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# DRIVING FORWARD A SUSTAINABLE SUGARCANE MARKET

EUROPEAN SUGAR REFINERIES ASSOCIATION (ESRA)

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# ABOUT ESRA

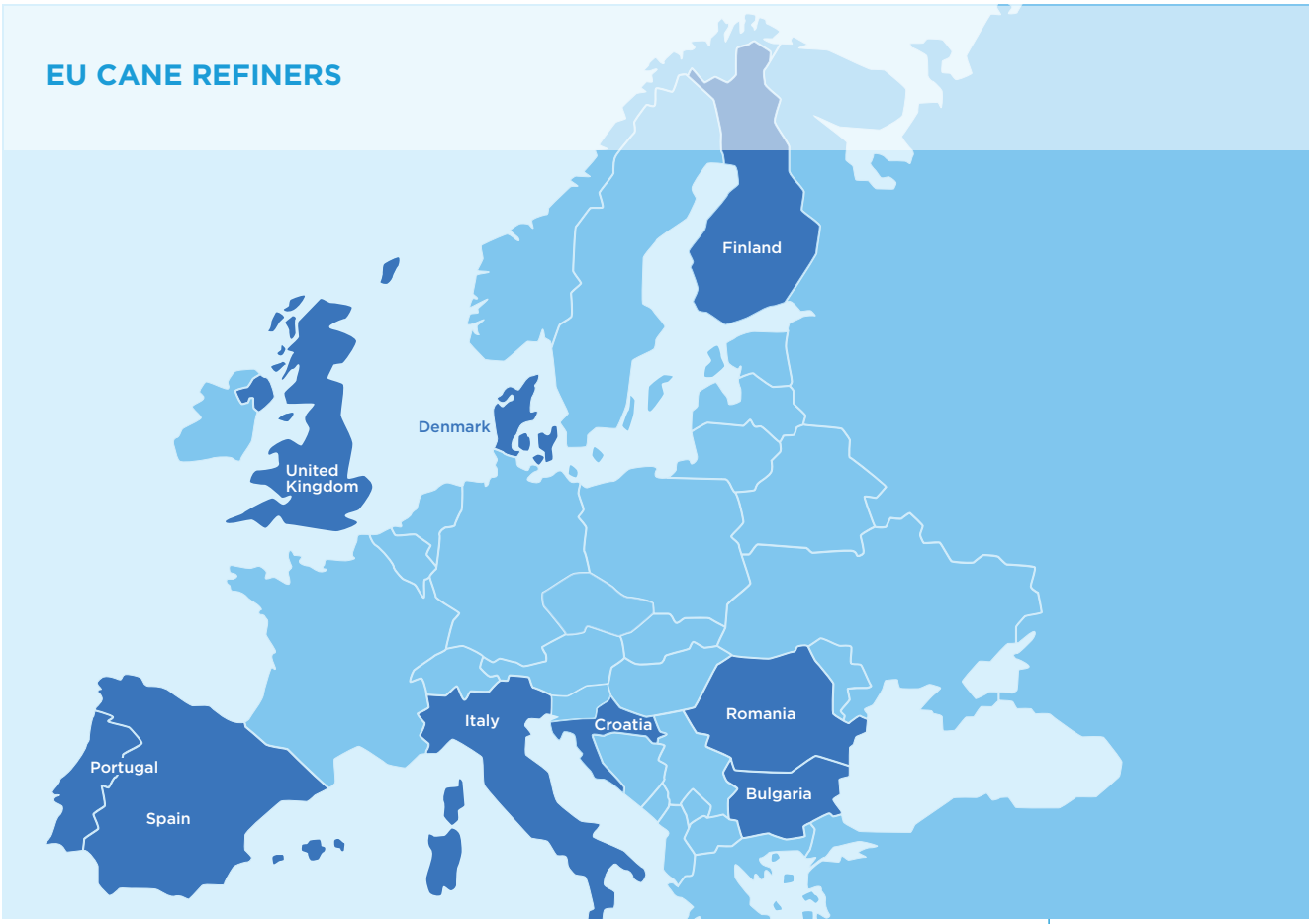
The European Sugar Refineries Association (ESRA) is the leading voice of Europe's sugar refining industry. Established in 2011 and headquartered in Brussels, the association represents the majority of the full-time cane sugar refineries in the EU.

Our members are full-time cane sugar refineries located in four European countries. Cane refiners provide consumer choice, competition, food security and a link to global markets, thanks to their use of a different raw material for producing sugar.

ESRA members employ 4,500 workers, mostly in high grade jobs (chemists, engineers, plant operatives) and provide several other jobs indirectly. Altogether, they have 2,400 active customers ranging from food & drink processors and retail chains to pharmaceuticals.

ESRA members market several types of sugar products derived from sugar cane for a number of different uses and purposes across market segments, namely industry and distribution.

## EU CANE REFINERS




European States with full-time cane refineries

*Source: List of Full-time refiners, European Commission, 2016. ESRA's membership represents the majority of the EU cane refining sector, including Tate & Lyle Sugars (UK), Agrana (Romania), SRB (Italy), Sidul and RAR (Portugal)*

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# FOREWORD – DRIVING FORWARD A SUSTAINABLE SUGAR MARKET

The European Union is undertaking a green revolution. As a result of the European Green Deal, sustainability principles now lie at the core of Europe's growth strategy, underpinning every EU policy and programme. The goal: to make Europe the first carbon-neutral continent by 2050, and to ensure that long-term economic growth is decoupled from resource use.

Sustainability lies at the core of the cane sugar industry, too. Over the past two decades, unprecedented efforts at every level of the cane sugar supply chain have been made by a host of stakeholders: from farmers to manufacturers, refiners, traders, and retailers. Driven by a strong demand from consumers themselves, the cane sugar sector has embarked on a quest for sustainability that will continue to transform and evolve in the years to come.

Yet such progress can only be sustained and strengthened if access to sustainable sugar is commercially viable. The EU, one of the largest single markets in the world, can be a powerful driver of sustainable sugar production and demand. To tap into this potential, a level-playing field for raw sugar trade is paramount.

Currently, cane refiners in the EU cannot source sustainable raw sugar at competitive prices due to prohibitive import tariffs. This reality may hinder the viability of a sector that in Europe alone employs close to 5,000 workers, mostly in high-grade jobs, and which for has for long ensured a stable and reliable sugar supply for EU consumers, including during the Covid-19 crisis.

If the EU is to lead sustainability efforts at the international level, it must leverage the power of its market to drive sustainability beyond its borders. This includes sugarcane, whose sustainable sourcing and production in third countries can be supported by means of well-designed Free Trade Agreements (FTA) that include Duty-Free Tariff Rate Quotas. Only a competitive, dynamic and diverse EU sugar sector will be able to address the most pressing challenges of one of the most traded commodities in the world.

The members of the European Sugar Refineries Association (ESRA) are committed to supporting this development of a sustainable sugar market. With the following study, ESRA aims to shed light on the evolution of sustainability efforts in the cane sugar sector, as well as to bring to the table policy solutions at the EU level that can help sustain and encourage sugarcane's sustainability trend.

# EXECUTIVE SUMMARY

This study has been carried out by the Secretariat of the European Sugar Refineries Association (ESRA), which represents the majority of the sugarcane refining industry in the European Union. It presents an analysis of how the sugarcane sector has incorporated sustainability principles along the different elements of its value chain and how EU-led policy can contribute to its further development at the international level.

Sugarcane producers, millers, traders, and refiners can offer today's consumers cane sugar that meets the highest sustainability standards. This has been largely driven by consumer demand and made possible thanks to the collective effort of citizens, NGOs, industry, and governments.

The high social and environmental standards demanded by EU consumers place the EU in an unparalleled position to drive change around the world. Trade is a key asset for the EU to lead globally towards more sustainable supply chains. EU trade deals must therefore be ambitious and designed to leverage the EU market as a force for good at the global level.

Throughout the different sections, the study draws on relevant examples from Brazil and Australia, two countries that hold strategic importance for the EU in terms of trade, whom play a key role in setting international sustainability standards for the sugarcane market.

The first part of the study describes the importance of sugar, both as a nutrient and as one of the most traded commodities in the world. Despite the economic slump caused by the COVID-19 pandemic, the production and consumption of sugar is expected to grow worldwide in the coming years. The research focuses on Europe, providing a brief analysis of the effects that the abolition of sugar quotas in 2017 has had on the European sugar market i.e. driving down sugar prices and distorting the level-playing field for sugar producers and refiners both within and beyond EU borders. It looks at examples from trade negotiations with Brazil and Australia, and outlines possible solutions for upcoming trade deals.

Drawing on different data sources and indicators, the second section of the study goes on to analyse sugarcane's progressive trend towards sustainability along the different parts of its supply chain: from production and extraction, to its transport, refining and final consumption. The study shows how the combined effect of international standards, industry commitments, national legislation in producer countries, and coordinated international efforts have increased the environmental performance of the sugarcane sector as measured against key socio-economic and environmental indicators.

The third part discusses the EU's role as a key driver of sustainability at the international level across a number of sectors as a result of its normative power. The study concludes by arguing that EU trade policy can be a powerful incentive in driving the sustainability of the international sugarcane sector by ensuring fair access to the world's largest single market for sustainable raw sugarcane. This would not only rebalance the EU sugar market as such, but also encourage sustainable sugarcane production in less developed regions in the world. In a free market, demand is the ultimate driver of change. Therefore, the EU must leverage its market power and effectuate change today.

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# SUGARCANE: ANATOMY OF A GLOBAL COMMODITY

## Sugarcane – A versatile crop

Sugar has long made the headlines around the world. Feared by some, craved by most, misunderstood by many, sugar comes in a number of forms, the best known of which is *sucrose*, or *table sugar*. Sucrose is a carbohydrate that consists of glucose bound to fructose in a 1:1 ratio.[1]

Plants produce sucrose naturally through photosynthesis, the process by which they transform the sun's energy into food. For human consumption, sucrose is extracted and refined from either sugarcane or sugar beet, which are the crops that have the largest quantities of the nutrient, making them the most efficient sources for sugar extraction.[2] Currently, global sugar production amounts to approximately 180 million tonnes,[3] 80% of which comes from sugarcane and the other 20% from sugar beet.[4]

The purification process is similar for both sugarcane and sugar beet, resulting in the same pure sucrose. Nonetheless, there are important differences between the two crops: while sugarcane is a perennial grass that grows in tropical climates, sugar beet is a root crop which flourishes in cooler weather conditions characterised by rich soils.[5]

Sugar beet (*Beta vulgaris*) is believed to have originated in Asia. It is a biennial crop with a relatively long growing period that can range from 140 to 200 days.[6] The European continent concentrates almost 70% of the global production of sugar beet, with Russia being the single largest producer.[7] The EU as a bloc accounts for close to 50% of the world production of beet sugar, with France, Germany, the Netherlands, Belgium and Poland being the largest producers.[8]

1 Mary E. Gearing, "Natural and Added Sugars: Two Sides of the Same Coin", Harvard University, October 5, 2015. http://sitn.hms.harvard.edu/flash/2015/natural-and-added-sugars-two-sides-of-the-same-coin/.
2 "What Is Sugar?" The Sugar Association, accessed August 4, 2020, https://www.sugar.org/sugar/what-is-sugar/.
3 "World Sugar Market and Trade", Canadian Sugar Institute, accessed August 10, 2020, https://sugar.ca/International-Trade/Global-Sugar-Trade-(WTO).aspx#:~:text=World%20Sugar%20Market%20and%20Trade,Thailand%20(see%20table%20below).&text=World%20beet%20sugar%20production%20continues,Russia%20and%20the%20United%20States.
4 "Sugar – Overview", European Commission, accessed August 12, 2020, https://ec.europa.eu/info/food-farming-fisheries/plants-and-plant-products/plant-products/sugar_en#latest
5 "Where in the United States Does Real Sugar Come From?" The Sugar Association, accessed August 4, 2020, https://www.sugar.org/sugar/farm-to-table/
6 "Sugarbeet", Databases and Software – Crop Information, Food and Agriculture Organization of the United Nations, accessed August 4, 2020, http://www.fao.org/land-water/databases-and-software/crop-information/sugarbeet/en/
7 "FAOSTAT, Crop data – Visualisation tool", FAO, Accessed August 4, 2020, http://www.fao.org/faostat/en/#data.
8 "Sugar Overview". European Commission. Accessed August 12, 2020.

In contrast, sugarcane (*Saccarum officinarum*) is grown in warmer climates, typically located between 35oN and S of the equator.[9] The crop flourishes under a long, warm growing season (15-16 months) characterised by a high incidence of radiation and moisture, followed by a dry, sunny and fairly cool harvesting period. Global production of sugarcane is currently concentrated in Latin America and Asia.

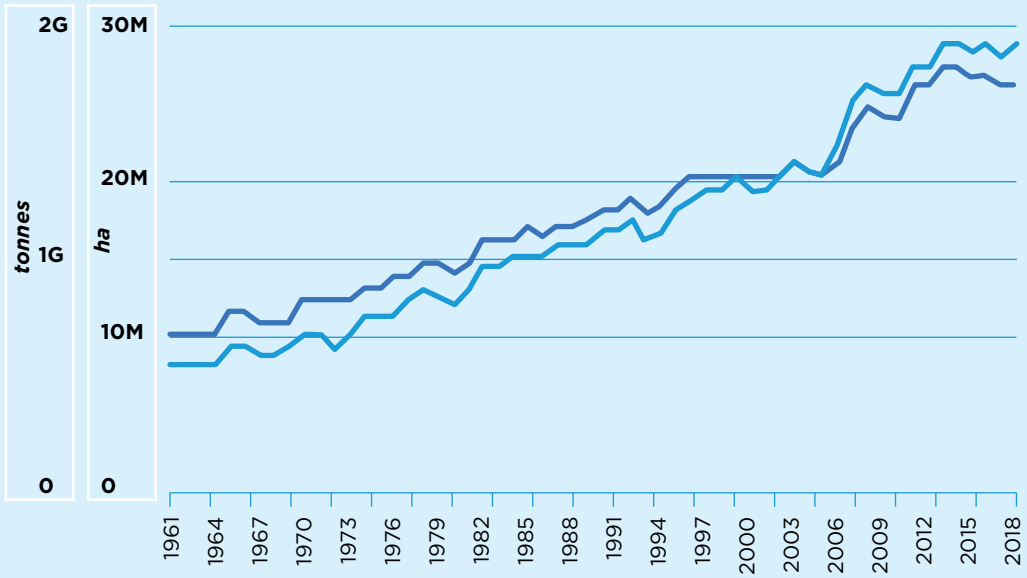
## A booming industry

According to the Food and Agriculture Organization of the United Nations (FAO), sugarcane is currently the third most-produced commodity in the world, trailing behind cereals and milled cereals. The latest data shows that global production of sugarcane has grown steadily over the past six decades, going from less than 500 million tonnes in 1961, to more than 1.9 billion tonnes in 2018; harvested across 26 million hectares around the world.[10]

9 "Sugarcane", Databases and Software – Crop Information, Food and Agriculture Organization of the United Nations, accessed August 4, 2020, http://www.fao.org/land-water/databases-and-software/crop-information/sugarcane/en/.

10 FAOSTAT, Crop data – Visualisation tool", FAO, Accessed August 4, 2020, http://www.fao.org/faostat/en/#data.

## PRODUCTION/YIELD QUANTITIES OF SUGAR CANE IN WORLD + (TOTAL) 1961 - 2018

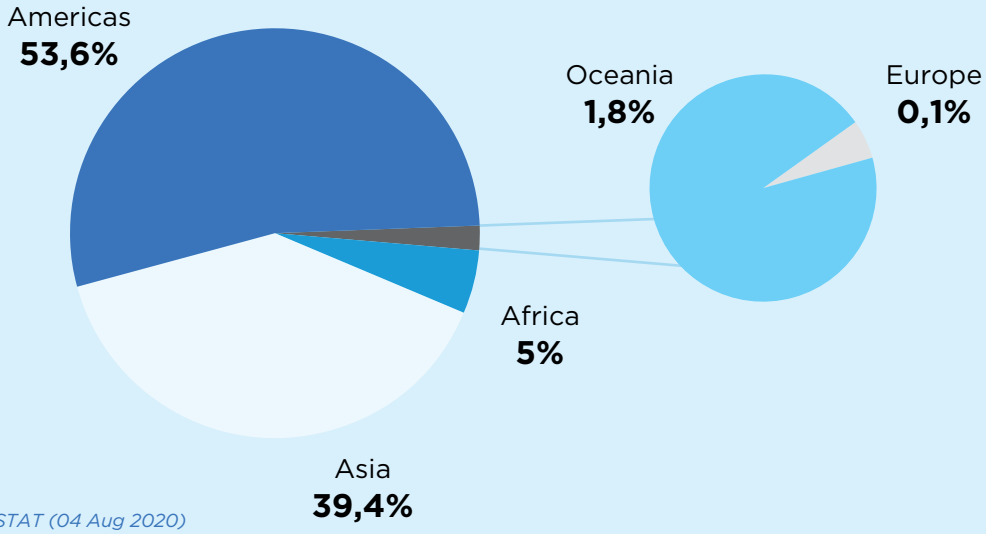



Source: FAOSTAT (04 Aug 2020)

**Figure 1.** *Production/ Yield of sugarcane in the World (1961-2018).*

As shown in Figure 2, the Americas account for more than half of the global production of sugarcane, whereas Asia accounts for an additional 40% of the total production.

## GLOBAL SUGARCANE PRODUCTION BY REGION IN 2018.




Source: FAOSTAT (04 Aug 2020)

**Figure 2.** *Global sugarcane production by region in 2018.*

At country-level, Brazil is the single largest producer of sugarcane. In 2018 alone, the South American nation produced almost 747 million tonnes of sugarcane, equivalent to 37% of the total global production of the crop.

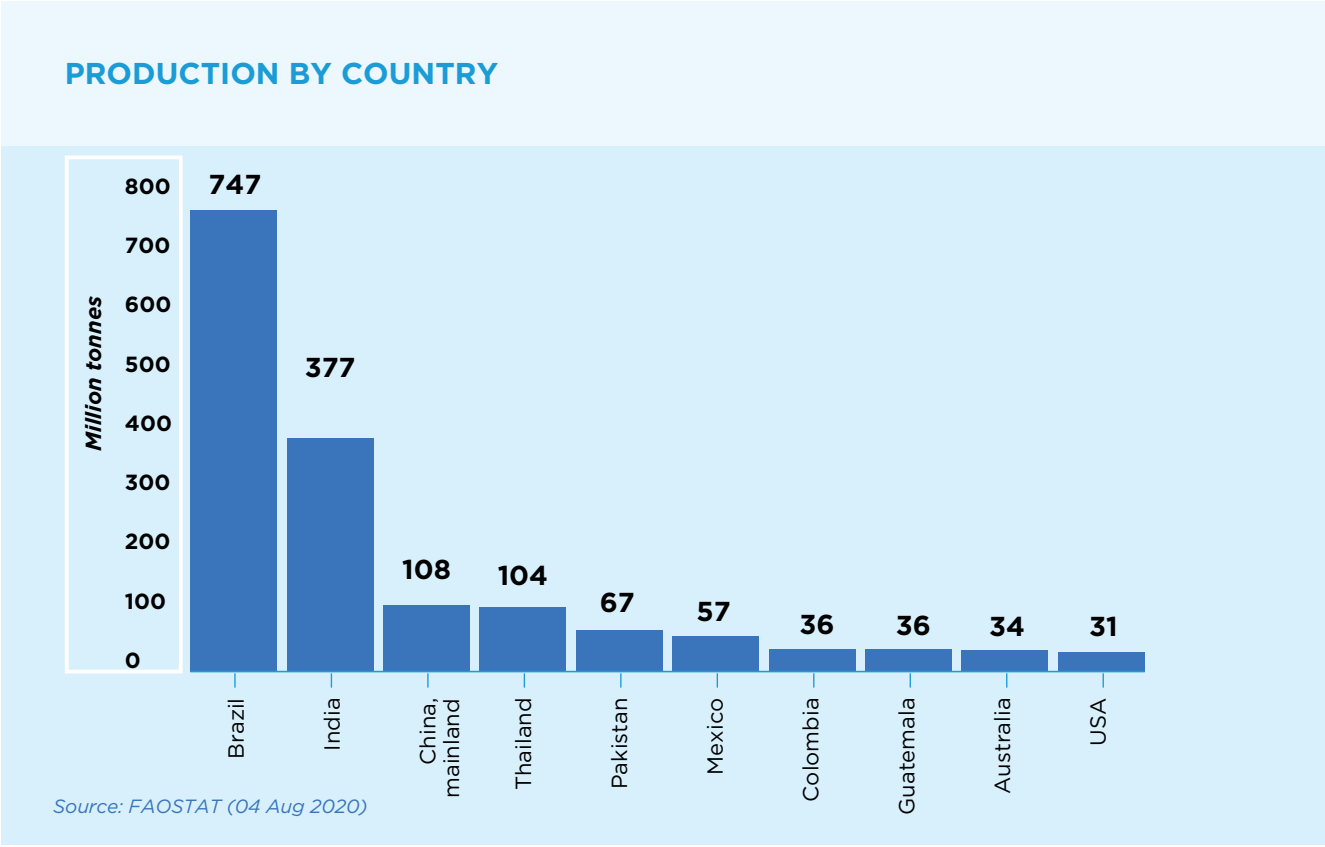



**Figure 3.** *Sugarcane production by country in 2018.*

# The sugarcane value chain

Several stakeholders are involved in the sugarcane value chain: from the agricultural production stage to the processing of the crop, the transport and manufacturing of sugar, all the way to its final retail and consumption.[11][12]

**1. Agricultural production:** this part of the chain includes the sugarcane plantations and farmers, who grow and harvest the crop either by hand or mechanically. Since harvested sugarcane quickly loses its sugar content once cut, it must be transported immediately to the sugar mill, which may be owned by the farmers themselves or operate independently.

11 "Sugarcane: An Investor Brief on Impacts that Drive Business Risks", 4, Ceres, accessed August 20, 2020, https://engagethechain.org/sites/default/files/commodity/Ceres_EngageTheChain_Sugarcane.pdf.

12 "About cane: Supply chain", European Sugar Refineries Association, accessed August 30, 2020, https://www.sugarrefineries.eu/about-cane/supply-chain.

**2. Raw sugar extraction (milling):** the extraction of juice from cane takes place in sugar mills, where the sugarcane is crushed with heavy rollers to retrieve the juice that contains the sucrose. When used for sugar production, the juice is then filtered to remove impurities before being crystallised. The result is raw sugar with a golden colour that still requires further refining before it can be used in the food chain. Alternatively, the juice can be delivered to a fermentation tank to generate ethanol.[13]

**3. Transportation and trade:** the resulting raw sugar is then transported in bulk to refineries for further processing. When shipped to other regions of the world, companies such as Bunge[14], Cargill[15] and Czarnikow[16] move unrefined sugar in large quantities across borders.

**4. Refining:** the refineries remove any remaining impurities and colour from the sugar by washing and filtering the raw product. Once refined, the sugar is crystallised, dried and packed; leaving it ready to be consumed. Refineries produce a wide range of sugar products, including different crystal sizes, colours, and forms, such as liquid sugar.

**5. Retail:** sugar is then ready to be delivered to consumers. The final product can be found in a variety of forms: from packages for individual consumption available at supermarkets, to bulk packaging for commercial use in the food sector and other forms of industrial use.

# The European sugarcane market

## Consumption

Sugar consumption in the EU has been stable in recent years at ca. 18.6 million tonnes (MT) (see table 1). Food processors have reduced the sugar content in their products through reformulation, in response to pressure from consumers and health authorities. The rising trend of lower *per capita* sugar consumption has, however, been so far offset by the increase in population.

A different picture emerges, however, when considering the long term. According to the FAO, *per capita* sugar consumption in Europe will continue to decline as a result of changing consumer habits regarding sugar intake.[17] The European Commission estimates an annual decrease of 0.8% in human sugar consumption between 2019 and 2030 as the consumption of soft drinks and confectionery

13 Betty Rook, "The Sugar Series: Ethanol", Czarnikow, April 14, 2020, https://www.czarnikow.com/product/sugar/the-sugar-series-ethanol.
14 "Who we are", Bunge, accessed September 11, 2020, https://www.bunge.com/.
15 "About Cargill", Cargill, accessed September 11, 2020, https://www.cargill.com/about.
16 "About us", Czarnikow, accessed September 11, 2020, https://www.czarnikow.com/about.
17 "OECD-FAO Agricultural Outlook 2020-2029", OECD-FAO, accessed October 23, http://www.fao.org/3/ca8861en/CA8861EN.pdf

continues to follow a declining trend.[18] According to the European Commission, demand for other sugar uses would be insufficient to offset this decline, as human consumption accounts for approximately 85% of sugar uses.

**TRENDS IN EU SUGAR CONSUMPTION (MILLION TONNES).**

| | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 (f) | + % 17/18-18/19 |
|---|---|---|---|---|---|---|
| **Consumption** | 18.6 | 17.7 | 19.0 | 18.6 | 18.6 | -2.1% |
| Human | 16.6 | 16.2 | 17.3 | 16.8 | 16.8 | -2.9% |
| Industrial | 1.9 | 1.5 | 1.8 | 1.8 | 1.8 | 0 |
| Ethanol | 1.1 | 0.8 | 0.9 | 1.0 | 1.0 | +11.1% |

**Table 1.** *Trends in EU sugar consumption (million tonnes).*

*Source: EC, 'Short-term outlook for EU agricultural markets in 2019 and 2020', Autumn 2019[19]*

## Production – the abolition of sugar quotas

The viability of the cane refining sector is dependent on the sugar refining margin, which is the price difference between raw and white sugar. The abolition of sugar quotas in the EU in 2017 triggered a severe crisis in the European cane refining sector, as it led to freefalling prices that threatened the survival of all but the biggest producers. EU beet growers, having been insulated from the supply and demand economics for decades, overproduced massively in the first quota-free year, placing too much sugar on an adjusting market that was also challenged by a global surplus.

The Commission's autumn 2020 agricultural outlook report suggests EU sugar production is adjusting to the new post sugar quota abolition market realities.[19] Over the 2019/20 marketing year, the EU sugar production was down 1.3%, with a 2.1% decline projected for 2020/21.[20] At the same time, prices for white sugar within the Community have also started to increase, as shown in Figure 5.

18 "EU Agricultural Outlook: For Markets and Income 2019 – 2030", European Commission, accessed October 23, https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/agricultural-outlook-2019-report_en.pdf.

19 "Short-term outlook for EU agricultural markets on 2020 - Autumn 2020" European Commission, accessed November 19, 2020. https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/short-term-outlook-autumn-2020_en.pdf

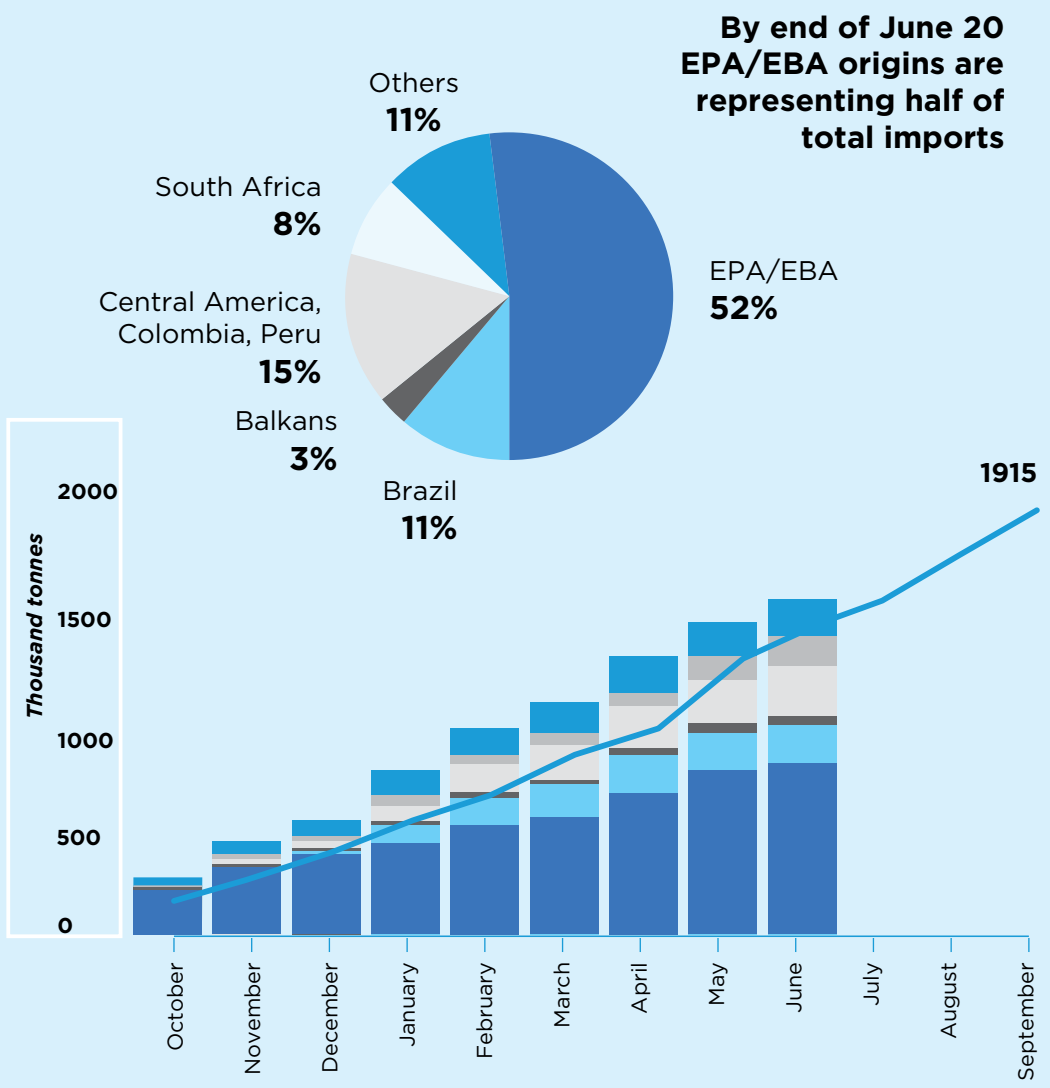
20 Ibid.

## *Sugar Trade Regime*

Imports of raw sugar for refining purposes occur under preferential arrangements and tariff rate quotas (TRQs). This system allows lower tariffs to be levied on imports below a set quantity (the in-quota tariff rate). Higher, usually prohibitive, tariffs are applied to imports above this level.

As shown in Figure 4, the bulk of EU raw sugar imports comes from African-Caribbean-Pacific countries (ACP) and least developed countries (LDC) through

**EU SUGAR MAIN IMPORTS ORIGINS IN 2019-2020**
**compared to EU total imports in 2018-2019 (EU+UK from 1/2/20)**




Source: EUROSTAT

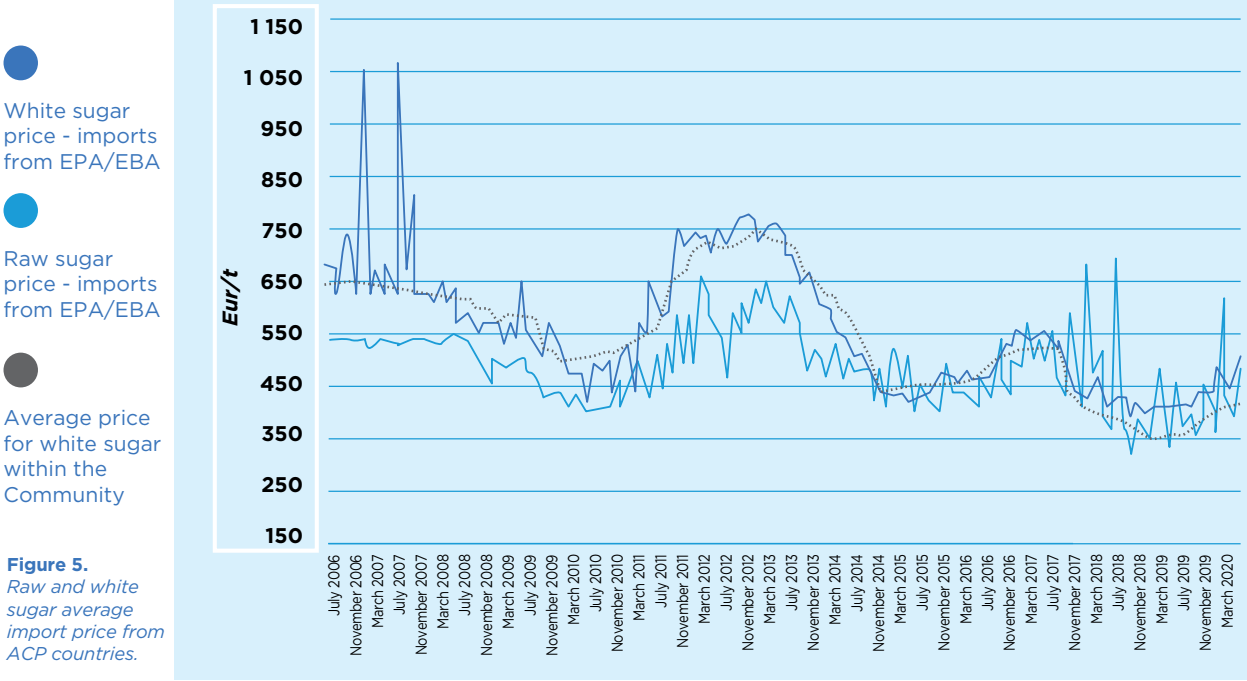
**Figure 4.** *EU Total imports*

the Everything But Arms (EBA) agreement and Economic Partnership Agreements (EPA).

These countries are not among the most competitive sugarcane producers, and their level of exports to the EU is largely a reflection of the preference margins they enjoy due to the trade agreements. ACP/EBA partners have historically supplied the EU market with raw sugar of above-average price, a system made possible as a result of the quotas regime.

In practical terms, the EU's current trade regime for raw sugar translates into artificially high costs for European sugarcane refiners, who must source their raw material from the global market.

## EPA / EBA AVERAGE IMPORT PRICE




White sugar price - imports from EPA/EBA

Raw sugar price - imports from EPA/EBA

Average price for white sugar within the Community

**Figure 5.** *Raw and white sugar average import price from ACP countries.*

*EU27 + UK from 1/2/2020*

In the post-quota era, ACP/EBA partners' preference margins are being eroded as EU prices fall and inch closer to global levels (Figure 5). Imports dropped drastically following the abolition of quotas and the drop in white sugar prices. They have since gradually increased and reached 1.9 million tonnes overall in 2018/2019 – an increase of over 46% compared to the previous year. More than half of these imports were attributed to ACP/EBA partners. The volumes of EU sugar imports are projected to continue to recover from the low levels in the 2017/18 year. Nonetheless, the pace of the recovery is still slow: while imports during the 2019/20 year were 54% above the level in the 2017/18 season, they represented only 69% of the level attained in the 2015/16 season (Figure 4).

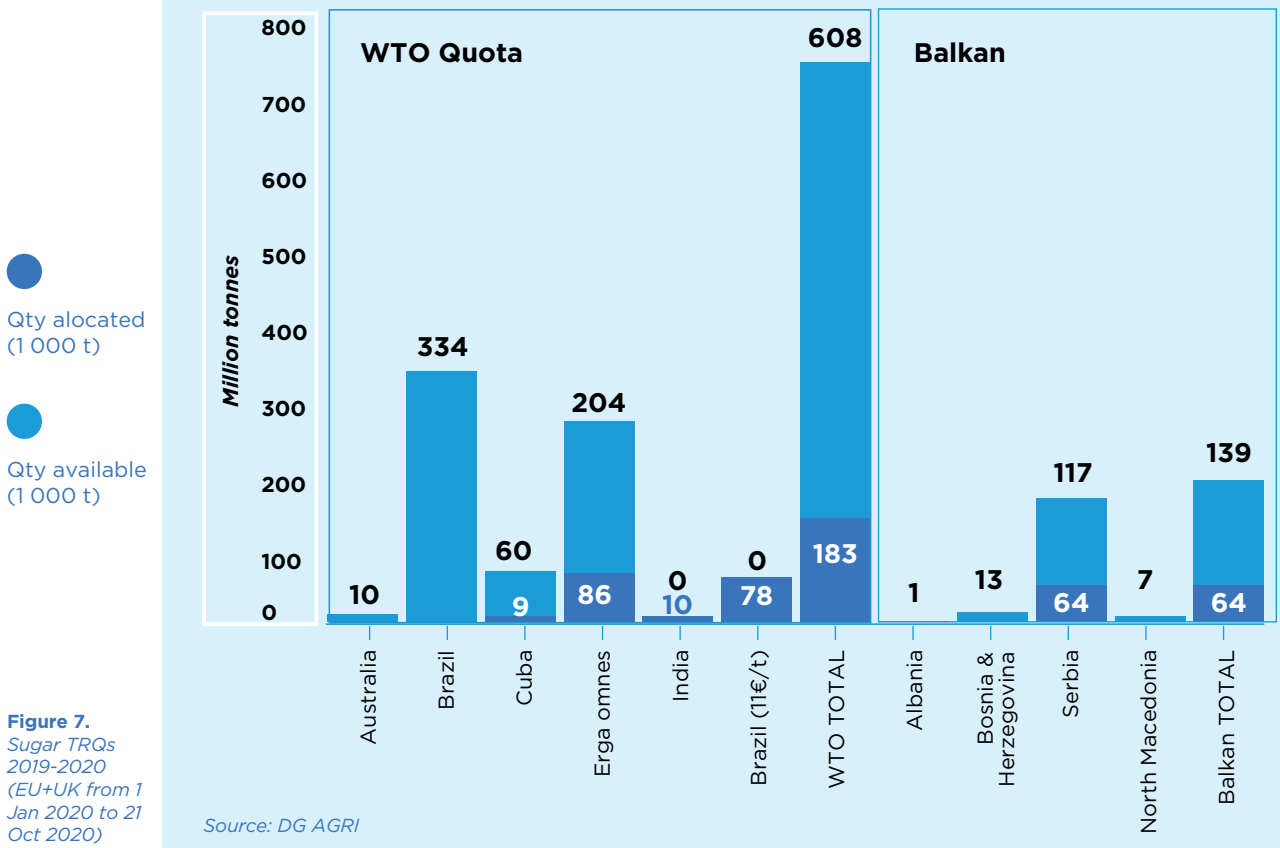
Following the conclusion of free trade agreements with the countries of Central America and the Andean Community in 2012, these also became important providers of EU raw sugar, albeit restricted by TRQs. Similarly, South Africa, which enjoys a TRQ of 150,000 tonnes under the SADC-EU EPA, also became a relevant supplier of raw sugarcane to the EU.

Among those countries without FTAs, imports also came from two important producers under the WTO quota: Brazil and Cuba. However, in these cases, imported raw sugar is subject to an import duty of EUR 98/tn. Although these were profitable sources of raw sugar for EU refiners in the pre-quota equilibrium, the low prices for white sugar in the EU today mean that the import duty substantially reduces the commercial viability of such imports by refiners.

As a result, very little raw sugar can enter the EU market at world prices. Such imbalance makes it virtually impossible for the market to find a real balance after the quota abolition. The distributional effects of such a trade regime have weighted heavily and unfairly on sugarcane refiners, whose profitability has been dramatically reduced.

Well-designed FTAs, nonetheless, hold potential for bringing about a more bal-

## SUGAR TRQS 2019-2020




Source: DG AGRI

**Figure 7.** *Sugar TRQs 2019-2020 (EU+UK from 1 Jan 2020 to 21 Oct 2020)*

anced sugar market. The next section explores in more detail two of the EU's trade partners with the most significant potential in offering the EU cane refining sector a chance of sourcing competitively in the future: Mercosur and Australia.

An import duty of EUR 98/tn on TRQs for Brazil, Australia and Cuba means access is rendered inviable for EU refiners. These quotas remain largely unfulfilled.

## Mercosur

On 28 June 2019, the European Union and the Mercosur states (Argentina, Brazil Paraguay and Uruguay) concluded the negotiations of the EU-Mercosur trade agreement. The EU-Mercosur agreement has the potential to become the EU's most important trade agreement; several times larger than that of the European Union and Canada (CETA). Mercosur, one of the world's most highly protected markets, would gradually eliminate duties on over 93% of tariff lines in the first ten years of implementation, with a longer liberalization of up to 15 years for more sensitive products. In parallel, the EU would liberalise 82% of its agricultural imports. The agreement would also grant the EU first-mover advantages, as the deal would be the first major FTA signed by the South American bloc.

Tariff-rate quotas will be applied for EU-sensitive products such as beef, poultry, pig meat, sugar, ethanol, rice, honey, and sweetcorn. Further reciprocal TRQs will be opened by both sides and cover imports of cheese, milk powders and infant formula.

Brazil currently accesses the EU market via a tariff quota allocated under the WTO schedule, with an in-quota duty. With the Mercosur agreement, 180,000 tonnes of sugar for refining would be allowed into the EU duty-free under this existing quota. We highlight that no new sugar quota would be created for Brazil in the agreement. In addition, the agreed amounts cover a volume accounting for 1% of EU sugar consumption.[21]

Fairness should remain a guiding principle for the EU's position on sugar trade. As a sector, sugarcane refiners simply ask for a level playing field with our beet sugar colleagues, who have seen the decline in white sugar prices go hand-in-hand with reduced costs for sugar beet. The EU-Mercosur agreement would allow EU refiners to partially regain their profitability margins, without posing any threats to EU beet sugar production, as imports are quantitatively limited by the existing TRQ.

Access to producer markets such as Brazil is key today and will become even more so in the future. According to FAO projections for the next decade (2019-29), global sugar production is projected to expand by 15%, with 96% of the

21 "EU-Mercosur Trade Agreement: Creating Opportunities While Respecting the Interests of European Farmers", European Commission, accessed October 23, 2020, https://trade.ec.europa.eu/doclib/docs/2019/july/tradoc_158059.pdf.

projected increase originating from developing countries. Brazil's Renovabio, a federal programme to curb carbon emissions, is set to increase the consumption of ethanol in the country, thereby benefiting the sugarcane industry. Brazil is projected to maintain its position as the world's largest sugar producer and to account for about 18% of the world's sugar output by 2029.

## Australia

The negotiations of the EU-Australia FTA were launched on 18 June 2018. Australia is a leading global exporter of sugar, and its cane growing industry is a model of market-orientation and sustainability. Sugarcane growers – mostly family farmers based in the state of Queensland – operate independently of any price supports, import tariffs, quotas, or other forms of protection. It is in effect the most trade-exposed sugar sector in the world.

As with Brazil, access to raw cane sugar from Australia would take place via a TRQ to safeguard the EU's internal market. In its 2016 study on the cumulative impact of FTAs, the European Commission implicitly acknowledged that Australian sugar imports – even under an ambitious scenario of full liberalisation – would not cause any harm to the EU sugar sector. The impact assessment of the EU-Australia FTA further acknowledged that imports would remain at a manageable level, ensuring access to Australian raw sugar for the EU sugarcane sector, and supporting a level playing field for the European sugar sector in general.

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# SUSTAINABLE SUGARCANE – A PROGRESSIVE TREND

Despite the economic value generated by agricultural commodities, the environmental impact of large-scale crop-farming can be significant. According to data from 2010, global food supply chains released approximately 13.7 billion metric tonnes of carbon dioxide (CO2) equivalent, amounting to 26% of the total GHG emissions produced by human activity in that year.[22]

Like in many other sectors, the sugar and sugar-bioproduct industries face increasing pressure to reduce their environmental impact and promote social values.[23] This is a challenge that sugarcane producers, millers, traders, and refiners, have fully embraced.

Over the past two decades, a number of initiatives have pushed forward sustainable production and milling in different corners of the world. According to the International Trade Center, there are more than 40 voluntary sustainability standards applicable to sugar.[24] Examples that stand out in their reach include Bonsucro, the VIVE Programme, Fair Trade, and the International Sustainability & Carbon Certification. A detailed overview of these schemes and the results achieved can be found in Annex.

The sugarcane industry comprises a complex system with more than 1,600 enterprises operating more than 2,500 mills and refineries in over 100 countries.[25] Each operator along the supply chain bears a unique responsibility, in view of the common goal of enhanced sustainability. Farmers, mills, refiners, traders, and buyers must all work for the continuous improvement of sustainability and traceability along the supply chain.

At producer and processing level, more than 130 mills and farms are Bonsucro-certified,[26] more than 660 sugarcane growers implement Smartcane best management practices in Australia,[27] and about 62,000 small-scale sugarcane growers hold Fairtrade certifications in 17 countries.[28]

22 Nicolas Viart, Rafael Seixos, Liz Foggitt, Chen-Wei Chang and Katherine Earley, "Bonsucro Outcome Report 2019", 43, accessed October 23, 2020, http://www.bonsucro.com/wp-content/uploads/2020/06/Bonsucro-Outcome-Report-2019.pdf.

23 Benites-Lazaro, Lira Luz, Leandro Giatti, and Angelica Giarolla, "Sustainability and governance of sugarcane ethanol companies in Brazil: Topic modeling analysis of CSR reporting." Journal of Cleaner Production 197 (2018): 583-591.

24 "The State of Sustainable Markets 2018: Statistics and Emerging Trends", International Trade Centre, accessed October 23, 2020, https://www.intracen.org/uploadedFiles/intracenorg/Content/Publications/Sustainibility%202018%20layout-FIN-web-v1.pdf.

25 Jenkins, Beth, Piya Baptista, and Marli Porth. "Collaborating for Change in Sugar Production: Building Blocks for Sustainability at Scale." Cambridge, MA: The CSR Initiative at the Harvard Kennedy School and Business Fights Poverty, 2015.

26 "Our Members", Bonsucro, accessed September 4, 2020 https://www.bonsucro.com/certified-members-3/

27 Jenkins, Beth, Piya Baptista, and Marli Porth. "Collaborating for Change in Sugar Production: Building Blocks for Sustainability at Scale." Cambridge, MA: The CSR Initiative at the Harvard Kennedy School and Business Fights Poverty, 2015.

28 Ibidem

Major industry associations such as CANEGROWERS in Australia, SASA in South Africa, and the Brazilian Sugarcane Industry Association (UNICA) in Brazil have played a crucial role in advocating for sustainable practices. Through its campaigns and awareness efforts, UNICA, for example, signed the Agro-Environmental Protocol in collaboration with the Brazilian government, which defined a set of requirements to be followed on a voluntary basis by processors requesting eligibility for an environmental compliance certificate.[29] Since 2007, 160 sugarcane mills have voluntarily implemented the protocol, accounting for 85% of the total number of processing plants in the country.

When it comes to the global buyers, big consumer brands have signed up to sustainable sugar sourcing commitments, signalling the shift. Six of the world's top ten[30] food and beverage companies–General Mills,[31] Kellogg,[32] Nestlé,[33] PepsiCo,[34] The Coca-Cola Company,[35] and Unilever[36] – have explicit quantitative sustainable sourcing targets that apply to sugar; seven of them –General Mills, Mars, Mondelēz, Nestlé, PepsiCo, The Coca-Cola Company, and Unilever– are Bonsucro members;[37] and an additional one, Danone, has made important commitments to sustainable agriculture and raw material sourcing.[38]

In addition to the impact that these leading companies have on spreading sustainable practices and standard setting at the international level, food and beverage producers and retailers outside the global top ten ranking have also made significant commitments to sustainability. For example, Tate & Lyle Sugars, a company with a long history of sugarcane refining, is the biggest buyer of Fairtrade sugar in the world and since 2008, has paid over $62 million in Fairtrade premiums to support smallholder farming communities around the world.[39] Ben & Jerry's[40], Sainsbury's,[41] and Waitrose,[42] have all made similar commitments to sourcing Fairtrade sugar.

29 Carolina de Oliveira Jordão and Evandro Mateus Moretto, "The environmental vulnerability and the territorial planning of the sugarcane cultivation," Ambiente & Sociedade 18, no. 1, (2015). 75-92.
30 Corinna Hawkes and Sophia Murphy, "An overview of global food trade," Trade, food, diet and health: Perspectives and policy options, 16, (2010). 32.
31 "Sustainability: Sustainable sourcing", General Mills, accessed September 4, 2020, https://www.generalmills.com/en/Responsibility/Sustainability/sustainable-sourcing.
32 "Sourcing Responsibility", Kellogg's, accessed September 4, 2020, http://crreport.kelloggcompany.com/sourcing-responsibly.
33 "Raw Materials: Sugar", Nestle, accessed September 4, 2020. https://www.nestle.com/csv/raw-materials/sugar.
34 "Sustainability: Goals and Progress", PepsiCo, accessed September 4, 2020, https://www.pepsico.com/sustainability/goals-and-progress.
35 "2019 Business and Sustainability Report", The Coca Cola Company, accessed September 4, 2020, https://www.coca-colacompany.com/content/dam/journey/us/en/reports/coca-cola-business-and-sustainability-report-2019.pdf.
36 "Our Approach to Sustainable Sourcing: Sustainable Cocoa and Sugar", Unilever, accessed September 4, 2020, https://www.unilever.com/sustainable-living/reducing-environmental-impact/sustainable-sourcing/our-approach-to-sustainable-sourcing/sustainable-cocoa-and-sugar/.
37 "Our Members", Bonsucro, accessed September 4, 2020, http://www.bonsucro.com/bonsucro-members-2/
38 "2018 Nature Scorecard: Danone's Environmental Results", Danone, accessed September 4, 2020, https://www.danone.com/content/dam/danone-corp/danone-com/about-us-impact/policies-and-commitments/en/2019/2018%20Danone%20Nature%20Scorecard.pdf.
39 "Fairtrade", Tate & Lyle, accessed September 4, 2020, https://www.wearetateandlylesugars.com/fairtrade
40 "Values: Issues We Care About: Fairtrade", Ben & Jerry's, accessed September 4, 2020, https://www.benjerry.com/values/issues-we-care-about/fairtrade.
41 "Sainsbury's unveils ambitious new sourcing approach to give greater support to farmers" Sainsbury's, accessed September 4, 2020 https://www.about.sainsburys.co.uk/news/latest-news/2017/23-05-2017.
42 "Fairtrade: Fairtrade Sugar", Waitrose, accessed September 4, 2020, https://www.waitrose.com/home/inspiration/about_waitrose/the_waitrose_way/fairtrade/fairtrade-sugar.html.

# Sugarcane environmental legislation: Brazil and Australia

At the national level, governments have also taken important steps in favour of sustainability in the sugarcane value chain. Brazil and Australia – both strategic trading partners for the EU and important sugarcane-producing countries – have implemented legislation aiming to ensure the sustainability of the crop.

## *Brazil*

The Brazilian Forest Code, approved in 2012, provides the main regulatory framework for agriculture in Brazil, including sugarcane. It establishes strict obligations for producers in terms of environmental protection. Requirements under the Forest Code include:

- The mandatory registration of all rural properties in the Rural Environmental Registry (CAR), an electronic registry containing all relevant information about the environmental characteristics and areas of use of properties and rural possessions;[43]

43 The CAR includes the data of the owner or direct responsible for the rural property; the georeferenced plant of the perimeter of the property; the demarcation of areas of social interest and public utility areas; location information of the remnants of native vegetation; permanent preservation areas, restricted use areas, etc. The information registered from all rural properties across the country is received, integrated and managed by the Rural Environmental Registration System (SICAR). The registration of all rural properties in Brazil is mandatory. Irregular properties are subject to fines and their owners are prevented from accessing credit in financial institutions.

- The maintenance of native vegetation in Permanent Preservation Areas (APP), sensitive areas that must be preserved depending on their location, such as rivers, springs, hilltops and very steep areas;

- The maintenance of native vegetation in a percentage of the rural property, called Legal Reserve (RL), which varies between 20 to 80% according to the region in which the property is located.

Brazilian sugarcane farmers are thus required to preserve native vegetation on their own rural property in order to be compliant with environmental law. This requirement ranges from 80% of their property in forest areas to 35% in *cerrado* areas (Brazilian savannah), and 20% in general fields. Monitoring and enforcement of such rules is strictly carried out with the use of wall-to-wall satellite-based monitoring.[44] This system allows for the consistent monitoring of land use change in Brazil.[45]

The CAR registry permits the mapping of properties for environmental registration. Landowners' registration in the CAR allows them to demonstrate compliance with environmental regulations while making sure that public authorities can monitor land-use. Farmers that are not able to prove their compliance with the Forest Code can be penalised in the form of fines and by being denied access to credit from financial institutions.

Finally, legal compliance with the Forest Code is one of the sustainability pillars of Bonsucro for Brazilian mills. To date, Bonsucro has certified 40 sugarcane mills representing 818,000 hectares in Brazil (or 7% of the sector).[46] WWF, a founding member of Bonsucro, is working with other institutions to develop spatial maps of priority areas in the Atlantic Forest for Smart Compensation. WWF, the *Banco do Brasil* and other institutions are identifying and sharing best restoration practices with the sector.[47]

## Australia

In Australia, nearly 95% of sugarcane is grown in Queensland and about five per cent in northern New South Wales, along 2,100 km of coastline between Mossman in far north Queensland and Grafton in northern New South Wales.[48]

44 Alexandra Tyukavina et al. Types and rates of forest disturbance in Brazilian legal Amazon, 2000–2013. Sci. Adv. 3, 1601047 (2017). Accessed November 19, 2020. https://pubmed.ncbi.nlm.nih.gov/28439536/

45 Rolf Simoes, Michelle C. A. Picoli, Gilberto Camara, Adeline Maciel, Lorena Santos, Pedro R. Andrade, Alber Sánchez, Karine Ferreira & Alexandre Carvalho, "Land use and cover maps for Mato Grosso State in Brazil from 2001 to 2017," Scientific Data 7, no. 34 (January 2020), https://doi.org/10.1038/s41597-020-0371-4.

46 "Brazil's new Forest Code: A guide for decision-makers in supply chains and governments," World Wildlife Fund, accessed October 23, 2020, http://assets.wwf.org.uk/downloads/wwf_brazils_new_forest_code_guide_1.pdf.

47 Ibidem

48 "Sugar: Overview," Australian Government: Department of Agriculture, Water and the Environment, accessed October 23, 2020, https://www.agriculture.gov.au/ag-farm-food/crops/sugar#senate-inquiry-into-sugar-marketing-arrangements.

It is known that rainfall, leaching and irrigation run-off can wash nutrients and sediment into waterways and coastal wetlands which flow to the Great Barrier Reef. On 1 December 2019, the Queensland Government started implementing reef protection regulations, which will be rolled out over the course of three years.

These minimum practice agricultural standards for sugarcane production focus on retaining nitrogen, phosphorus, and sediment on-farm to minimise run-off and improve water quality. The Queensland Government has committed to keeping these standards unchanged for the next five years.[49]

Under the regulations, all sugarcane producers in the Australian regions of Wet Tropics, Burdekin, Mackay Whitsunday, Fitzroy, and Burnett Mary are required to:

- Keep general records from 1 December 2019;
- Comply with minimum practice agricultural standards, as this requirement is applied to each region over the next three years;
- Implement a farm nitrogen and phosphorus budget, as this requirement is applied to each region over the next three years from 2021;
- Obtain an environmental authority (permit) if commencing new or expanded cropping or horticulture activities on five hectares or more that do not meet the cropping history test in the Cape York, Wet Tropics, Burdekin, Mackay Whitsunday, Fitzroy and Burnett Mary regions from 1 June 2021 (deferred from 1 June 2020).

49 "Reef protection regulations in the Great Barrier Reef regions: Sugarcane requirements," Queensland Reef Water Quality Program, accessed October 23, 2020, https://www.qld.gov.au/__data/assets/pdf_file/0018/113490/factsheet-sugarcane-all-regions.pdf.

# Socio-economic impact

For many countries, sugarcane is one of the most important sources of employment and national income.[50] Between 2000 and 2011, the world trade in raw sugar rose from $10.2bn to $47bn, with around $33.5bn of exports being sourced from developing countries. [51]

In Australia, the sector accounts for 22,657 direct and indirect full-time equivalent jobs were supported and represents 1.2% of Queensland's Gross State Product.[52] The socio-economic impact is even greater in developing countries, where a large part of sugarcane production takes place.

Substantial progress has been achieved in improving the labour conditions in sugarcane cultivation, harvesting and processing, which in the past have been associated with violations of labour, environmental and human rights.[53]

In countries such as Brazil –one of the world's largest sugarcane producers– the operation of sugarcane plantations, mills and processing plants constitutes a driving force of the national economy, as measured by employment, taxes and GDP indicators.[54] Furthermore, it has been estimated that the expansion of sugarcane ethanol production in Brazil in 2030 could increase the national GDP by 2.6 billion USD and create 53,000 full-time jobs.[55]

Currently, Brazil has more than 400 sugarcane processing plants in operation.[56] It is estimated that the Brazilian sugarcane industry employs almost 800,000 people,[57] with more than 350 municipalities in the country basing their economy on the cultivation of sugarcane. Different studies have demonstrated the positive long-term socio-economic impacts of sugarcane industry in the country: the rising economic importance of the sugarcane sector in Brazil (driven by the increasing demand of both cane sugar and sugarcane ethanol) has led to job creation, higher income, and overall improvements in working conditions and corporate social responsibility in the sugarcane in-

50 "Fairtrade and Sugar", Fairtrade, accessed September 4, 2020 https://www.fairtrade.org.uk/wp-content/uploads/legacy/Fairtrade-and-Sugar-Briefing-Jan13.pdf
51 Ibidem
52 "Interpreting the Lawrence Consulting Report 2018", Australian Sugar Milling Council, accessed November 19, 2020. https://asmc.com.au/wp-content/uploads/2019/01/Interpretation-Summary.pdf
53 Jesus F. Deberson, J. F. Genevieve, and Ben Richardson, "Violations of Labour and Environmental Law by Sugarcane Mills in São Paulo State, Brazil," Ethical Sugar, accessed October 23, 2020, https://ethicalsugar.files.wordpress.com/2016/05/ethical-sugar-violations-of-labour-and-environmental-law-by-sugarcane-mills-in-sc3a3o-paulo-state-brazil.pdf. Natasha Schwarzbach, and Ben Richardson. "A Bitter Harvest: Child Labour In Sugarcane Agriculture And The Role Of Certification Systems," UC Davis J. Int'l L. & Pol'y 21, (2014): 99.
54 Marnix LJ Brinkman, Marcelo P. da Cunha, Sanne Heijnen, Birka Wicke, Joaquim JM Guilhoto, Arnaldo Walter, André PC Faaij, and Floor van der Hilst. "Interregional assessment of socio-economic effects of sugarcane ethanol production in Brazil." Renewable and sustainable energy reviews 88, (2018): 347-362.
55 Ibidem
56 Ibidem
57 "Homepage", União da Indústria de Cana-de-Açúcar (UNICA), accessed October 23, 2020, https://unica.com.br/.

dustry, as well as better scores in the Human Development Index, including the education indicator.[58] [59]

The sugar-energy chain stands out in the context of agribusiness and the Brazilian economy, having contributed substantially to income generation in rural areas. According to information from the Center for Advanced Studies in Applied Economics from the University of São Paulo (CEPEA), 3.2% of the total number of people employed in agribusiness in 2017 worked in sugarcane-related activities, including the production of sugarcane, sugar and ethanol.[60]

The sector also presents a high level of formalization within agribusiness, with 80% of the workers formally employed under a work contract; a high figure compared with the 17% average for the country's agricultural sector in general.

Salaries for sugarcane industry workers are among the highest in Brazil's agricultural sector, second only to wages in the soybean industry. From 2006 to 2016, the real wage gains reached about 35% for industry and administrative jobs, and almost 60% for the agricultural area. The growth is due to the sector's expansion in the period and the rapid technological transformation that took place. Similarly, between 2000 and 2008, when the sector expanded extensively, the total number of total jobs increased by 99.6%, in particular among high-skilled positions.

Moreover, the rapid expansion of the industry has catalysed both private and public investments that have considerably improved the working conditions in the sugarcane sector.[61] Studies suggest that several factors, such as banning the practice of pre-harvest burning of sugarcane fields (see next section), growing compliance with environmental and labour standards, and rising exports of sugar in an increasingly accessible international market, all may have played a crucial role in improving the labour and social conditions of Brazilian sugarcane workers.[62]

## Environmental impact

In 2018, global sugarcane production reached almost 2bn tonnes a year, more than three times the average quantity that was produced in the 1970s.[63] This exponential growth is associated with environmental impacts common to

58 Andre Chagas, and Rudinei Toneto, "The expansion of sugarcane cultivation and its impact on municipal revenues: an application of dynamic spatial panels to municipalities in the state of São Paulo, Brazil," in Energy, Bio Fuels and Development (Routledge, 2011), 316-338.
59 Márcia Azanha Ferraz Dias Moraes, Fabíola Cristina Ribeiro Oliveira, and Rocio A. Diaz-Chavez. "Socio-economic impacts of Brazilian sugarcane industry," Environmental Development 16 (2015): 31-43.
60 "Mercado de trabalho do agronegócio brasliero: a dinâmica dos empregos formais na agroindústria sucroenergética de 2000 a 2016", Centro de Estudos Avançados em Economia Aplicada (CEPEA), acessed November 19, 2020, https://www.cepea.esalq.usp.br/upload/kceditor/files/MERCADODETRABALHO_EDICAOESPECIAL_N2(2).pdf
61 Ibidem
62 Márcia Azanha Ferraz Dias de Moraes and David Zilberman, "Production of ethanol from sugarcane in Brazil: from state intervention to a free market", Springer Science & Business Media 43, (2014).
63 "Annual statistics", Konema, accessed on September 4, 2020, https://knoema.com/FAOPRDSC2020/production-statistics-crops-crops-processed.

large-scale intensive farming.[64] As shown in this section however, substantial progress has been achieved in Brazil and Australia to address risks related to greenhouse gas emissions, water supply, land use and pesticides use.

## Greenhouse gas emissions

Until a decade ago, the main concern about the environmental damage caused by sugarcane production arose from the burning of the straw in certain countries where harvesting was not mechanised.

Cane can be harvested with or without prior burning of the straw. The former technique is usually carried out when sugarcane is harvested manually in order to avoid its transport to the production unit, reduce the physical effort and risks associated with manual sugarcane cutting, and increase the productivity per person.

In Australia, where harvest has been fully mechanised for the past 40 years, this has not posed a risk for the environment. For countries like Brazil, however, this practice resulted in considerable amounts of greenhouse gas (GHG) emissions being released into the atmosphere and caused a number of problems, including the destruction of soil organic matter, leaving it exposed to erosion and prompting the silting of water sources; the reduction and even elimination of birds, animals and insects, which are important control agents for pests; the reduction of soil microorganisms; and the volatilisation of nutritional elements essential to the sugarcane plant. [65]

Recent research[66] specifies that, considering an approximate 2.4 tonnes of $CO_2$ emissions per ha−1 of sugarcane produced, most of the released $CO_2$ indeed results from residue burning (44%).[67]

To mitigate this environmental impact, the mechanisation of the harvest, which avoids burning, has been encouraged by a series of state-level decrees in Brazil. In the state of São Paulo, the largest producer in the country, a state decree from 2003 provides for the complete elimination of this practice by 2021 in areas where mechanization is possible, and by 2031 in areas where mechanization is currently considered technically unfeasible.

Mechanical harvesting, with the use of harvesters specially designed for this purpose, is the most used technique today. The mechanised harvesting system of sugarcane is increasingly present in production systems in Brazil, where the transport of chopped sugarcane in small lots is carried out by trailers suitable

64 Frances, Karen. "Sweet and sour: The impact of sugar production and consumption on people and the environment", No. 10. Alexis Vaughan, 2000.
65 Raffaella Rossetto and Antonio Dias Santiago. Plantio da cana-de-açúcar. Ageitec – Agência Embrapa de Informação Tecnológica. Accessed November 19, 2020. https://www.agencia.cnptia.embrapa.br/gestor/cana-de-acucar/arvore/CONTAG01_33_711200516717.html
66 Eduardo Barretto de Figueiredo, Alan Rodrigo Panosso, Rangel Romao, and Newton La Scala Jr, "Greenhouse gas emission associated with sugar production in southern Brazil", Carbon Balance and Management 5, no. 3, (2010).
67 Ibidem

for this task. In this system, practically all of the harvest is carried out without previous burning, since the leaves, sheaths, pointers, and variable amount of pieces of stem are cut, crushed and released onto the soil surface, forming a cover of plant residue (straw).

As a result, the percentage of mechanised harvest in Brazil has substantially grown. In 2007-2008, 24.4% of the sugarcane produced in Brazil was mechanically harvested. That share reached 91% in the year 2018-2019. In the Central-South Region this share already exceeds 96.4% of the total area. However, other regions in Brazil still have progress to make: in the North/Northeast region, for instance, only 25% of the total sugarcane area is harvested mechanically.[68]

**SHARE OF MANUAL AND MECHANISED HARVEST IN THE STATE OF SÃO PAULO**

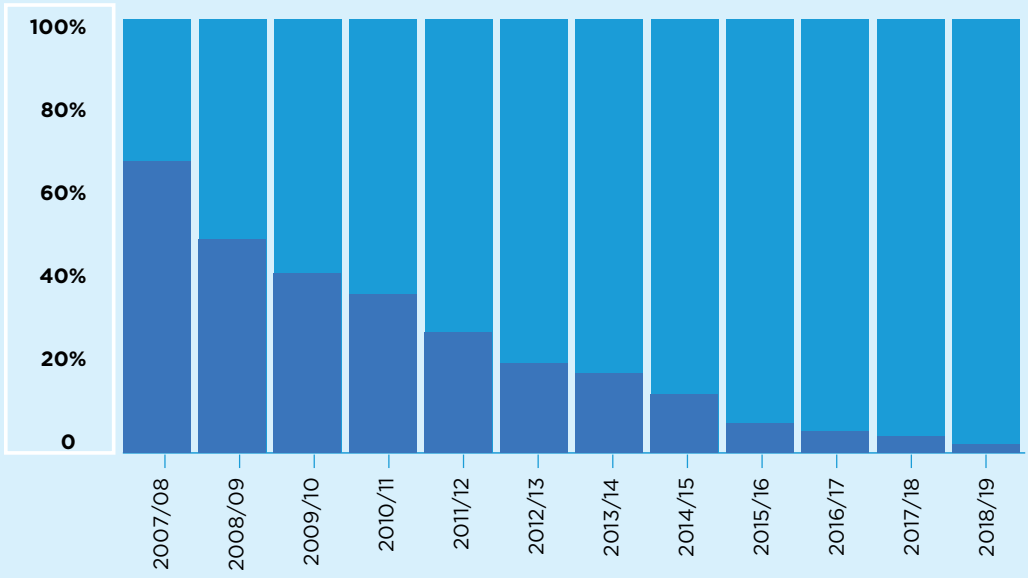


**Figure 8.** *Share of manual and mechanised harvest in the state of São Paulo*

*Source: CONAB (Companhia Nacional de Abastecimento)*

The prevalence of mechanised harvest has also paved the way for alternative uses for the straw, like the production of electricity and ethanol. Burning the straw alongside the bagasse in high-efficiency boilers leads to an even higher production of bioelectricity. Studies suggest that using sugarcane bagasse for energy production is a sustainable solution to supply the required energy within the sugar refineries and export the surplus electricity to the grid.[69,70] It is

68 "Acompanhamento da safra brasileira: cana-de-açúcar" Companhia Nacional de Abastecimento (Conab) . Augusto 2020. Accessed on November 19, 2020. https://www.conab.gov.br/info-agro/safras/cana/boletim-da-safra-de-cana-de-acucar

69 Peter Rein, "The carbon footprint of sugar," Sugar Industry-Zuckerindustrie 135, (2010).

70 Farhood Mohammadi, Majid Amidpour, Vahidi Hossein, and Gitipour Saeid. "Environmental-economic evaluation of sugar cane bagasse gasification power plants versus combined-cycle gas power plants". Global Journal of Environmental Science and Management 6 (2020): 73-84.

estimated that with the full utilisation of sugarcane residues, the bioelectricity produced could reach 146,000 GWh, enough to power an entire country the size of Sweden or Mexico.[71] In addition, the straw can also be used to produce cellulosic ethanol, which holds the potential to double the volume of fuel coming from the same amount of land planted with sugarcane.

## Water Supply

Another major environmental impact caused by extensive sugarcane cultivation refers to water supply. Water scarcity and damping are also associated with soil erosion and degradation.[72] Although sugarcane is mostly cultivated through rain-fed systems, certain areas are dependent on irrigation systems.

In Australia, sugar cane is largely unirrigated and therefore does not impact water scarcity. In Brazil, however, sugarcane has for a long time been dependent on irrigation. In the past, water withdrawal for cane production reached 15–20 m3/mg of cane. Currently, better technologies allow for much lower irrigation, with consumption averaging at 1.85 $m^3$/mg of cane.[73] Policy has played an important role in fostering this change.  For instance, in the State of São Paulo authorities established a target to limit water use in the sugarcane industry at 1 $m^3$/mg of cane, and 0.7 $m^3$/mg of cane in areas facing water scarcity.[74]

Furthermore, in Brazil, systems have been put in place to lower water consumption. One example is the use of waste from the mills themselves, known as called “rescue irrigation” (*irrigação de salvamento*). In this method, the plant receives only part of the required irrigation for it to achieve the necessary productivity levels. Nearly all irrigation in Brazil (98.4%) has applied this targeted method, which minimises water use.[75]

## Land Use

In the Central-South region of Brazil, the recent expansion of sugarcane happened in pasture areas, most of them ecologically degraded. Brazil has about 64.7 million hectares of areas suitable for the expansion of sugarcane cultivation, of which 19.3 million hectares are considered to have high productive potential, 41.2 million hectares of medium production and 4.3 million low potential for cultivation. The country is therefore well positioned to supply world markets with sugarcane by-products without the need to incorporate new areas with native coverage. The expansion of sugarcane production in Brazil, for

71 “Bioelectricity”,  SugarCane, accessed October 23, 2020, https://sugarcane.org/bioeletricity/.
72 “Study on Soil and water in a changing environment”, European Commission, accessed September 4, 2020 https://ec.europa.eu/environment/soil/pdf/Soil%20and%20Water.pdf.
73 Ricardo de Oliveira Bordonal, João Luís Nunes Carvalho et al. “Sustainability of sugarcane production in Brazil: A review,” Agronomy for Sustainable Development 38, no. 13 (2018). https://doi.org/10.1007/s13593-018-0490-x.
74 Carolina de Oliveira Jordão and Evandro Mateus Moretto. “The environmental vulnerability and the territorial planning of the sugarcane cultivation.” Ambiente & Sociedade 18, no. 1, 2015, 75-92.
75 “ANA maps irrigated sugarcane area to help manage water resources,” Agência Brasil, accessed October 23, 2020, https://agenciabrasil.ebc.com.br/economia/noticia/2017-07/ana-mapeia-area-irrigada-de-cana-para-ajudar-na-gestao-dos-recursos.

both sugar and ethanol, does not need to directly affect the land used for food production.[76]

In addition, studies of direct land use changes to sugarcane plantations during 2000–2009 in the Central-South region of Brazil, report that nearly 96% of the recent expansion has occurred over pastures (69.7%), annual crops (e.g., soybean, corn, sorghum, and cotton; 25%), and citrus (1.3%).[77] Similarly, other studies confirm that the sugarcane expansion between 1996 and 2006 resulted in a significant reduction of pastures, but did not directly contribute to deforestation.[78]

In areas where conversion has happened, results demonstrated the expansion of sugarcane can relatively increase carbon fixation and carbon sequestration due to its carbon fixation characteristics.[79] Studies based on maps and data from hundreds of satellite images in Brazil revealed that conversion of natural vegetation to a crop/pasture warms the region by an average of 1.55°C, but subsequent conversion of the crop/pasture to sugarcane cools the region by an average of 0.93°C, resulting in a net increase of around 0.6° C.[80] The research concluded that expanding sugarcane into existing crop and pastureland has a direct local cooling effect that reinforces the indirect climate benefits of this land-use option. Therefore, sugarcane may be better than other field crops for environmental protection in increasing atmospheric $CO_2$ and surface temperature.

Similarly, it is estimated that 5.9 mg of carbon is stored per hectare annually into sugarcane biomass.[81] The replacement of degraded grasslands and other ecosystems containing low biomass carbon stocks, by high yielding energy crops like sugarcane may reduce or even equal the carbon emissions from land use change.[82]

76 Celso Manzatto; Eduardo Assad; Jesus Bacca; Maria Zaroni; Sandro Pereira. (2009). "Zoneamento Agroecológico da Cana-de Açúcar Expandir a produção, preservar a vida, garantir o futuro". Accessed November 19, 2020. https://www.embrapa.br/busca-de-solucoes-tecnologicas/-/produto-servico/1667/zoneamento-agroecologico-da-cana-de-acucar-para-o-brasil

77 Marcos Adami, Bernardo Rudorff, Ramon Freitas, Daniel Aguiar, Luciana Sugawara, Marcio Mello. (2011). "Remote Sensing Time Series to Evaluate Direct Land Use Change of Recent Expanded Sugarcane Crop in Brazil". Sustainability. 4. 574-585. 10.3390/su4040574.

78 Gerd Sparovek, Alberto Barretto, Goran Berndes, Sergio Martins and Rodrigo Maule, "Environmental, land-use and economic implications of Brazilian sugarcane expansion 1996–2006," Mitigation and Adaptation Strategies for Global Change 14 (2009): 285–298. https://doi.org/10.1007/s11027-008-9164-3.

79 Georgescu Matei, David Lobell, and Christopher Field, "Direct climate effects of perennial bioenergy crops in the United States," Proceedings of the National Academy of Sciences of the United States of America, 108, no. 11, (2011): 4307–4312.

80 Scott R. Loarie, David B. Lobell, Gregory P. Asner, Qiaozhen Mu, Christopher B. Field, "Direct impacts on local climate of sugar-cane expansion in Brazil," Nature Climate Change, 1, no. 2, (2011): 105–109.

81 Revin Panray Beeharry, "Carbon balance of sugarcane bioenergy systems," Biomass and Bioenergy 20, no. 5, (2001): 361–370. https://doi.org/10.1016/S0961-9534(00)00094-5.

82 Holly K Gibbs, Matt Johnston, Jonathan A Foley, Tracey Holloway, Chad Monfreda, Navin Ramankutty and David Zaks. "Carbon payback times for crop-based biofuel expansion in the tropics: the effects of changing yield and technology," Environmental Research Letters, 3 (2008). https://doi.org/10.1088/1748-9326/3/3/034001.

## Pesticides

Regarding the use of inputs in sugarcane production, like pesticides such as herbicides, fungicides and insecticides, a number of initiatives are in place to minimise the risk of contamination of water bodies, soils, and food.

This is particularly the case in Australia, where sugar cane has impacted water quality in the Great Barrier Reef. According to the WWF, about 3,000 farms sprawl over 360,000 hectares in the region, some of them dating back more than 100 years. Nutrients entering the Reef have been found to result from fertilizers. In addition, pesticides used on coastal floodplains also threaten water quality.

The Australian and Queensland governments have set a target of reducing nitrogen pollution by up to 80% in key catchments under the Reef 2050 Plan.[83] To reach those targets, current farm practices will need to change. Solutions have thus been developed to help farmers adapt in order to minimise the impact that crops have on the Reef. A number of programmes and support tools have been made available from across the industry, and the Queensland and Australian governments. Investment in research has also continued, aiming to improve our understanding of the issues facing the Reef and to develop tools to support sugarcane farmers.

Among the support programs for sugarcane farmers, a few examples stand out:

The Smartcane Best Management Practice (BMP) programme is an industry-developed system that improves the sustainability of farm enterprises. Meeting the Smartcane BMP 'industry standard' minimises the risk of nutrients, pesticides and sediment leaving the property and impacting on the health of the Reef. Growers can self-assess their practices to determine if they are 'below', 'at', or 'above' the industry standard. If their activities are below the industry standard, the system shows what they would need to do to reach that standard. Help is also available through local facilitators, who can also assist to have their BMPs independently accredited.

Similarly, the SIX EASY STEPS™ programme, developed by Sugar Research Australia, is a grower-friendly nutrient management programme, used to improve nutrient management. The Reef Trust[84] is an Australian Government initiative that provides innovative and targeted investment to improve water quality, restore coastal ecosystem health and enhance species protection in the Reef region. In the same vein, the Water Quality Grants and Partnership component of the Australian Government Reef Programme[85] aims to increase the voluntary uptake of improved land management practices by landholders that will reduce the dis-

83 "Highlights of the Reef 2050 Long-Term Sustainability Plan", Australian Government, Department of Agriculture, Water and Environment. Accessed on November 19, 2020. https://www.environment.gov.au/marine/gbr/publications/highlights-long-term-sustainability-plan

84 "Reef Trust Projects", Australian Government: Department of Agriculture, Water and the Environment, accessed October 23, 2020, http://www.environment.gov.au/marine/gbr/reef-trust/projects.

85 "The Australian Government Reef Programme," Australian Government, accessed October 23, 2020, http://www.nrm.gov.au/national/continuing-investment/reef-programme.

charge of sediments, nutrients and pesticides into the Great Barrier Reef lagoon.

Moreover, the Reef Alliance[86] is a partnership between industry and NRM bodies who work closely with communities, private business and government to deliver farm specific and whole of landscape projects in reef catchments. Furthermore, the Department of Agriculture and Fisheries offers a range of extension services[87] to support sugarcane growers to adopt better business and farming practices.

Finally, a partnership between WWF, natural resource management groups, Reef Catchments,[88] NQ Dry Tropics and Terrain, the Coca-Cola Foundation,[89] the Australian Government and sugar cane farmers, known as Project Catalyst, is among the most successful endeavours. It supports farmers to identify and trial cutting-edge practices that can reduce their environmental footprint. [90]The project encompasses today more than 15,000 hectares. A number of innovations, such as a more targeted way of applying mill mud (a nutrient-rich by-product of the sugar cane milling process), have already been widely taken up. The long-term goal is to build on such impressive results throughout Queensland and beyond.

## *The other side of the coin: sugarcane biofuels*

When assessing the sustainability of sugarcane, one cannot ignore the crop's role in producing the biofuel with the lowest carbon footprint in the world: sugarcane ethanol.[91] Its high energy efficiency makes it one of the world's main allies in the transition towards cleaner energy.

Ethanol and sugar are two sides of the same coin. In Brazil, 60% of production plants consist of sugar mills with attached ethanol distilleries.[92] Ethanol is extracted from sugarcane biomass and has recognized potential to sequester carbon from the atmosphere. On average, 55% of Brazilian sugarcane is converted into alcohol, and 45% into sugar. Data from the Sugarcane Industry Union shows that Brazil is the world's second largest producer of ethanol, after the United States of America.[93]

Ethanol production in Brazil was encouraged by the government during the international oil crisis in the 1970s, and has continued to grow, driven at first by

86 "Reef Alliance," Queensland Farmers' Federation, accessed October 23, 2020, http://www.qff.org.au/projects/reef-alliance/.
87 "Support Programs," Queensland Government, accessed October 23, 2020, https://www.qld.gov.au/environment/agriculture/sustainable-farming/reef/reef-regulations/support-programs.
88 "About," Reef Catchments, accessed October 23, 2020, http://reefcatchments.com.au/.
89 "The Coca-Cola Foundation," World Wildlife Fund, accessed October 23, 2020, https://www.wwf.org.au/About-us/Partners/The-Coca-Cola-Foundation/the-coca-cola-foundation.
90 "Project Catalyst - preserving the Great Barrier Reef for 10 years," Australian Government: Department of Agriculture, Water and the Environment, accessed October 23, 2020, https://www.environment.gov.au/about-us/partnerships/case-studies/preserving-great-barrier-reef-10years.
91 "Ethanol: Sustainable Energy," UNICA, accessed October 23, 2020, https://unica.com.br/setor-sucroenergetico/etanol/.
92 Ibidem
93 "Balanço de atividades: 2012/12 a 2018/19", União da Agroindústria Canavieira do Estado de São Paulo (UNICA). Accessed November 19, 2020. https://www.unica.com.br/wp-content/uploads/2019/06/Relatorio-Atividades-201213-a-201819.pdf

societal concerns over excessive vehicle emissions and their impact on air quality in large cities, and later by the growing awareness about the link between global warming and the burning of fossil fuels.[94]

In 2019, power generated by ethanol and sugarcane residues accounted for 18% of the total energy supply in Brazil (an increase of 5.5% or 0.6 percentage point in relation to 2018). In 2019, the Internal Energy Supply in Brazil grew by 1.4% compared to 2018, about 2% of the world supply. The performance of sugarcane products contributed to the share of renewable energy in the Brazilian energy matrix from 45.5% (2018) to 46.1% (2019).[95]

Studies have shown that sugarcane-based ethanol is the most effective option by most parameters, including highest energy balance in comparison with corn, wheat, sugar beet, and sorghum. In practice, this means that ethanol from sugarcane reduces emissions of GHGs by 85% through substitution of fossil fuels if compared with emission avoidance of 30% for corn, 45% for sugar beet, 53% for sorghum, and 64% for wheat.[96] The outstanding performance of sugarcane in emission reductions is largely due to the use of biomass as a biofuel for power generation during the industrial phase.[97]

## SUGARCANE ENERGY BALANCE IN COMPARISON WITH CORN, WHEAT, SUGAR BEET, AND SORGHUM

| **Feedstock** | Energy balance* | GHG savings ** (%) | Fuel yield (L $ha^{-1}$) | Water footprint*** (L of water per L of ethanol) |
|---|---|---|---|---|
| Corn (*Zea mays* L.) | 1.4[a,b] | 30[a] | 4010[a,j,k] | 2486[n,o] |
| Sugarcane (*Saccharum spp.*) | 9.1[c,d] | 85[a,d,f,g,h] | 6900[c,d,g,j] | 2245[n,o] |
| Wheat (*Triticum*) | 5.2[b] | 64[i] | 2450[l] | 4339[n,o] |
| Sugar beet (*Beta vulgaris*) | 2.0[b] | 45[a,h] | 5250[a,l] | 1176[n,o] |
| Sorghum (*Sorghum bicolor* L. Moench) | 2.8[e] | 53[e] | 2990[m] | 8317[n,o] |

*Mean values were computed according to the arithmetic average of the data found in the literature (superscript letters) for each assessed parameter. Otherwise, absolute values were considered when there is only one available data.*
** Ratio of energy output in a liter of ethanol over the fossil fuel energy input required to produce it*
*** Avoided greenhouse gas (GHG) emission through substitution of fossil fuels*
**** Water footprints of bioenergy crops were estimated considering the green and blue components*

94 Rogério Cezar de Cerqueira Leite and Manoel Régis L. V. Leal. "O biocombustível no Brasil". Novos Estudos - CEBRAP, São Paulo, v. 78, p. 15-21, jul. 2007. Accessed November 19, 2020. https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0101-33002007000200003.
95 "Brazilian Energy Review," Ministry of Mines and Energy: Secretariat for Energy Planning and Development, accessed October 23, 2020, http://www.mme.gov.br/web/guest/secretarias/planejamento-e-desenvolvimento-energetico/publicacoes/resenha-energetica-brasileira.
96 Ricardo de Oliveira Bordonal, João Luís Nunes Carvalho et al. "Sustainability of sugarcane production in Brazil: A review," Agronomy for Sustainable Development 38, no. 13 (2018). https://doi.org/10.1007/s13593-018-0490-x.
97 Alfredo Fuentes, Carlos García, Anna Hennecke, Omar Masera, Fabio Manzini, Enrique Riegelhaupt. "Life-cycle greenhouse gas emissions and energy balances of sugarcane ethanol production in Mexico", Applied Energy 88, no. 6 (2011): 2088– 2097. https://doi.org/10.1016/j.apenergy.2010.12.072.

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# THE EU AS A DRIVER OF SUSTAINABILITY

The European Union has long championed a green economy and sustainable development through a number of policies and initiatives at European level. In December 2019, the President of the European Commission, Ursula von der Leyen, unveiled the European Green Deal as Europe's plan to make its economy sustainable and ensure a green economic transition powered by research, innovation, and digitalisation across industrial sectors.

Hailed as the growth strategy of the European Union, the Communication on the Green Deal outlined an ambitious roadmap of initiatives with the overall objective of making Europe the first carbon-neutral continent by 2050.

Sustainably-sourced sugarcane has the potential to help the EU advance much of the ambitions set out in the Green Deal when it comes to imported commodities. From freeing the EU's supply chains of deforestation, to driving forward circularity, allowing cane refiners – and ultimately EU consumers – to access sustainable sugarcane from producing partners would promote policy coherence at the EU level; with trade and environmental policy reinforcing each other.

## Sustainability beyond borders

The European Green Deal does not stop at home, recognising that the "environmental ambition of the Green Deal will not be achieved by Europe alone. The drivers of climate change and biodiversity loss are global and are not limited by national borders." [98] The European Commission goes a step further by highlighting that "the EU can use its influence, expertise and financial resources to mobilise its neighbours and partners to join it on a sustainable path."[99]

The EU has a long history of development and climate-related engagement with its international partners. One of the most relevant initiatives is the 2017 European Consensus on Development,[100] which provides a common policy framework for the development cooperation of the EU and its Member States in support of the global implementation of the United Nations 2030 Agenda for Sustainable Development.[101] Through the Consensus, the EU committed to

98 "The European Green Deal", European Commission, 2, accessed on September 4, 2020. https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf
99 Ibidem
100 "European Consensus on Development", European Commission, accessed September 4, 2020, https://ec.europa.eu/europeaid/sites/devco/files/european-consensus-on-development-final-20170626_en.pdf
101 "2030 Agenda for Sustainable Development", United Nations, accessed September 4, 2020, https://sustainabledevelopment.un.org/post2015/transformingourworld/publication

target a host of issues through the promotion of sustainable agriculture, the defence of human and labour rights worldwide, and the sustainable management of water.[102]

Moreover, since 2015, the EU has pursued a wide range of policy approaches specifically intended to globally target deforestation and biodiversity loss, such as the implementation of the Global Strategic Plan for Biodiversity 2011-2020.[103] The Plan specifically includes a target on the EU contribution to fighting global biodiversity loss through increased support for sustainable economic development, the conservation and restoration of terrestrial ecosystems, nature-based solutions, and the mainstreaming of biodiversity across sectors.

## Sustainable trade

With the European Green Deal, the European Union has cemented its commitment towards the environment via targeted actions and a comprehensive policy framework that goes beyond the regional arena. Commerce and trade are key policy areas where the EU can wield considerable influence, a fact recognised in the text of the Green Deal: "As the world's largest single market, the EU can set standards that apply across global value chains."[104] The Commission goes further by committing to "use its economic weight to shape international standards that are in line with EU environmental and climate ambitions", and to "work to facilitate trade in environmental goods and services (...) and in supporting open and attractive EU and global markets for sustainable products."[105]

Industry recognises the power of trade in encouraging climate action. BusinessEurope, the Confederation of European Businesses, has highlighted that it is "essential that the design of policy options linking the trade and climate agendas strikes a careful balance between ensuring a global level-playing field to support European competitiveness and enhancing access to foreign markets while effectively complementing domestic climate-related measures."[106]

Trade policy, as an exclusive EU competence, offers a promising path for leading sustainable efforts in the sugarcane supply chain. The EU constitutes the largest single market in the world. As such, EU consumers' demand for sustainable products, such as sugarcane, can propel (or slow down) the sustainable production of different commodities along entire supply chains in other regions of the world.

Bonsucro, the leading certification standard of sustainably produced sugar-

102 "European Consensus on Development", European Commission, accessed September 4, 2020, https://ec.europa.eu/europeaid/sites/devco/files/european-consensus-on-development-final-20170626_en.pdf
103 "Global Strategic Plan for Biodiversity 2011-2020", European Commission, accessed on 4 September, 2020, https://www.cbd.int/sp/
104 "The European Green Deal", European Commission, 22, accessed on September 4, 2020. https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf
105 Ibidem
106 "What trade can do for climate", BusinessEurope, 2, accessed October 6, 2020, https://www.businesseurope.eu/sites/buseur/files/media/position_papers/rex/2020-06-22_what_can_trade_can_do_for_climate_0.pdf.

cane, recognises that buyers have been instrumental in expanding the development and reach of the certification scheme, acknowledging that they are "a powerful driver for change."[107] In a similar vein, the International Sustainability & Carbon Certification's (ISCC) 2018 Impact Report, highlights that "one of the major impacts of the ISCC is a shift in perception towards sustainability through its comprehensive requirements for farms and plantations, as well as all other elements along the value chain",[108] acknowledging that "Consumer interests can (...) increase demand for sustainably produced products, thus creating a price premium that incentivizes producers to move towards more sustainable practices and seek certification of their efforts.[109] A recent study published in the Science journal, argues that "Though producers are a vital part of the solution, their ability to reduce environmental impacts is limited", highlighting the key role that consumers can play by avoiding high-impact producers.[110]

107 Nicolas Viart, Rafael Seixas, Liz Foggitt, Chen-Wei Chang and Katharine Earley, "Bonsucro Outcome Report 2019". Accessed November 19, 2020. http://www.bonsucro.com/wp-content/uploads/2020/06/Bonsucro-Outcome-Report-2019.pdf

108 "Impact Report 2018," International Sustainability & Carbon Certification, 8, accessed October 23, 2020, https://www.iscc-system.org/wp-content/uploads/2019/10/ISCC-Impact-Report-2018.pdf.

109 Idem, 11.

110 Joseph Poore and Thomas Nemeck, "Reducing food's environmental impacts through producers and consumers," Science 360, no. 6392 (June 2018): 990, https://doi.org/10.1126/science.aaq0216.

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# CONCLUSIONS

Over the past two decades, the sugarcane industry has evolved into a sector deeply concerned about its environmental footprint. Thanks to a number of initiatives and the collective effort of citizens, NGOs, industry and governments, sugarcane producers, millers, traders, and refiners can offer consumers today cane sugar that meets the highest sustainability standards.

To a large extent, this progress has been made possible by an increasing demand for sustainably-sourced sugar. In an ever-interdependent economy, consumers, of all players, are perhaps the most influential link in the chain.

On almost every front, the more advanced economies have both the capacity and the responsibility to set standards, advocate change and champion causes that less developed countries cannot tackle on their own. This includes leading the fight against climate change and addressing environmental issues. The precondition, nonetheless, is an open market, where entry barriers are low, and the playing field is levelled. Only then can measures taken at the top –such as the ambitions etched into the European Green Deal– trickle down to the lower levels and have a real impact.

As the largest single market in the world, the EU can lead the demand for sustainable commodities and, in turn, drive positive change in other regions of the world. As shown in this study, in Brazil –one of the world's largest sugarcane producers– a successful sugarcane market driven by international demand has led to job creation, higher income in rural areas, overall improvements in working conditions and corporate social responsibility in the sugarcane industry.

The challenge lies in how to drive this change, to which EU trade policy holds part of the answer. By including sustainability commitments in its Free Trade Agreements with third countries, and ensuring their implementation, the EU can provide a powerful incentive for other economies to source responsibly. In the case of sugarcane, this can only happen if raw sugar imports come with no duty attached.

In the same way that Europe can lead the sustainability race, fairness should remain a guiding principle for the EU's position on sugar trade. For Europe to continue being a driver of change, a level-playing field for all stakeholders is imperative. In the sugar sector, this means fair conditions for both sugarcane refiners and beet sugar producers. The EU-Mercosur agreement would allow EU refiners to partially regain their profitability margins, without posing any threats to EU beet sugar production, as imports are quantitatively limited by TRQs.

We call upon the European Commission to bear this in mind as negotiations continue. The only real access to this market is duty-free access and the EU domestic sugar sector does not require “protection” from Australian imports. Global trade will continue to grow, as will the production of sugarcane. The European Union can stay in the lead by driving global demand and efforts for sustainable sugarcane.

Sustainability is a work in progress and many challenges will remain subjects of permanent reflection: from transparency and accountability in the responsible sourcing of sugarcane, to tackling new environmental impacts that may emerge from intensive production. These however cannot be resolved in isolation. The high demand of EU consumers is Europe’s most powerful tool in driving change around the world and ensuring that standards continue to rise. The EU cannot waste this asset. We must design trade agreements that fully tap into the potential of our market as a force for good at the global level. Europe can –and must– make a difference today.

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# ANNEX

## Bonsucro

One of the largest and best-known initiatives is Bonsucro. Originally established in 2005 as the *Better Sugar Cane Initiative* by the WWF and a number of producers, retailers, investors, traders and NGOs, Bonsucro is today a global multi-stakeholder, non-profit organisation that promotes sustainable sugarcane production, processing and trade around the world. Bonsucro currently supports more than 550 members in over 50 countries from all elements along the sugarcane supply chain: from farmers and millers, to traders, buyers, and support organisations.[111]

To encourage sustainability along the sugarcane supply chain, Bonsucro has implemented the *Bonsucro Production Standard*[112] as a tool to certify farmers and mills, and help them measure their productivity and key environmental and societal impacts against the three pillars of sustainability: economic, social and environmental viability.[113]

In order to become certified, farmers and mills must meet a number of principles, including obeying the law, respecting human rights and labour standards; managing input, production and processing efficiencies to enhance sustainability; continuously improving key areas of the business; and showing adherence to EU biofuels directives.[114] The Standard is currently under revision to bring it in line with evolving social, environmental and economic challenges in the sugarcane sector.

Bonsucro has also developed the *Chain of Custody Standard*, which concerns the supply of a product including all stages from the feedstock production up to consumption.[115] It serves as proof that certified entities are sourcing and trading responsibly, and it provides assurance that claims of compliance can be tracked along the supply chain. This allows companies to make on-product claims and makes it easier for end users to support the production of sustainable sugarcane. By the end of 2019, a total of 54 Companies in 28 countries had been certified.[116]

Since the Bonsucro certification scheme was launched in 2011, its impact on the

111 "About Bonsucro", Bonsucro, accessed August 31, 2020, https://www.bonsucro.com/what-is-bonsucro/.
112 While all sugarcane mills and farms can apply for the Bonsucro Production Standards, a separate Bonsucro standard exists for Smallholder Farmers that have less than 25 hectares.
113 "Bonsucro Production Standard". Bonsucro. Accessed October 23, 2020, http://www.bonsucro.com/wp-content/uploads/2017/04/Bonsucro-PS-STD-English-2.pdf.
114 Idem, 6.
115 " Chain of Custody Standard", Bonsucro, accessed August 31, 2020, http://www.bonsucro.com/chain-custody-standard/.
116 Nicolas Viart, Rafael Seixas, Liz Foggitt, Chen-Wei Chang; and Katharine Earley. "Bonsucro Outcome Report 2019". Accessed November 19, 2020. http://www.bonsucro.com/wp-content/uploads/2020/06/Bonsucro-Outcome-Report-2019.pdf

sugarcane sector has been significant and the number of certified entities has grown consistently. In the period 2018-2019, close to 6% of global sugarcane land and 72 million tonnes of sugarcane were Bonsucro-certified.[117]

According to the latest available data, certified farmers produce more sugarcane with less land than conventional farmers, and estimations suggest that certified operators have potentially avoided the release of 200 million kg $CO_2$ into the atmosphere. Certified mills are more efficient, more likely to reduce their greenhouse gas (GHG) emissions, and consume less water than non-certified mills, whereas sugarcane producers tend to reduce the use of fertilizers.[118] After five years of certification, accident rates are cut by half at mill level and by a third at farm level.[119] In addition, wages on Bonsucro certified farms are 20% above national minimum wage, and data from certification holders suggests that the proportion of female workers on farms improves continuously after certification.[120]

## VIVE Programme

The VIVE Programme, launched in 2015 and managed jointly by Czarnikow and AB Sustain, is a voluntary sustainability programme that promotes supply chain integrity, covering all operations and activities from producers to end users of both sugarcane and sugar beet. Its aim is to promote good agricultural practices that result in efficient and environmentally sustainable production of ingredients; ensure labour rights and safe and fair working conditions; and guarantee traceability.[121]

The programme consists of five modules: farm, facilities (mill and refinery), shippers, forwarders and chain of custody. Participants choose the modules in which they wish to participate and VIVE evaluates their current performance in each of them and sets improvement objectives. These objectives are then tracked along the supply chain and evaluated in three-year improvement cycles supported by independent third-party assessments. Participants can join the programme at different entry levels and move up as they identify and close gaps in their supply chain and expand their sustainability agenda over time. [122] Each level indicates the extent to which participants cover the sustainability indicators established in the programme: Foundation (50% coverage), Claim (75%) and Excellence (100%).

According to VIVE's Progress Report, published for the first time in 2019, the programme is now implemented across 21 facilities in ten countries, including nine sugar refineries, seven sugarcane mills, three chains of custody, and two sugar beet factories. Altogether, they cover approximately 2 million metric

117 Idem, 7.
118 Idem, 5-7.
119 Idem, 35.
120 Idem, 37-39.
121 "Our programme", VIVE, accessed August 31, 2020, https://www.viveprogramme.com/our-programme.
122 Ibidem

tonnes of refined and unrefined sugar at the Claim Level of the programme, while two thirds of the participants have reached the Excellence Level.[123] Last August, the first end-to-end sugar supply chain was completed by participants in the VIVE Programme: 50,000 metric tonnes of sustainably sourced and shipped sugar were moved from Brazil to Malaysia, where they were further processed in a VIVE Excellence Level refinery, and later purchased by a major Asian manufacturer of soft drinks, also a participant in the VIVE Programme. [124]

## Fairtrade

Fairtrade is a global, non-profit, multi-stakeholder association that promotes fairer conditions for international trade with the ultimate goal of enabling farmers and workers to have more control over their lives and investments in their own future.[125] Products that meet the social, environmental and economic Fairtrade Standards are awarded the FAIRTRADE Mark as a symbol that they have been fairly produced and traded, and that they are fully traceable.[126] Products covered by Fairtrade range from bananas and coffee, to rice, honey, cotton, gold, wine, sugar and even sports balls.[127]

According to the latest Fairtrade sugar monitoring report, until 2017 a total of 99 sugar producer organisations were Fairtrade certified, representing close to 55,000 farmers across 19 countries and covering an area of 146,388 hectares. Despite a 2% decline in the global production of sugar by Fairtrade organisations, the amount of sugar sold as Fairtrade increased by 30% compared to 2016, amounting to more than 200 thousand metric tonnes. This translated into nearly €12 million in Fairtrade Premium funds that producer organisations could invest in sustainable production, business and environmental projects – a 27% increase over the previous year.[128] A more detailed analysis indicated that on average, sugarcane farmers spent more than half (60%) of that money on services for farmers, including the provision of agricultural tools and inputs, payments to members and investment in good agricultural practices.[129]

Case studies have revealed that the collaboration between Fairtrade and small-scale farmers has translated into qualitative benefits in different corners of the world. In Cuba, the investments made with Fairtrade Premium money have helped maintain the organic production of sugarcane on the island; in Malawi, a sugarcane cooperative has invested half of its premium in ensuring its business

123 "VIVE Progress Report Autumn 2019," AB Sustain and Czarnikow, accessed August 31, 2020, 4-7, https://www.czarnikow.com/wp-content/uploads/2019/10/CZ_VIVE_AW_digital.pdf.
124 "A sustainability-linked trade facility to fund a unique VIVE end to end sugar supply chain", News, VIVE, published August 11, 2020, https://www.viveprogramme.com/news/post?s=2020-08-11-a-sustainability-linked-trade-facility-to-fund-a-unique-vive-end-to-end-sugar-supply-chain.
125 "What is Fairtrade?", Fairtrade International, accessed September 2, 2020, https://www.fairtrade.net/about/what-is-fairtrade.
126 "The FAIRTRADE Marks", Fairtrade International, accessed September 2, 2020, https://www.fairtrade.net/about/fairtrade-marks.
127 "Fairtrade products", Fairtrade International, accessed September 2, 2020, https://www.fairtrade.net/product.
128 "Monitoring the Scope and Benefits of Fairtrade: Sugar" Monitoring Report, 10th Edition. Fairtrade International. Accessed November 19, 2020. https://files.fairtrade.net/publications/2019_Monitoring_Sugar_10thEd.pdf
129 Idem, 10.

remains compliant with international standards, including water for irrigation and health and safety infrastructure; and in Belize, cane farmer associations have invested in projects to prevent child and forced labour, increase gender equality and safety in the fields, as well as farmer productivity and biodiversity.[130]

## International Sustainability & Carbon Certification

The International Sustainability & Carbon Certification (ISCC) is a multi-stakeholder initiative that began operations in 2010. Governed by an association of more than 100 members, ISCC aims at contributing to the implementation of environmentally, socially and economically sustainable production and use of all kinds of biomass in global supply chains.[131] The ISCC offers certification for the food and feed market, industrial applications and the energy sector to ensure the implementation of ecological and social sustainability requirements, good management practices and continuous improvement, the monitoring of greenhouse gas emissions, compliance with laws and international treaties, and traceability along global supply chains.

From the point of origin, to the first gathering point, trading, storage, processing and the delivery of the final product, each element of the supply chain must obtain a certificate in order to claim that they handle sustainable materials. ISCC offers two certification schemes: ISCC EU – to demonstrate compliance with the legal requirements of the Renewable Energy Directive (RED) and Fuel Quality Directive of the European Union; and ISCC PLUS, which covers food, feed and industrial applications on a global scale as well as biofuels for non-European markets. To cater for small-scale farmers –who operate the majority of the world's farms–, ISCC has also developed the Independent Smallholders certification approach. Over the past eight years, ISCC has issued over 20,000 certificates, and today more than 3,300 companies in 100 countries are ISCC certified.[132]

To date, 60 million tonnes of oil and sugarcane have been produced under the ISCC sustainability requirements.[133] In Latin America alone there are 20 certified sugarcane operations and over a hundred ISCC certificates have been issued for biofuels, feed, food and bio-based products.[134]

## Other sustainable initiatives

Other important projects and standards around the world help to verify, directly or indirectly, sustainability claims related to sugarcane production and supply. The Organic Standards, developed by the United States Department of Agriculture (USDA), are used to label crops, livestock and processed products

130 Idem, 12-16.
131 "About: Objectives", International Sustainability & Carbon Certification, accessed September 2, 2020, https://www.iscc-system.org/about/objectives/.
132 "Impact Report 2018," International Sustainability & Carbon Certification, 8, accessed October 23, 2020, https://www.iscc-system.org/wp-content/uploads/2019/10/ISCC-Impact-Report-2018.pdf.
133 Ibidem.
134 Idem, 48.

that are produced without excluded methods (e.g. genetic engineering) and that meet US federal criteria on soil quality, prohibited substances, pest and weed control, and the use of additives.[135] The ProTerra Certification Standard was created in 2005 based on the Basel Criteria to promote the social responsibility and environmental sustainability of agricultural commodities. It is issued to organisations that respect human rights and good labour practices (e.g. workplace safety, equal opportunities, prevention of child and forced labour), follow good agricultural practices (soil fertility, water management, reduction of fertilisers and pesticides), and protect biodiversity.[136] In Australia, the Project Catalyst, a partnership between the WWF, industry, NGOs and Australian cane growers, supports sugarcane farmers in implementing cutting-edge management practices that lead to more sustainable and productive farming; with the ultimate aim of improving the water quality from sugarcane farms impacting the Great Barrier Reef.[137] Finally, Ceres, a non-profit organisation established in 1989, works with investors and the industry to make commitments and take action on global sustainability challenges by providing them with sustainability risk analyses and investor briefs on several commodities, including sugarcane[138].

135 "Organic 1010: What the USDA Organic Label Means", United States Department of Agriculture, accessed October 23, 2020, https://www.usda.gov/media/blog/2012/03/22/organic-101-what-usda-organic-label-means.

136 "Global ProTerra 2019: Global ProTerra Program Results", ProTerra Foundation, accessed September 2, 2020, https://www.proterrafoundation.org/wp-content/uploads/2020/07/Apresenta%C3%A7%C3%A3o-Global-ProTerra-2019-EN.pdf.

137 "Global ProTerra 2019: Global ProTerra Program Results", ProTerra Foundation, accessed September 2, 2020, https://www.proterrafoundation.org/wp-content/uploads/2020/07/Apresenta%C3%A7%C3%A3o-Global-ProTerra-2019-EN.pdf.

138 "An Investor Brief on Impacts that drive Business Risks: Sugarcane". Ceres. Accessed November 19, 2020. https://engagethechain.org/sites/default/files/commodity/Ceres_EngageTheChain_Sugarcane.pdf

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Barretto de Figueiredo Eduardo, Alan Rodrigo Panosso, Rangel Romao, and Newton La Scala Jr. Greenhouse gas emission associated with sugar production in southern Brazil. Carbon Balance and Management, vol. 5, article 3, 2010.

Ben & Jerry's. "Values: Issues We Care About: Fairtrade". Accessed September 4, 2020. https://www.benjerry.com/values/issues-we-care-about/fairtrade.

Benites-Lazaro, Lira Luz, Leandro Giatti, and Angelica Giarolla. "Sustainability and governance of sugarcane ethanol companies in Brazil: Topic modeling analysis of CSR reporting." Journal of Cleaner Production 197, 2018, 583-591.

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# CONTACT


**European Sugar Refineries Association**

A Rue Paul Emile Janson 6, 1000, Brussels, Belgium
T + 32 (0)2 899 93 94
E secretariat@sugarrefineries.eu
W sugarrefineries.eu