conditions	Y	Y	Y
Contractors and suppliers	Y	Y	-
<b>Employment, wages and labor conditions</b>			
Wages/per unit wages	Y	Y	Y
Work hours/breaks/overtime	-	Y	Y
Contracts	Y	N	-
Communication/complaints/mediation mechanisms	-	-	N
<b>Human health and safety</b>			
Conditions of occupational safety and health for workers	Y	Y	Y
Social impact assessment	N	N	N
<b>Rural and social development</b>			
Social development	-	N	N
Women, youth, children and indigenous communities	-	N	Y
<b>Economic development</b>			
Production and processing efficiency	N	-	-
Economic viability	N	N	-
Good management practices	N	N	N*
Engagement and communication with stakeholders	N	N	-
<b>Food security</b>			
Assess food security impacts	-	N	N

\* no, with the exception of criteria 4.4.13 related to records of employees as this is required by CLT law.

### **5.3. Chain of Custody Standards**

In addition to the production standards, operators in the biofuel supply chain are required to follow specific standards for the chain of custody. This set of technical and administrative requirements allow buyers and other economic operators throughout the supply chain to identify, trace, and verify the sustainability characteristics of the products. Bonsucro, RSB and ISCC have specific chain of custody standards. Table 9 summarizes the qualitative results for the following criteria: administrative requirements, information requirements for traceability of certified products, models used for traceability/technical requirements and mass balance system differences.

For Bonsucro, the unit of certification for the chain of custody standard is all economic operators after the mill and its cane supply base who take legal ownership of the Bonsucro certified sugarcane products and/or all sugarcane products derived thereof. The mill and cane supply are required to comply with production standards, which also include the same chain of custody requirements.

For RSB, the chain of custody standard applies to all participating operators in the certification system, including any sites where biomass/biofuel products are legally and physically controlled by participating operators.

For ISCC, the relevant elements for the traceability and mass balance calculations are: farm plantation; first gathering point (warehouses or traders which buy sustainable biomass from a variety of farms or plantations and sell sustainable biomass to customers); conversion units (conversion of sustainable biomass or bioliquids); warehouses; and transport of sustainable products.

For RSB and RSB-EU, the only difference in the chain of custody standard is that for RSB-EU, the “content ratio accounting” tracking system (which will be discussed in more detail below) is not valid. In the Bonsucro standards, there are several additional requirements for Bonsucro-EU chain of custody certification.

Bonsucro chain of custody certification is achieved through compliance with 100% of requirements in the standard. Bonsucro-EU chain of custody certification is achieved through 100% of chain of custody standards plus additional EU requirements (criteria 3.2.3, 3.2.4, 3.3.3, 3.3.4, 3.3.5, 3.4.1). RSB and ISCC chain of custody certification is achieved through compliance with all requirements.

#### **Administrative requirements**

Administrative requirements are those related to the administration of the traceability system. The Bonsucro chain of custody standard includes one criterion related to the general responsibilities of operators within the chain of custody, besides from two criteria related to the responsibilities regarding validation of the mass balance data and record keeping. The RSB standard and the ISCC standard for traceability include several criteria related to general administrative requirements, responsibilities of operators, procedures, records, and resource

management/training. ISCC and RSB also include monitoring and control requirements and confidentiality issues.

### **Information requirements for traceability of certified products**

Information requirements are those related to the data that should appear on delivery notes or should accompany the product throughout the supply chain. This data is especially related to the sustainability characteristics of the products. All three standards have general information requirements. ISCC additionally has specific requirements for different stages of production and distribution chain: 1) Farms/plantations; 2) First gathering point; 3) Trader/warehouse; 4) Conversion units (oil mills, ethanol plants, refining plants); 5) Transport.

These requirements are generally related to keeping track of the documentation of certified products and making sure that it is not mixed with that of non-compliant product along the supply chain, so that the sustainability of the product can be maintained and proved. Also, in standards such as the RSB and the ISCC, where more than one tracking system can be used (i.e., mass balance, identity preservation, etc.), operators need to make sure that changes are documented. The information requirements vary, but the most important difference is related to the extent of the requirements. Only ISCC has general and specific requirements for operators in the chain of custody.

The requirements in Bonsucro and Bonsucro-EU differ within this topic. In the Bonsucro standard, there are only two criteria related to identification of consignments and basic specification that should accompany the consignments. In the Bonsucro EU standard, besides the two former criteria, there are two more: one related to clearly specifying the scope of compliance (i.e., non-compliant, Bonsucro compliant or Bonsucro-EU compliant) and another related to additional data required to be associated with the documentation of certified products, including GHG emissions figures.

Another important information requirement is related to GHG emissions monitoring and calculations. In the Bonsucro standard, there are no requirements for GHG emissions calculations within the chain of custody, only in the production standard. In the Bonsucro EU standard, there are additional information requirements regarding the inclusion of GHG emissions data within the documentation of certified products. For the Bonsucro EU standards, all Bonsucro EU compliant consignment must contain data on GHG emissions according to appendix 2 (EU RED for the calculation of annualized emission from carbon stock change caused by land use changes) and appendix 3 (monitoring GHG emissions) of the Bonsucro mass balance chain standard. In appendix 3, there is a formula that should be used to calculate GHG emissions from the production and use of transport fuels, biofuels and bioliquids, which is a sum of the emissions from all phases of the production/processing/storage/transport of the products. The calculation methodology is the same used in the production standard, which is detailed in appendix 1 of the chain of custody standard. However, operators are encouraged to use the default value of 24gCO<sub>2</sub>/MJ as allowed by the EU legislation, which represents the emission value from farm to end user in Europe.

The RSB and RSB-EU standards require GHG calculations for all participating operators within the chain of custody: production, conversion, processing, trading, transporting, and distributing biomass/biofuels in the RSB certification systems. The ISCC and ISCC-EU standards also require GHG calculation in all levels of the chain of custody. The methodologies for calculations of GHG emissions in the chain of custody standards are the same as those for the production standards. Therefore, the comparisons carried out in the production standards benchmark above are also valid in the case of the chain of custody requirements for GHG calculation.

### **Models used for traceability/technical requirements**

Within this category, the three standards have significant differences. The first important consideration when looking at the table is that in this specific section, the “yes/no” classification means that the standard accepts or does not accept each traceability system. This is because each operator in the supply chain can choose one model to apply. Some certifications, however, only have one choice, such as Bonsucro and Bonsucro-EU.

It is also important to mention that there is a hierarchy among these systems. The identity preservation model is at the highest level of this hierarchy since it requires physical segregation of products and associated documents. The segregation model is the second level, as it requires physical segregation, but allows documents of separate compliant batches to be merged after separate tracking of product characteristics is no longer needed. The mass balance system is the third level, as it allows documents of separate compliant batches to be merged after separate tracking of product characteristics is no longer needed and also allows compliant products to be mixed with physical product not compliant, as long as the balance between inputs and outputs is not exceeded within a certain period of time. There are other systems that would be under these in this traceability systems hierarchy. The content ratio accounting system allows mixing physical products and documentation and sustainability claims are made based on a percentage of content of certified product in the mix. The last system is the book and claim system, which is a certificate trade system, not associated to physical products. This system requires a trading platform and the creation of a certificate market. This system, as well as the content ratio accounting system, is not EU-RED compatible.

The mass balance system is the lowest in the hierarchy that is EU-RED compatible. Any system above it is EU-RED compatible. To further clarify this issue, it is important to give an example. Suppose the first operator in the chain of custody decides to adopt the identity preservation system for traceability. If within any internal processing steps, the operator fails to maintain the documentation of each batch of compliant product separate, he would no longer be able to claim that the product was tracked using the identity preservation system and would have to use the models in the lower levels of the hierarchy. It is possible, therefore to change tracking models along the chain of custody, as long as it is always following the systems hierarchy. A product tracked through the mass balance system could never be transferred to the

identity preservation model or to the segregation model in subsequent steps of the supply chain.

Bonsucro and Bonsucro-EU only have specific requirements for the mass balance system, as this is the most commonly used system. RSB has specific requirements for four different tracking systems: identity preservation, segregation, mass balance and content ratio accounting. RSB-EU does not include the content ratio accounting system, as it is EU-RED incompatible. ISCC has specific requirements for identity preservation, segregation, and mass balance systems. All three standards have specific requirements for mass balance calculation, which will be discussed in a separate section below.

Bonsucro and ISCC have specific technical requirements for the control of consignments and mixes of consignments in the case where this is allowed (in this case, only through the mass balance system). The requirements are similar and are basically related to the maintaining separate sizes and sustainability characteristics of each individual consignment assigned to mixtures of consignments. This allows all consignments to be traced back to previous steps of the process.

RSB and ISCC have specific requirements for the identity preservation and segregation systems.

### **Mass balance system differences**

Within the standards, there are significant differences between the mass balance system requirements. This is because, although the EU proposes the mass balance system for traceability, it does not establish a standard methodology to calculate or control it.

There is a small difference regarding the reconciliation period between mass balance inputs and outputs, that is, the period of time allowed between balancing sustainable product input and output to make sustainability claims. For Bonsucro-EU this period is three months, and for Bonsucro it is not defined. For ISCC, RSB and RSB-EU it is also 3 months. After the period is expired for each standard, the operator can no longer make sustainability claims on the products.

The methodologies for calculation are only clearly defined in the Bonsucro-EU and ISCC standards. In the RSB system the mass balance accounting is calculated automatically in their CoC accounting software, currently under development. Operator buying and selling certified product may store it in the

For the Bonsucro standard, the requirements are that the accounting system for the control of mass balance is documented and mass balance records and data are maintained on a daily base; that the mass balance data be validated by the management representative in charge of the traceability system before entering the system; and also that the mass balance in the period is reliable within a tolerance of plus or minus 5% calculated over the total sugar and/or alcohol content (input – output).

For Bonsucro-EU, there are two additional requirements: the first is related to the reconciliation period for the mass balance calculation (discussed above). The second is related

to the weight or volume calculation, which should be based on sampling and analysis by a qualified laboratory; and that the metering and weighing equipment in the operations or used by subcontractors for volume or weight input and output of the mass balance be calibrated with a minimum frequency of one year by a calibration and testing organization.

In the ISCC standard, batches of sustainable (may have different sustainability characteristics) and non-sustainable products can be physically mixed within a company internal process. Within the period, batches of sustainable products with the same sustainability characteristics can be arbitrarily split within the bookkeeping as long as the total amount does not exceed the quantity credit. There are not very specific requirements related to laboratory testing and calibration of equipment, such as in Bonsucro.

**Table 9. Chain of Custody benchmark (EU and original standards)**

	Bonsucro	RSB	ISCC	Bonsucro EU	RSB EU	ISCC
<b>Administrative requirements</b>						
General	N	Y	Y	N	Y	Y
Responsibilities of operators	Y	Y	Y	Y	Y	Y
Procedures	N	Y	Y	N	Y	Y
Records	N	Y	Y	N	Y	Y
Resource management/training	N	Y	Y	N	Y	Y
Monitoring and control	N	N	Y	N	N	Y
Confidentiality	N	N	Y	N	N	Y
<b>Information requirements for traceability of certified products</b>						
General information requirements	Y	Y	Y	Y+	Y	Y
Specific requirements for stages of production/distribution	N	N	Y	N	N	Y
GHG emissions monitoring/calculation	N	Y	Y	Y	Y	Y
<b>Models used for traceability/technical requirements</b>						
Identity preservation	N	Y	Y	N	Y	Y
Segregation	N	Y	Y	N	Y	Y
Mass Balance	Y	Y	Y	Y+	Y	Y
Content ratio accounting	N	Y	N	N	N	N
Book and Claim	N	N	N	N	N	N
Control of consignments and mixes of consignments (mass balance)	Y	N	Y	Y	N	Y
<b>Mass Balance System Differences</b>						
Periodic calculations of mass balance	-	monthly	-	-	monthly	-
Reconciliation period between mass balance inputs and outputs	-	3 months	3 months	3 months	3 months	3 months

\*Y+ represents additional requirements of Bonsucro-EU standard beyond requirements in Bonsucro regular chain of custody standard.

Obs: ISCC refers to ISCC-EU as mentioned in section 2.4

#### **5.4. Governance, transparency and public disclosure of information**

Governance is an important issue when analyzing private standard setting and certification initiatives because it is related to the legitimacy of the process. According to the Social and Environmental Accreditation and Labeling Alliance's (ISEAL) code of good standard setting practice, the governance model chosen by an organization affects all aspects of its development and is fundamental to the legitimacy of the initiative in the eyes of the stakeholders (Mallet and Smith, 2007). The ISEAL alliance is an international organization committed to assisting voluntary multi-stakeholder organizations in setting strong and effective social and environmental standards. The code of good standard setting processes requires organizations to create: 1) Standards that are developed in transparent, multi-stakeholder processes; 2) Certification schemes that consumers can trust; 3) Relevant, high level performance criteria that create genuine social and environmental change. Initiatives such as the Forest Stewardship Council (FSC), The Sustainable Agriculture Network (SAN) and The Marine Stewardship Council (MSC) are examples of initiatives that are members of the ISEAL alliance. RSB and Bonsucro are also members of the ISEAL alliance. RSB is a Full Member, which means that they have demonstrated full compliance with the ISEAL Code of good standard setting practice and other applicable ISO guides. Bonsucro is an Associate Member, which means that they have completed a pre-assessment successfully and have committed to fulfilling the additional requirements within one year. We carried out a descriptive analysis of the governance structure of each of the analyzed initiatives: RSB, Bonsucro and ISCC.

Transparency and access to information are also fundamental for stakeholders to participate and play an effective role in the governance model. As international initiatives, these organizations need to have systems in place to keep their stakeholders informed and to allow them to express their interests, complaints or resolve conflicts (Potts, Meer and Daitchman, 2010). Therefore, we also carried out an analysis of the standards focused on public disclosure of information systems and complaints, appeal and dispute resolution mechanisms (Table 10).

##### **5.4.1. Governance Structure**

###### **Bonsucro**

To ensure multiple stakeholder involvement and transparency in the standard-setting process, Bonsucro became an associate member of the ISEAL alliance. The governance model chosen by Bonsucro was that of appointing decision making bodies. Members have indirect representation in decision making, but are able to contribute and express their interests through the standard consultation process, required by the ISEAL code.

Bonsucro's governance structure is currently formed by: the Bonsucro Board, with thirteen directors; an executive secretariat, with four employees; four committees, formed by members and experts; and the general members, whom are represented by the board.

The board is the highest level of authority and its composition is balanced with member representatives from all levels of stakeholder groups: Growers/Producers: small scale and large scale; Processors: agro-industrial, milling and refining; End users/Intermediaries: end users and retail, intermediaries and international operators; Civil Society. The board is elected annually by a full member ballot and is, therefore, accountable for representing the interest of the members of Bonsucro. It is also responsible for the overall decisions of Bonsucro, the content of the standard and for the committees, which are created as needed to address specific issues. The committees are formed by members of the board and other Bonsucro members, as well as moderators or consultants, as are seen fit. Moderators are hired to provide assistance in the resolution of conflicts that may exist within the committee members. Consultants are hired to provide technical assistance with issues that are not the expertise of any members of the committee. Currently, Bonsucro has four committees in operation: certification; communication, claims and labeling; governance; and EU RED.

The governance committee is responsible for recommending adaptations to the current governance structure and to ensure that Bonsucro is, at all times, a credible, growing and effective membership-based organization and also to be transparent and accountable to members and outside stakeholders. The communication, claims and labeling committee is responsible for Bonsucro's communication strategy and brand objectives. The certification committee is responsible for reviewing the certification process and system and recommending adaptations to the board. The EU RED committee is responsible for all issues related to Bonsucro-EU specific standard and recognition as a valid certification for EU RED compliance.

The executive secretariat is responsible for the administration of Bonsucro. It is formed by: 1) executive director; 2) head of engagement/communication; 3) head of sustainability; 4) certification coordinator; 5) office manager (in the process of being recruited).

Under the committees are also the technical working groups (TWGs) that are currently inactive. They were created to help Bonsucro achieve its objectives of establishing a standard for sustainable sugarcane production and processing practices. They were formed by technical and scientific experts from different parts of the world. The TWGs were divided in three teams, responsible for assessing best management practices being used by sugar producers around the world: 1) Social and Labor issues, 2) Processing and milling issues, 3) Agronomy issues. The TWGs can be called to work again as seen fit by Bonsucro to revise the standard or perform other activities.

Bonsucro currently has 60 members in 18 countries, including a number of large Brazilian mills, associations and processors and two global NGOs - WWF and Solidaridad – among other stakeholders.



## **RSB**

RSB is a multistakeholder initiative, and a full member of the ISEAL alliance. The RSB governance model is also one of appointing decision making bodies. The current governance structure is formed by: a steering board, with 14 representatives from the seven different stakeholder chambers, with members of the different levels of stakeholder groups; an executive secretariat, with six employees; expert groups, with members and outside experts.

The steering board is formed by two members from the seven stakeholder chambers. To ensure equal representation, chambers are advised to elect as their steering board representatives, one member from a developing country and one from a developed country. The seven chambers are: 1) farmers and growers of biofuel feedstocks; 2) industrial biofuel producers; 3) retailers/blenders, the transportation industry & banks/investors; 4) rights-based NGO's (land, water, human & labor rights) and trade unions; 5) rural development, food security, small holder farmer and indigenous; 6) environment, conservation & climate change and policy organizations; 7) intergovernmental organizations (IGOs), governments, standard-setters, specialist advisory agencies, certification agencies, and consultant experts. Chambers 1, 2 and 3 are dedicated to the private sectors, while Chambers 4, 5 and 6 include Non-governmental Organizations and Civil Society Organizations, therefore ensuring an equal decision power between these sectors. Chamber 7 is a non-voting chamber.

The executive secretariat is formed by: 1) executive secretary; 2) transparency and social affairs manager; 3) science and technology manager; 4) projects and partnerships manager; 5) two administrative employees. In 2011, the RSB Services Foundation was created in the US to implement and monitor the RSB certification system throughout the world. It is composed of four staff members and has a Board of Directors, which liaises with the RSB Steering Board.

The expert groups in RSB are also only activated when needed. Currently, there are two active groups: greenhouse gas emissions and accounting and indirect impacts. The greenhouse gas expert group is responsible for including a GHG methodology and threshold in the RSB standard, which includes: developing a GHG lifecycle methodology, conducting lifecycle GHG calculation for 10 standard biofuel pathways and conduct pilots to assess the technical and economic feasibility of attaining certain levels of GHG reductions from biofuel operations.

The indirect impacts and implementation group is responsible for addressing indirect impacts of biofuel operations (ILUC factors). The GMO expert group was established to look at a representative sample of national regulations and common or civil liability laws relating to nuisance, trespass and similar remedies regarding GMOs. Its work was completed in 2011.

RSB currently has 99 members in 27 countries, including many regional and international NGOs focused on social and environmental issues. Among the large environment or conservation organizations are the National Wildlife Federation, WWF International, the International Union for the Conservation of Nature (IUCN) and the United Nations Foundation.

## ISCC

The ISCC was an initiative of the German Ministry of Food, Agriculture and Consumer Protection through its Agency for Renewable Resources<sup>5</sup>. There is no public information on how the ISCC was created, as well as on the process it followed to establish its standards for biofuels. There are no public records of a multi-stakeholder approach being followed in the initial stages of the ISCC, although it is currently managed by a multi-stakeholder approach through the ISCC Association. However, unlike the other initiatives analyzed, the ISCC is not a member of the ISEAL alliance.

According to the ISCC representative consulted, the standard was an initiative established to address complaints of stakeholders regarding practices of production and to separate sustainable products from non-sustainable products. It was first discussed in a meeting in Berlin in 2006 involving several stakeholders from the biofuels sector, as well as the German government and NGO's. The initiative was funded by the German government. The standard was developed through workshops involving stakeholders, open consultations in several countries (Brazil, Argentina, United States, Europe) and involved around 250 organizations. When a first version of the standard was ready (in 2009), a public conference was held (around 100 people participated) and public consultation took place until mid-2010. In 2010, after the public consultation phase ended, the standard became operational.

The current governance structure is formed by: the ISCC Association, the ISCC system and relevant stakeholder members. The ISCC Association encompasses the executive board, the board and the general assembly. The general assembly includes stakeholder members divided into three groups: 1) agriculture and conversion; 2) trade, logistics and users; 3) NGO's, social, research, others. The board is formed by five members representing the three stakeholder groups listed above. ISCC currently has 63 members in 17 countries, although it has issued more than 1,300 certificates for biomass in sixty countries, including Brazil. However, there are no global NGO's supporting the initiative - only two local NGOs: WWF Germany (an isolated support from this WWF office, since the global initiative dropped its support, claiming that ISCC does not contemplate the criteria established by the NGO for certification systems) and the Kiel Institute for the World Economy (a German think tank).

The board is responsible for managing the ISCC system and also the technical committees, which are created as needed to address specific issues. The ISCC system is formed by employees working with ISCC operations: registry, qualification, quality control, marketing, development/projects.

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<sup>5</sup> According to representatives from the initiative, the ISCC is an international multi-stakeholder approach that was supported, during its development process, by the German Ministry of Food, Agriculture and Consumer Protection through its Agency for Renewable Resources.

#### 5.4.2. Transparency and public disclosure of information

This topic includes a comparison of the public information available regarding processes and records of the initiatives. As mentioned previously, transparency and access to information are fundamental in standard setting and certification processes to ensure participation and engagement of different stakeholders.

The comparison in the first category – information regarding decision makers – is challenging, due to the differences in names and purposes of committees and technical expert groups within the initiatives. However, the purpose of the comparison is to assess the availability of information related to records and processes. This category includes list of board members, list of committee members and list of expert group members. Table 10 summarizes the comparison between the standards.

- For Bonsucro
  - a) Board = Bonsucro Board
  - b) Committees = committees (governance, claims and labeling, certification, EU RED)
  - c) Expert groups = technical working groups
- For RSB
  - a) Board = RSB Steering Board
  - b) Committees = not existent
  - c) Expert groups = expert groups (GHG emissions, Indirect impacts, GMOs)
- For ISCC
  - a) Board = ISCC Board
  - b) Committees = technical committees
  - c) Expert groups = not existent

All three standards have the list of board members publicly available on their websites. For committee members, neither Bonsucro nor ISCC have the complete list of members available online. Bonsucro has only the name of the chairman for each committee and ISCC has the complete list for one committee (there are three currently active committees). RSB does not have committees. Regarding expert groups, both Bonsucro and RSB have the complete list of members available online. This category is not applicable to ISCC (although the committees are like technical expert groups).

All three standards have the list of compliant enterprises publicly available, but only RSB has the certification decision information available online (i.e., the certification report from the certification body). RSB requires public summaries of audits from certification bodies, which is included in the document – “RSB Requirements for the evaluation of and reporting on participating operators”. Also, none of the standards have complaints, appeals and resolutions posted in their websites, although they all have procedure documents for this process.

RSB is the only initiative that has board meeting minutes and records available on their website. All RSB chamber meetings are available upon request. For committee meetings, Bonsucro does not have any meeting minutes or records available and ISCC has documents for only one meeting held in Brazil. This category does not apply to RSB, as they do not have committees. As for expert groups, only RSB has meeting minutes available. Bonsucro does not have minutes of meetings and this does not apply to ISCC.

As mentioned previously in the governance section, RSB has demonstrated compliance with the ISEAL code for standard setting going through a series of pilot field tests, public consultations, outreach meetings in different countries and standard revisions; Bonsucro is in the process of demonstrating compliance with the ISEAL code. These processes are described in detail in the initiatives websites, as well as the future review procedures. RSB has all feedback on each principle of the first version of the standard available online. They also have pilot audit reports and regional outreach meeting minutes and all previous versions of the standard online. For the review process, RSB has a specific standard – “RSB Standard for Modification of RSB Principle & Criteria and Indicators”. Bonsucro also has a detailed section of their website on the standard revision process to be followed. ISCC does not have information available regarding the standard setting process or review procedures.

All three standards have policies and procedures for complaints, appeal and dispute resolution. ISCC and RSB have specific standards for this issue. The ISCC standard involves procedures to handle situations in which there are complaints and appeals related to administrative decisions within the ISCC system and issues of interpretation of the standards. RSB treats this issue within the standard for *participating operators* (RSB-STD-30-001), which states that the participating operator shall establish systems for settlements of disputes and complaints and that these should be documented. There is also a specific standard for dispute resolution – RSB Standard for Dispute Resolution (RSB-STD-65-001) – that should be applied in cases of disputes related to the RSB standard or the RSB certification system. Bonsucro does not have a specific standard for the complaints and dispute resolution process, but addresses the issue through the Bonsucro Code of Conduct, where the Complaints Resolution Process is mentioned and set out.

Only RSB has publicly available annual reports which contain financial information about the organization. They are available on their website.

**Table 10. Public disclosure of information benchmark**

	Bonsucro	RSB	ISCC
<b>Decision Makers</b>			
List of board members	Y	Y	Y
List of committee members	N <sup>1</sup>	NA	N <sup>2</sup>
List of expert group members	Y	Y	NA
<b>Decisions</b>			
List of compliant enterprises	Y	Y	Y
Complaints, Appeals, Resolutions	N	N	N
Certification Decisions	N	Y	N
<b>Documents</b>			
Board meeting minutes and records	N	Y	N
Committee meeting minutes and records	N	NA	N <sup>3</sup>
Expert groups meeting minutes and records	N	Y	NA
Standard setting and review procedures	Y	Y	N
Policies and procedures for complaints	Y	Y	Y
Summary of standard setting org's financial statements	N	N	N
Annual report	N	Y	N

<sup>1</sup> Only Chairman

<sup>2</sup> Members are listed for one out of three committees

<sup>3</sup> Documents are available for only one meeting

**Y = Yes; N = No; NA = Not Applicable**

## 5.5. System Operations

System operations are an important issue when analyzing certification schemes. This was widely emphasized by standard representatives. This topic broadly includes the systems put in place by the initiatives to guarantee the adequate operation and implementation of the standards and the credibility and legitimacy of the initiatives. The section is divided in two central topics: conformity assessment and risk assessment. Conformity assessment is fundamental within the certification schemes to ensure that the assessment of compliance with standards is carried out in a legitimate way to guarantee the credibility of the certification. Risk assessment is included within some of the initiatives in order to evaluate the risk that each operator in the supply chain adds to the implementation of the standards and legitimacy of the certification system. Results of the system operations benchmark are presented in table 11.

### 5.5.1. Conformity Assessment

This category was included in order to assess the certification systems and the audit processes of the standards. This will be further explored in the gap analysis section through the results of the interviews with certified parties and certification bodies. The setup of the

certification systems are closely related to the credibility of the initiatives. It is important that the standard setting organization is not responsible for the conformity assessment of the standards to avoid conflicts of interest. All three of the analyzed initiatives have certification/verification bodies with no affiliation to the governance mechanisms of the standard setting organization. All of them work through the system of accreditation of certification bodies. However, only RSB has a separate entity for operating the certification system – RSB Services Foundation.

Certification bodies (CBs) must meet specific quality requirements in all three initiatives, in terms of the qualifications of the company and also of the auditors. Bonsucro requires the CBs to hold accreditation to ISO/IEC Guide 65<sup>6</sup> by an accreditation body that is a member of the International Accreditation Forum (IAF) and accreditation against ISO 14065<sup>7</sup>.

Additionally, Bonsucro requires CBs to comply with the approval procedure for CBs and requirements for CBs operations contained in the Bonsucro certification protocol document. For RSB, certification bodies are required to fully comply with ISO/IEC Guide 65 and the additional requirements specified in the “General requirements for certification bodies” standard (RSB-STD-70). RSB also has specific guidelines for risk assessment of certification bodies to ensure that they have systems in place to cover liabilities that may arise from its operations (RSB EU RED Requirements for certification bodies’ risk management). For ISCC, there are six requirements on CBs: 1) recognition by a national public authority or an accreditation body; 2) conduct audits in conformity with standard ISO 19011<sup>8</sup> establishing guidelines for quality and/or environmental systems auditing; 3) the workflow of the certification process complies with the requirements of ISO Guide 65; 4) conduct audit and certification according to the principles and requirements of ISO 17021<sup>9</sup>; 5) signed cooperation agreement with the ISCC System; 6) appointment of competent employees in terms of the requirements in this document. There are requirements for auditors in all three standards as well. Such requirements are established in order to ensure appropriate conformity assessment of the standards and audit quality. The accredited CBs in all three standards are generally well established, global companies with wide experience in similar certifications.

Bonsucro surveillance audits are carried out annually (during the three years of certificate validity) after the initial certification audit. For ISCC, because the certificate is only valid for one year, audits are necessarily annual if the operator wishes to re-new the certificate. For RSB, audit frequency depends on the risk level attributed to the certified

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<sup>6</sup> ISO/IEC 65: General requirements for bodies operating product certification systems.

<sup>7</sup> ISO 14065-2007: Greenhouse gases – requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition.

<sup>8</sup> ISO 19011:2002: Guidelines for quality management for systems auditing and environmental management systems auditing.

<sup>9</sup> ISO 17021:2006: Conformity assessment – requirements for bodies providing audit and certification of management systems.

operations. The risk level determines the interval between audits, audit type (i.e., desk, office, field) and the audit team, which can include social and environmental experts if the risk level is very high (levels 4, 5 and 6). For the lowest risk level operators (level 1), desk audits are annual and office and field audits are necessary every two years. For risk level 2 operators, desk audits are every 9 months and office and field audits every 18 months. For risk level 3 operators, there are no desk audits and office and field audits must take place annually. For operators with higher levels of risk (levels 4, 5 and 6), office and field audits must take place more frequently, varying from 3 to 9 months. Risk level also determines samples for group certification. These requirements are detailed in the document “RSB Introduction to Certification Systems” available online at the RSB website.

Another issue included in the conformity assessment comparison is stakeholder consultation for certification, that is, if stakeholders are included somehow in the certification decisions. In Bonsucro, new members are subject to approval of existing members, which is indirectly stakeholder consultation for certification, since all certified parties must become members. However, only RSB explicitly states that the CB must develop and document a methodology to ensure stakeholder consultations during the audit process. These requirements are listed in the document “RSB Requirements for the evaluation of and reporting on participating operators” (RSB-STD-70-003) and include, for example, that a range of representative stakeholders is consulted appropriate to the scale, intensity, complexity and impacts of the operations evaluated and that stakeholders are able to present their comments to the auditor in local language and under terms of confidentiality.

RSB also requires operators seeking to obtain certification to carry out a self-assessment (self-evaluation) regarding the standard’s principles and criteria, as well as a self-risk assessment. The risk assessment is required in the certification application process to identify and manage the risks associated to the operators business and to the stability and integrity of the RSB system. The self-assessment is a means for operators to self-indicate their level of compliance, which is then checked by the certification body.

For Bonsucro and ISCC, self-assessment related to principles and criteria is not a requirement, although the ISCC requires an internal audit before registering new members for group certification. For Bonsucro, it is explicitly stated as optional in order for the operator to evaluate their level of compliance prior to initiating the certification process. In order to do that, operators can use the Bonsucro self-assessment tool available online at the Bonsucro website. ISCC requires a self-risk assessment, discussed in the next section.

### **5.5.2. Risk Assessment**

This category was included in order to identify the presence of and characteristics of risk assessment systems within the analyzed standards. Such systems are implemented to ensure security and integrity of the initiatives and certification systems. ISCC and RSB have standards or guidelines for risk assessment. Bonsucro does not have a risk assessment

system, although there is a risk analysis for companies that wish to become members. In this process, new members are subject to a 30 day public consultation, where existing members and other stakeholders can comment on applications. Any comments received are reviewed by the board, which has final decision regarding the acceptance or rejection of members. However, in Bonsucro there are no systems in place, such as the ones in RSB and ISCC, to attribute risk levels to operators and to determine audit frequency, type and intensity. Table 11 summarizes the risk assessment systems of each standard.

RSB has a risk assessment standard (RSB-STD-60-001) for economic operators and another for certification bodies. Within RSB, risk is considered to be any possible damage (environmental, social and/or economic) resulting from the deficient implementation of the RSB standards and/or the RSB certification systems. The RSB standards on risk management include a list of risk factors that could result in such damages. The risk management approach is intended to allow operators and certification bodies to focus on the areas of the RSB standards that add risk to the certification system. Operators carry out a self-risk assessment, which is built into the application form. Audit frequency, intensity and type depend on the risk level attributed to the operator.

ISCC also has a specific standard and system for risk assessment, which is based on risk indicators. Such process is an important part of the ISCC system, since it is one of the pillars to ensure its safety and integrity. All elements of the supply chain seeking to obtain certification are required to carry out a self-risk assessment based on the ISCC risk factors and the three ISCC risk categories: low, medium and high. Such assessment should help in the design of the operator's certification management system, which should be focused on the minimization of the identified risks. Although operators are required to carry out a self-risk assessment, a third party assessment is also necessary. The certification bodies must carry out a risk assessment prior to the first audit to classify the operators according to the ISCC risk levels and to determine the frequency and intensity of audits.



**Table 11. System Operations Benchmark**

	Bonsucro	RSB	ISCC
<b>Conformity Assessment</b>			
Certification/verification body has no affiliation with governance mechanism of standard-setting	Y	Y	Y
Separate entity for operating certification system	N	Y	N
Accreditation of CBs	Y	Y	Y
CB must meet specific quality requirements (ISO 65 or 17021 compliant or equivalent)	Y	Y	Y
Auditors must have specific qualifications	Y	Y	Y
Stakeholder consultation for certification	N	Y	N
Self-assessment	N*	Y	N
Audit frequency	annual	depends on risk	annual**
<b>Risk assessment</b>			
specific guidelines/standard	N	Y	Y
self-risk assessment	N	Y	Y
risk level affects audits	NA	Y	Y

\*Optional

\*\*Although there is a mass balance audit after six months.

**Y = Yes; N = No; NA = Not Applicable**

## 5.6. Assessment of the IDB Scorecard

As previously mentioned, the IDB scorecard was created by the IDB as a tool to encourage more sustainability in biofuel projects and as a base to determine eligibility for financing projects. The categories are based on the RSB criteria and the tool is useful for operators to assess sustainability issues and to inform certification and/or life-cycle assessment processes.

Because the scorecard has different objectives and does not replace a certification, it was assessed separately. The categories include quantitative and qualitative indicators on general, environmental and social issues related to biofuels from “field to tank”. Users are required to choose among answer options based on a color spectrum, where:

- Bright green: excellent
- Light green: good
- Yellow: satisfactory
- Orange: potential risk
- Red: unsatisfactory

All categories also have a not applicable alternative. The color options available depend on the question. After answering all questions, the scorecard generates a color map that indicates performance in different areas and potential improvements required. The categories included in the scorecard are listed below in tables 12 (environmental) and 13 (social).

The scorecard covers most of the issues in the analyzed standards, although in a much more general way. The standards, however, are intended to provide guidelines and requirements regarding these issues, whereas the scorecard is intended to give the user an idea of their level of sustainability in operations and to guide IDB financing. Also, the

scorecard can be used at multiple stages of projects to help in identifying and measuring improvements and necessary changes.

The 17 broad sub-topics defined to carry out the benchmark are all covered through the scorecard. The assessment considering the benchmark categories and the scorecard categories is in Table 14 below. The 36 comparison criteria were not assessed due to the differences in the purposes of the standards versus the scorecard.

The scorecard generally does not address economic development issues and many issues that are treated in detailed sub-categories in the standards are encompassed through one category in the scorecard (e.g., employment, wages and labor conditions in the benchmark category within human rights and labor rights in the scorecard categories).

**Table 12. Environmental and social issues**

	<b>Category</b>
<b>Project Site</b>	Biodiversity Invasive Species Carbon emissions from land use change
<b>Feedstock/Crop Management</b>	Crop lifecycle Crop rotation/crop mix Harvesting method Water Management Fertilizer Management Pesticide use
<b>Production/Facility Management</b>	Energy source for facility Water requirements for industrial production Waste management Waste diversion
<b>Distribution</b>	Relative energy efficiency of transport and distribution
<b>Cross-cutting</b>	Environmental and social impact assessment Yield - Biofuel and co-products Energy balance Greenhouse gas emissions savings

**Table 13. Social issues**

	<b>Category</b>
<b>Social</b>	Humand rights Labor rights Labor ownership Change in access to resources Impact on food security Consultation and transparency Capacity building Local income generation Local grower arrangements Community development Impacts on indigenous people

**Table 14. Benchmark vs. IDB Scorecard Categories**

<b>Benchmark categories</b>	<b>IDB Scorecard</b>
<b>Biodiversity</b>	Biodiversity, Invasive species
<b>Soil</b>	Crop lifecycle, Crop rotation/ crop mix
<b>Crop management and agrochemical use</b>	Fertilizer management/Pesticide use
<b>Water</b>	water management, water requirements for industrial production
<b>Air</b>	Harvesting method
<b>Waste</b>	Waste management, waste diversion
<b>Environmental sustainability (cross-cutting)</b>	Energy balance, Distribution/Environmental and social impact assessment
<b>Direct Land use changes</b>	Carbon emission from land use change
<b>GHG emissions</b>	GHG emissions saving
<b>Laws and International conventions</b>	Treated separately in each category
<b>Land, water and resources</b>	Land ownership; Change in access to resources
<b>Human rights and labor rights</b>	Human rights/ Labor rights
<b>Employment, wages and labor conditions</b>	Human rights/ Labor rights
<b>Human health and safety</b>	Capacity building/Environmental and social impact assessment
<b>Rural and social development</b>	Local income generation/local grower arrangements/community development/Impacts on Indigenous people
<b>Economic development</b>	Consultation and transparency
<b>Food security</b>	Impact on food security; Change in access to resources

## 6. Gap Analysis

The gap analysis was conducted in order to understand the existing gaps between the standards and current practices adopted along the supply chain, as well as difficulties preventing the adoption of the standards. We interviewed sugarcane mills, chain of custody certified organizations and certification companies involved in the standards analyzed in this study. Aggregate results are presented below. These results reflect the opinions of interviewed parties regarding their experience, but also considering what they think would be difficulties for other producers to comply. We did not ask specific questions about each criterion in the standard. Instead, we carried out informal conversations to understand in general what the most important difficulties in complying with the standard were.

We interviewed five companies, encompassing fourteen mills, one intermediary company and two certifying companies to understand their experience with the certification and identify the main difficulties throughout the process.

As previously mentioned, all three standards analyzed in this study have been recognized by the EU as certificates of sustainability for the Renewable Energy Directive, although Bonsucro does not meet the sustainability requirement of Article 17(3)(c) on highly biodiverse grassland according to the EU RD assessment report on the Bonsucro EU standard. The incorporation of EU requirements in the standards is an important issue within this analysis, especially regarding high conservation value areas (HCVA) and indirect land use change (ILUC) criteria. The EU has not yet provided a definition for HCVA and is still considering whether to include ILUC in GHG emissions calculations. ISCC and RSB, anticipating what the EU may decide, have provided definitions for HCVA and RSB has launched a public consultation on a document to include ILUC in the standard. Regarding the first issue, RSB and ISCC have determined that pasture areas cannot be converted into agricultural areas. This poses a significant difficulty for Brazilian producers to comply with the standards, since most expansion in Brazil has been taking place (and is likely to continue to take place) over pasture areas, as will be discussed in more detail below. Also, there is a concern that the EU will define an international database for HCVA, without taking into consideration that the Brazilian legislation already requires national conservation areas and protected areas within rural properties through the Forest Code (Legal Reserve and Permanent Preservation Areas).

It is important to emphasize that for each standard, there is a different level of gap. For ISCC and RSB, the gap is the implementation of the standard, since there are no certifications of these standards for sugarcane ethanol currently in the country. For Bonsucro the gaps in the production standard are related only to the expansion of certification to other areas. The producers that have achieved the Bonsucro certificate in Brazil have selected their “best areas” to certify. These areas are generally owned or managed by the companies (not third party supplier areas) and have other quality certificates, such as ISO. Therefore, they

generally did not have much difficulty implementing the Bonsucro standard. Most issues that had to be addressed were related to details, such as signs indicating required personal protective equipment, pedestrian crosswalks inside the plants, codes of conducts with suppliers, quality of water for workers, training, and adaptation of documents and controls to comply with the standard.

In some cases, there were other more complicated issues. For example, changing the pattern of buying or leasing land for production due to the requirement that expansion does not take place in areas with high conservation value after 2008 and proving the past occupation and status of land that was recently purchased or leased. This was identified as a competitiveness barrier. Furthermore, there were some issues pointed out related to Bonsucro parameters for production (Bonsucro calculator), which in some cases are more strict than the law and, therefore, required adjustments (such as water return and fertilizer use).

Finally, there are some problems related to compliance with the environmental and worker health and safety legislations, but that were also minor or already being addressed. One example is the recovery of Permanent Preservation Areas (APPs) and Legal Reserve, which are required by the Brazilian Forest Code. Some producers may not have the APPs entirely in compliance, but are already in the process of recovery. The Legal Reserve also has to be at least delimited and in the process of recovery to be considered in compliance with the legislation.

For expansion of certification to other areas and plants, however, the gaps would be more extensive. Three broad gaps stood out for being mentioned with frequency: compliance with the law, supplier areas and structural adaptations. The first two are much related, since the main concern regarding compliance with the law for larger mills is with sugarcane supplier areas. This is especially true for the Forest Code. Some mills buy part of the sugarcane that they process from suppliers. They have control only of their own sugarcane producing areas and mill areas. Assuring that third party areas comply with the Forest Code, as well as other environmental and labor laws is a problem and a gap that will have to be dealt with in the expansion of certification to other areas. For smaller mills and producers, the gap of compliance with the law will be even larger, as it will encompass other legal issues that are not a problem for larger mills like the ones that are obtaining these certificates currently. The Forest Code requirements and the insecurity generated by its current revision is a major gap for smaller producers. Labor issues related to overtime, shifts and breaks, biodiversity conservation and GHG emissions requirements also.

The structural adaptations issue is also mostly related to compliance with the law. The NR-31 norm that regulates worker health and safety in agriculture has extensive requirements related to worker housing, dining facilities, as well as chemical product deposits, warehouses, stairs, ramps and others. Some structural adaptations required are

very costly and/or structurally not viable in older mills. This is an important gap in expansion of certification to other areas and to smaller producers.

Other issues identified were the use of personal protective equipment (which is still a problem in some cases), worker safety training, and lack of driving licenses to operate machinery (class C). All these are legal compliance issues. Furthermore, there are gaps related to issues that go beyond the law, such as the principle for communication with stakeholders. When this takes place, it is usually not a formal procedure.

For Bonsucro, there are also two important points regarding the EU Renewable Energy Directive. The first is that if the EU defines that ILUC effects should be taken into account in GHG emissions, and if Bonsucro decides to address this in the standard, it might become a problem for current and future certified organizations. Second, Bonsucro does not meet the sustainability requirement of Article 17(3)(c) on highly biodiverse grassland of the Directive. The Bonsucro standard states that HCVA should be defined nationally and that in the absence of such definition producers should prove that no HCVA's have been converted after 2008. This is an important factor in the implementation of Bonsucro in Brazil, since expansion of production takes place (and is likely to continue to take place) mostly over pasture areas. If the European Union decides that certain types of planted pastures can be considered highly biodiversity grasslands, this will be a problem for Brazilian producers and a major gap in increasing certified areas in Brazil. This is also an important issue for Bonsucro, since it has already certified producers in Brazil taking into account what is required by the national legislation and the current definition of HCVA.

During the interviews, it became clear that most difficulties are related to compliance with the Brazilian legislation and not with the criteria in which the standard goes beyond the law for Bonsucro. The legal compliance issue, however, is a gap for all three standards, since they all require compliance with the law.

For the chain of custody standard, there are clear problems related to the requirements on paper and what is actually being done and certified. It is important to note that there are differences in the perception of the producer or operator and the certification body (CB) regarding the requirements of the chain of custody. Whereas CBs may benefit from having more specific requirements and more documented controls of procedures in order to "audit" the system, the producers/operators may find it a bigger hurdle. The Bonsucro chain of custody standard, however, clearly has problems and needs to be revised. Most difficulties are related to the many different cases of chain of custody actors. Also, it is not clear who is responsible for what in the standard, for example, for calculating and monitoring the mass balance.

In general, there is a perception that because Bonsucro is a new standard, it still requires improvements, especially in the chain of custody standard, but also in the production standard and regarding consistency between documents (standards, audit guidance,

certification protocol, and calculator). Generally, until this point there were no major difficulties in implementing the Bonsucro standard and it has been the preferred certification among Brazilian sugarcane producers.

For ISCC, the gap is the implementation of the standard. The ISCC production standard has not been applied to biofuels from sugarcane in Brazil (only in Colombia). It has been applied to other products, however. Also, there are organizations certified ISCC chain of custody, including in the sugarcane ethanol supply chain.

Again, it is clear that most difficulties for the implementation of the production standard are related to legal compliance, especially environmental legislation and other issues identified for Bonsucro. Most likely, this will not be different for most crops. However, there are some other important issues in ISCC that could hamper its adoption. The first is related to conversion of pastureland into agriculture areas. Agricultural production in Brazil has been expanding over pasture areas. Until EU definitions for high conservation value areas are in place, these areas are considered to be highly biodiverse non-natural grasslands and, therefore, areas that cannot be used for production. This is a major gap for the certification in Brazil. The definitions and maps of high conservation value areas (HCVA) as required by the EU Renewable Energy Directive is also a concern. Because Brazilian environmental legislation already requires national conservation areas, as well as conservation areas inside farms (Forest Code), these should be reconciled with international databases. Furthermore, there is a concern regarding the risks of indirect land use change (ILUC) effects and the EU's intention to raise the threshold for GHG emissions savings to take this into account. These are all related to the EU Renewable Energy Directive and are issues that have not been well defined or are being discussed. Also, because ISCC does not cover sugar certification, sugarcane producers have been resistant to adopt it. Lastly, the food security criterion, which requires that biofuel operations do not replace staple crops, does not impair food security and does not cause local food prices to rise. This criterion is very vague and difficult to measure/verify. There is no definition for staple crops, but if these are equivalent to staple crops, this would mean that sugarcane could not be produced in areas previously occupied with grains or even as a rotation crop with grains and other staple crops. This would be a difficulty for Brazilian sugarcane producers.

The chain of custody standard has been implemented by at least three of the interviewed parties. There were no major gaps identified in the process. Criteria are clear and the standard is consistent. The implementation of the standard required separating documents and training people, but no changes in the normal processes.

Generally, ISCC is the only initiative currently seeking to harmonize different certification schemes, by recognizing other EU approved certification schemes, as long as delivery notes are checked and approved.

For RSB, the gap is also the implementation of the standard. There are currently no certified producers in Brazil. Two pilot projects were conducted in Brazil, though only one was finalized. Based on our interviews with producers and certification bodies, there are other difficulties, besides from the legal compliance issues, related to the implementation of the standard. The first one is related to the consistency of the standard that, like Bonsucro, is a new standard and still requires adjustments and continuous improvement based on feedback from organizations implementing the standard. There is an impression that the standard's scope is not clear and that the criteria are difficult to understand. There is also a perception that certain social requirements in RSB go beyond the role of the organization/producer.

Also, the requirement for proving compliance with criteria, especially the social and environmental management plan (that describes how each criterion is being met) is seen as a difficulty. However, the standard does not require changes in processes, only documenting what is already being done to complement the evidence for the audit. This requires engagement and the right skills and expertise from the person responsible for the implementation of the standard. In this sense, RSB has already made changes to its standard and systems. A new tool available on the RSB Services website is much more accessible and has a step-by-step guide for organizations preparing for certification.

Another issue, common to ISCC, regards HCVA. Because the EU has not provided a definition for this, the RSB standard does not allow conversion of pasture to agricultural areas. Lastly, two additional concerns are the food security criteria and the discussions of how ILUC will be treated in the standard. The RSB food security criteria are more detailed and provide clearer guidance for implementation than the ISCC criteria. It requires an assessment of food security impacts and enhancement of food security of directly affected stakeholders in food insecure regions. Although there is a necessity for another report to assess this issue, the criteria do not present any major difficulties for producers. Regarding ILUC, RSB recently released a document with criteria related to the issue for public consultation. These could be important gaps in the implementation of RSB in Brazil.

### Audits and Audit Procedures

The information in this section is mainly about Bonsucro. In general, audits take from 3 to 5 days (depending on the number of auditors) and takes place in two phases: documents and field. For Bonsucro production standard, audits are focused on the relevant laws (mainly labor, worker health and safety and environmental) and in other criteria not related to the law. The audits are very strict (Example: measuring APPs). Auditors pay attention to details. However, because the auditors do not have experience with the standard and because the standard still need adjustments, there is still some level of uncertainty and margin for different interpretations in the inconsistency between documents.



Another important point regarding the audits is that most interviewed parties hired consulting companies or the certification bodies themselves to carry out a pre-audit in order to identify non-conformity points beforehand. This allowed them to make most necessary adjustments before the certification audit.

## **7. Conclusions and recommendations**

Throughout the benchmark, it becomes clear that all of the analyzed standards are more focused on two of the three sustainability pillars: environmental and social aspects of businesses. Among the three, Bonsucro is the one that has most economic related criteria. In the gap analysis, it becomes clear that the main gaps are also related to these two pillars.

It is interesting to note that the criteria in the standards are generally similar, with some exceptions discussed in detail in the benchmark section. Broadly, the most different criteria are related to GMOs, food security and ILUC. Furthermore, there are important differences, also already discussed in detail, regarding the HCVA criteria and definitions within the standards. However, the base for the standards is very similar. This makes it important to also analyze the differences in proving compliance with criteria (evidence), scope of standards, chain of custody, system operations and governance.

In terms of governance, it becomes clear that not all standards are governed in an equal fashion. A quality standard is created through a transparent, multi-stakeholder process representing the full value chain and civil society. In this sense, the governance of ISCC is not as transparent as that of Bonsucro and RSB, especially regarding the standard setting process. Bonsucro and RSB are members of the ISEAL alliance and both of their standards were developed based on stakeholder consultation processes and standards set by ISEAL. The ISCC is not an ISEAL member and there are no public records of the standard setting process followed. Furthermore, stakeholder representation, especially from global NGOs and civil society organizations is stronger in RSB. Bonsucro does not have as many members in these categories as RSB, but has two large international NGOs as members. ISCC, however, only has small and local NGO members.

In system operations, RSB and ISCC are stricter than Bonsucro since, depending on the risk level attributed to the operator, audit frequency and intensity are increased, as described in section 4.5.1 of this report. Bonsucro does not have requirements related to risk assessment and, therefore, audit frequency is the same for all operators. Risk assessment is an important issue to ensure the safety and integrity of the initiatives and its certification systems.

The analysis revealed that, in terms of implementation, the standards have different levels of gaps. Bonsucro is the only standard among the three that has certified sugarcane producers in the country. However, expansion of certification to other areas (small and

medium producers and third party areas) may be limited by another gap common to all three standards: compliance with the Brazilian law, especially environmental and labor and worker health and safety.

The RSB and the ISCC production standards have not been implemented in Brazil in the certification of sugarcane biofuels (although both had pilot projects in the country), mainly because Bonsucro has been the preferred standard among Brazilian sugarcane producers. We identified two main reasons that explain such preference: 1) the standard is more objective and does not have additional criteria included in the other two standards related to HCVA, food security and ILUC; 2) it also certifies sugar (although ISCC is in the process of implementing ISCC Plus, which will also allow this option within the system). These additional criteria are associated to complex issues that are still being extensively discussed. There are no widely accepted methodologies to address them, which complicates even more their inclusion into the standards. This results in the inclusion of such issues in the standards in a very conservative manner and in the involvement of the standard initiatives in the related methodological and scientific discussions.

Furthermore, the requirements to demonstrate compliance with criteria in RSB are seen as more complex than the others, since besides the evidence, there has to be a plan that describes how the organization complies with each criterion.

In conclusion, Bonsucro is currently the most viable alternative, since the implementation gaps for RSB and ISCC are larger in the short run. The industry has adopted the Bonsucro standard and it has an advantage by not addressing the issues not yet defined by the EU (such as HCVA). This may generate a problem in the future with existing and new certifications once the EU establishes definitions for HCVA and ILUC. Also, it is important to note that the Bonsucro standard still needs improvements, especially in its chain of custody standard.

Even for Bonsucro, however, the expansion of certification will require efforts from the industry since there are still many gaps related to compliance with the national legislation. There is great potential for harmonization of standards and systems, as demonstrated by ISCC and by companies operating in the industry. This may become an important point in the future of certification along supply chains.

## **8. Support Information**

### **Environmental, Land use and GHG emissions – aggregation of criteria (Table 15 and 16):**

- **Biodiversity:** includes all criteria related to protection and conservation of biodiversity and ecosystem services. Criteria related to invasive plants also.

- Genetically modified organisms: all criteria that are related to genetically modified organisms.
- Productive capacity of the soil: criteria related to soil conservation, salinization, organic matter, ph, biodiversity and erosion.
- Use of by-products: includes all criteria related to the use of agricultural by-products.
- Fertilizer: all criteria related to the utilization of fertilizer, storage and other good practices.
- Integrated Plant Management: criteria related to the implementation of Integrated Plant Management (IPM), utilization of IPM, and other criteria related do IPM.
- Agrochemicals: all criteria related to the utilization of agrochemicals, storage and other good practices.
- Quality of surface and groundwater: criteria related to maintain/enhance the quality of surface and groundwater.
- Quantity of surface and groundwater/Irrigation: criteria related to maintain/enhance the sustainable use of surface and groundwater. For agriculture, special attention is given to irrigation.
- Air pollution: criteria related to air quality.
- Open air burning: criteria related to open air burning as part of the production cycle.
- Reduce waste/waste management/disposal: criteria related to reduction of emissions, effluents and waste; the implementation of a waste management plan; correct disposal of waste.
- Energy: criteria that use energy to verify sustainability. Criteria that indicates reduction of consumption of energy.
- Efficiency: criteria about efficiency as it improve the sustainability of the project.
- Incorporate sustainability in new projects: criteria related to the incorporation of sustainability concepts (social and environmental) in new projects.
- Emission reduction: the threshold for GHG reductions that the biofuel must provide to final user.
- GHG calculations: the methodologies that each standard use to calculate GHG emissions. The GHG emission due to direct land use change must be added to the GHG calculation.

**Socio-Economic and Food security – aggregation of criteria (Table 17):**

- Compliance with relevant applicable laws: includes all criteria related to compliance with relevant national laws and international conventions.
- Land rights and land use rights: all criteria related to land rights and land use rights, including land titles and transfers for biofuel operations.

- Water rights: includes all criteria related to respecting rights to water of local communities and indigenous communities and also to comply with the law regarding such issue.
- Labor conditions: includes criteria related to compliance with core ILO principles: freedom of association and effective recognition of the right to collective bargaining (conventions 87 and 98); elimination of all forms of forced or compulsory labor (29 and 105); effective abolition of child labor (138 and 182); elimination of discrimination in respect of employment and occupation (100 and 111).
- Contractors and Suppliers: includes criteria related to requiring contractors and/or suppliers to comply with human rights and labor standards.
- Wages/per unit wages: includes criteria related to wages and per unit wages paid to workers and conformity of pay slips to legislation.
- Work hours/breaks/overtime: includes criteria related to regular working hours, overtime work and breaks and documentation of these issues.
- Contracts: includes criteria related to the provision of contracts or equivalent to document basic information such as hours of work, overtime payment, notice, holidays, wages, and mode of payment.
- Communication/complaints/mediation mechanisms: includes criteria related to worker representation within the property (excluding unions), existence of meetings between workers and management to discuss issues related to worker health, safety and welfare and the existence of complaint forms or mechanisms for workers.
- Conditions of occupational safety and health for workers: includes criteria related to worker health and safety, including training, provision of personal protection equipment, housing, clean water, handling hazardous substances, etc.
- Social impact assessment: includes criteria related to the need to carry out social impact assessments for new or existing operations/projects and to compensate for any negative impact.
- Social development: includes criteria related to the provision of social benefits to employees and social surroundings.
- Women, youth, children and indigenous communities: includes criteria related to assessing impacts of operations for these communities/groups and applying special measures that benefit and encourage participation of women, youth, indigenous communities and the vulnerable in biofuel operation and also to guarantee good quality education for all children living on the farm.
- Production and processing efficiency: includes criteria related to monitoring production and process efficiency and to measure the impacts of production to achieve continuous improvement.
- Economic viability: includes criteria related to promoting the economic viability and sustainability of the biofuel operations.

- Good management practices: includes criteria related to good management practices and continuous improvement, such as: research and development of extension expertise, records of production, areas used, technologies used and employees, and application of all standards to subcontractors.
- Engagement and communication with stakeholders: includes criteria related to engagement and participation of stakeholders in the processes.
- Assess food security impacts: includes criteria related to assessing the impact of biofuel operations on food security (local, regional and national) and enhancing the food security of relevant stakeholders in food insecure regions. Also includes criteria to guarantee that biofuel operations do not impair food security.

**Table 15. Aggregation of criteria: environmental, land use and GHG emissions**

Principles and Criteria	Bonsucro	RSB	ISCC
<b>Biodiversity</b>			
Biodiversity	4.1, 5.7.2	7,11.c	1
Genetic modified organism		11.b	
<b>Soil</b>			
Productive capacity of the soil	5.2	8	2.3,2.4
Use of by-products	4.1.4	8.a.1.3	
<b>Crop management and agrochemical use</b>			
Fertilizer	4.1.5, 4.1.6	11.d	2.6
Integrated Plant Management			2.7
Agrochemicals	4.1.7	11.d	2.8,2.9
<b>Water</b>			
Quality of surface and ground water	4.1.1	9.b,9.d	2.2,2.5.1,2.9.3,2.6.1
Quantity of surface and ground water/Irrigation	5.2.1	9.c	2.5.2
<b>Air</b>			
Air pollution	5.5.1	10.a	2
Open air burning		10.b	2.4.3
<b>Waste</b>			
Reduce waste/ Waste management/Disposal	5.5, 4.2	11.e	2.10
<b>Environmental sustainability (cross-cutting)</b>			
Energy	5.4.1,5.4.2,5.4.3		
Efficiency	3.1		
Incorporate sustainability in new projects	5.7	2.a	2.1
<b>Direct Land use changes</b>			
Restriction/Baseline for LUC	4.1.2, 5.7.1	7.a	1
<b>GHG emissions</b>			
Emission reduction	3.2	3.c	System Basics 4.2.3
GHG calculations	Appendix 3	RSB Methodology	GHG Emissions Calculation Methodology and GHG Audit

**Table 16. Aggregation of criteria: environmental, land use and GHG emissions (EU standards)**

Principles and criteria	Bonsucro-EU	RSB-EU	ISCC
<b>Biodiversity</b>			
Biodiversity	4.1, 5.7.2, 6.2	7,11.c	1
Genetic modified organism		11.b	
<b>Soil</b>			
Productive capacity of the soil	5.2	8	2.3,2.4
Use of by-products	4.1.4	8.a.1.3	2.4.5
<b>Crop management and agrochemical use</b>			
Fertilizer	4.1.5, 4.1.6	11.d	2.6
Integrated Plant Management			2.7
Agrochemicals	4.1.7	11.d	2.8,2.9
<b>Water</b>			
Quality of surface and ground water	4.1.1	9.b,9.d	2.2,2.5.1,2.5.3,2.9.3,2.6.1
Quantity of surface and ground water/Irrigation	5.2.1	9.c	2.5.2,2.5.4,2.5.5
<b>Air</b>			
Air pollution	5.5.1	10.a	2
Open air burning		10.b	2.4.3
<b>Waste</b>			
Reduce waste/ Waste management/Disposal	5.5, 4.2	11.e	2.10
<b>Environmental sustainability (cross-cutting)</b>			
Energy	5.4.1,5.4.2,5.4.3		
Efficiency	3.1		
Incorporate sustainability in new projects	5.7	2.a	2.1
<b>Direct Land use changes</b>			
Restriction/Baseline for LUC	4.1.2, 5.7.1	7.a	1
<b>GHG emissions</b>			
Emission reduction	3.2,6.1	3.c	System Basics 4.2.3
GHG calculations	Appendix 3	RSB Methodology	GHG Emissions Calculation Methodology and GHG Audit

**Table 17. Aggregation of criteria: Socio-Economic and Food Security (original and EU standards)**

Principles and criteria	Bonsucro	RSB	ISCC
<b>Laws and International conventions</b>			
Compliance with relevant applicable laws	1.1	1	5
<b>Land, water and resources</b>			
Land rights and land use rights	1.2	12a, 12b	4.5.1
Water rights		9a	2.5.2
<b>Human rights and labor rights</b>			
Labor Conditions	2.1	4a, 4b, 4c, 4d	4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5, 4.4.14
Contractors and suppliers	2.2	4g	4.6.3
<b>Employment, wages and labor conditions</b>			
Wages/per unit wages	2.4	4e	4.4.6, 4.4.18
Work hours/breaks/overtime		4e	4.4.16, 4.4.17
Contracts	2.5		4.4.5, 4.4.21
Communication/complaints/mediation mechanisms	2.1		4.4.7, 4.4.9, 4.4.10, 4.4.11
<b>Human health and safety</b>			
Conditions of occupational safety and health for workers	2.3, 5.1	4e, 4f	4.3.1, 4.3.2
Social impact assessment	5.7	2a	4.4.8
<b>Rural and social development</b>			
Social development		5a	4.4.19
Women, youth, children and indigenous communities	5.6	5b	4.4.12
<b>Economic development</b>			
Production and processing efficiency	3.1		
Economic viability	5.9	2c	
Good management practices	5.3, 5.6	11a	4.4.13, 4.6.1, 4.6.2, 4.6.3
Engagement and communication with stakeholders	5.8	2b	4.4.8
<b>Food security</b>			
Assess food security impacts		6a, 6b	4.4.22

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