September 19, 2022

Cheryl Laskowski
Branch Chief, Transportation Fuels Branch
Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: August 18, 2022 Second Public workshop to Discuss Potential Changes to the LCFS.

The Brazilian Sugarcane and Bioenergy Industry Association (UNICA) appreciates the opportunity to submit feedback on some of the topics presented to stakeholders during the workshop on August 18, 2022.

UNICA applauds California policymakers who have long led the nation on environmental conservation and climate change. The current deliberations over the future of the LCFS again reflect innovative thinking and continue the state's tradition of introducing change that can change the direction of the nation. It is in this spirit that we share our unwavering belief that our product is part of the carbon-reducing vision you seek. California was far-sighted in 2011 when it put biofuels to work. California's climate policy reach goes way beyond the west coast geographic limits, so today, perhaps more than ever, CARB's technical evaluation of biofuels needs to be fair for the different sources of energy, especially those willing to bring in scientific evidence to support their claims.

With this in mind, we only ask that in your deliberations that Brazilian ethanol is scored fairly and accurately so that California residents can continue to enjoy the environmental benefits derived from the world's more efficient, environmentally friendly biofuel. A careful review of the data will again demonstrate that Brazilian ethanol should continue contributing to the state's climate goals, not only in road transportation, but in hard to abate sectors, with the use of sugarcane advanced fuels for sustainable aviation fuels (SAFs) and hydrogen technologies.

We respectfully request that the update of the factors/ inputs presented below are included in the rulemaking process, not only because there is new data and scientific literature to support them but to give Brazilian biofuels a fair score in the LCFS program, which will help with the state's carbon neutrality goals.

The items UNICA would like to request to be updated are summarized here. A detailed explanation along with supporting references follows below.

INPUT	ASK
Primary Farming Data	Update farming input values based on truly verified primary data
Farming Energy + Mechanized Harvesting	Update mechanization to a conservative 95% rate in all states of the Center- South region of Brazil

Straw Yield	Update straw yield to 140 kg (dry) per ton of sugarcane (fresh weighted), in line with recent literature
N2O from Applied N	Update values to 0.006 kg-N20-N/kg N-fert applied according to Tier2 evidence.
N2O and CH4 from vinasse transportation	Eliminate emissions of N2O and CH4 from vinasse transportation
Credits for electricity surplus	Credits from electricity surplus must consider the marginal (natural gas, diesel) instead of average of the grid
Logistical Routes	Allow Brazilian mills to register different routes with different CIs
Maritime Backhaul Penalties	Reduce or eliminate backhaul penalties, subjecting maritime logistics to the verification procedures
Regenerative Agriculture	Recognize climate-smart agriculture techniques for crop-based biofuels, including in Brazil
By Products Optimization	Establish credit values for displacement of natural gas by biomethane

Sugarcane Farming Data – update farming input values with thoroughly verified primary data, differentiating production patterns in the US and Brazil.

Inspired by LCFS the RenovaBio program developed the most complete and updated database on biofuels production patterns in Brazil. The RenovaBio Program is a national policy guided by three strategic axes: 1) Decarbonization Targets; 2) Efficient Biofuel Production Certification; and 3) Decarbonization Credit (CBIO). In the first axis, each year, the government sets national targets for ten years, which are cascaded down to the fuel distributors, who are the obligated party of the policy. In the second axis, producers voluntarily certify their production and receive, as a result, energy-environmental efficiency scores (NEEA). These scores are multiplied by the volume of biofuel sold, which results in the amount of CBIOs that a given producer may issue and sell in the market, which is the third axis.[1]

The biofuel certification process follows several steps to ensure the reliability of the NEEA and of the program. First, the producers collect and organize information on agricultural and industrial phases to be ascribed into a GHG calculator (RenovaCalc) developed by the National Agency of Petroleum Biofuels and Natural gas (ANP). Each input data needs to be traceable and verifiable (up to the farm level) since each value will be audited in a third-party verification process by companies registered and accredited by ANP[2]. A detailed certification protocol has been pub-

[1] ANP. Renovabio - https://www.gov.br/mme/pt-br/assuntos/secretarias/petroleo-gas-natural-e-biocombustiveis/renovabio-1

[2] ANP. List of the accredited inspection companies - https://www.gov.br/anp/pt-br/assuntos/renovabio/arq/firmas-inspetoras-credenciadas.xlsx/view

lished by ANP to assure the reliability and homogeneity of the information. After that, the application is submitted to public consultation and then is verified by ANP before the NEEA is approved and the biofuel is certified.

The certified NEEA is valid for three years, after that the biofuel producer must submit a new certification process again. Also, to remain active and in compliance with the program, producers are required to update the calculator yearly.
It is important to clarify that for the biofuel to be considered eligible, the area of cultivation of the raw material that originated it must meet three criteria:

1. No deforestation of native vegetation after Dec/2017 (validated by satellite images).
2. The Rural Environmental Registry (CAR) must be valid.
3. The cultivated area is in a municipality listed in the Agroecological Zoning of the crop.

As for the reported information regarding the inputs used in the biomass production phase, these have two distinct origins, namely:

Primary data: areas where the raw material is cultivated, whose reported data on the inputs were confirmed through the presentation of documentation in the external audit process carried out by the inspection firm.

Standard penalized input: areas where the raw material is cultivated, which could not be proved through the presentation of documentation. These areas, as long as they meet the eligibility criteria, will have default input values assigned, which severely penalizes the final carbon intensity of biofuels in relation to the primary data.

The information requirements are similar (and were inspired by) to GREET modeling approach and include farming inputs (fertilizers, energy by type), industrial inputs, and yields. . It is important to notice that cherry-picking is not allowed in RenovaBio; each producer must inform and verify the complete set of production indicators to be considered in the primary data
As mentioned to staff during the August 18th workshop, UNICA has organized one of the most extensive database on production patterns in Brazil. The data presented in this database were collected directly from the 97 production units with the Biofuel Production Certification who agreed to share their annual monitoring spreadsheets, exposing their primary information. Thus, the values presented refer only to the portion of the cultivation areas whose proof was possible. These companies represent about 43% of ethanol production in Brazil in 2018 and 2019.
As CARB is aware, Brazil has also stated production of ethanol from multicropping. This production pattern is different from corn ethanol produced in the US, including using of inputs. Currently LCFS does not have such production patter registered in CA-GREET. We understand this is an important update in the CA-GREET tool as well.

Mechanized Harvesting – update the mechanization to a conservative rate of 95% in all states of center-south of Brazil.
Mechanization has significantly expanded in last decade and now represents more than 95% of the total harvested area in the Center-south. This information is supported both by official governmental data and by RenovaBio primary data collected and audited (afore-mentioned database). CARB cannot keep ignoring such evidence.
Mechanization has dramatically reduced emissions in sugarcane fields, and mills should be recognized for this progress. Brazilian biofuel producers who have made significant technological investments should not be penalized by lower default assumptions.
In the Tier1 sugarcane ethanol calculator, CARB offers two default values for sugarcane mechanization for Brazil: 80% for São Paulo state and 65% for other states in the Center-South region.

According to Conab (Brazilian National Supply Company), during the 2022/23 in the Center-South region of Brazil, 2.73% of the sugarcane was manually harvest. This rate has been below 10% since 2015/16. The Center-South region supplies more than 85% of all the sugarcane produced in Brazil.

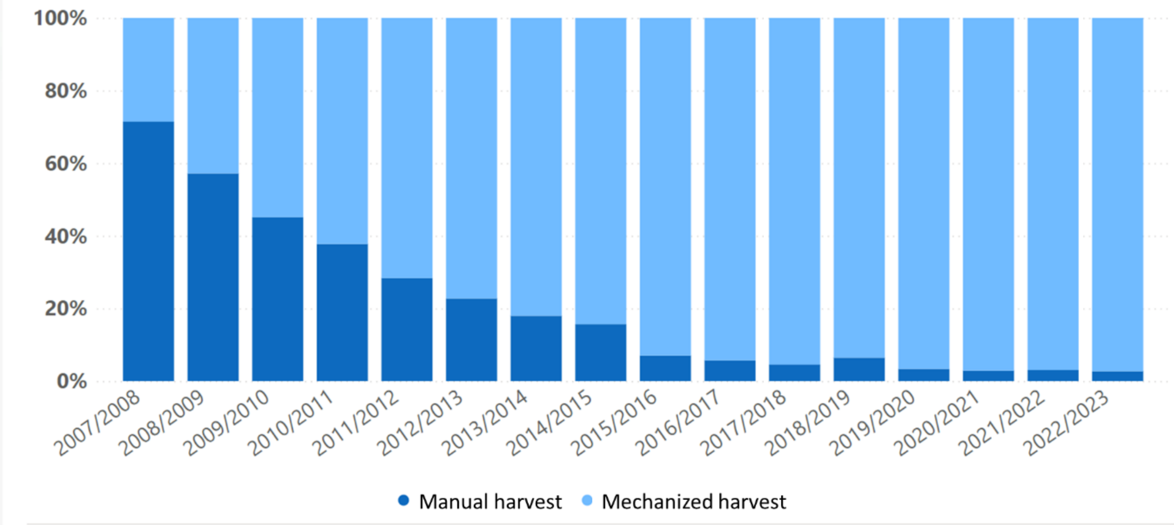

Figure 1: Ratio of manual and mechanized harvest in the Center-South region of Brazil.
Source: CONAB (Observatório da Cana)[3]

We again urge CARB to offer an option for self-declared mechanization percentage in the Tier 1 CI calculator. If for some reason this is not feasible, we respectfully ask staff to adjust the default mechanization values for Center-South Brazil to a value no lower than 95%. By doing so, CARB will be scoring input more closely to actual practice and will most likely avoid Tier 2 application requests from Brazilian mills, saving time and financial resources for both the Agency and the mills.

Straw Yield –
The CA-GREET3.0 calculator (sheet: Fuel_Prod_TS cell: CI269) considers a straw yield of 0.28 wet ton straw per tonne cane; wet straw containing 15% moisture. Our specialists were unable to identify the source of this combination of values, which leads to a dry straw yield of 0.238 dry ton straw per ton cane.
Scientific literature is consistently indicating the ratio of straw (tops and leaves) to cane stalks on about 140 kg (dry) per ton (fresh weight)[4,5], which is equivalent to 0.47 kg (dry) per kg (dry). More recent studies[6], on the other hand, have quantified the straw availability as 120 kg (dry) per ton (fresh), thus resulting in a 0.4 kg (dry) per kg (dry) ratio.

N2O from applied N – revise the Ratio of N2O – N ration from applied fertilizer to 0.6%, according to regional scientific evidence.

---

[3] CONAB. https://observatoriodacana.com.br/listagem.php?idMn=4
[4] S. J. Hassuani, M. R. L. V. Leal, and I. de C. Macedo (eds.), Biomass power generation: sugar cane bagasse and trash, (CTC ; PNUD, 2005).
[5] M. R. L. V. Leal, M. V. Galdos, F. V. Scarpare, J. E. A. Seabra, A. Walter, and C. O. F. Oliveira, ‘Sugarcane straw availability, quality, recovery and energy use: A literature review’, Biomass and Bioenergy, 53 (2013), 11–19.
[6] L. M. S. Menandro, H. Cantarella, H. C. J. Franco, O. T. Kölln, M. T. B. Pimenta, G. M. Sanches, S. C. Rabelo, and J. L. N. Carvalho, ‘Comprehensive assessment of sugarcane straw: implications for biomass and bioenergy production’, Biofuels, Bioproducts and Biorefining, 11/3 (2017), 488–504.

Currently CA-GREET 3.0 considers 0.01 kg-N2O-N/kg N-fert applied (IPCC recommendation). Independent studies found that the emission factors for regional-specific conditions (Tier 2) on the direct GHG emissions for sugarcane in Brazil are usually below the IPCC Tier 1 default value[7] due to the good drainage properties of the deep Oxisols, where sugarcane is commonly cultivated in Brazil. Carvalho et al. (2021)[8] developed an extensive work with field experiments combined with a thorough literature review. Its recommendation for the sugarcane ratoon, which receives most of the N application of the sugarcane areas and represents 4/5 of the sugarcane cycle, the average N2O–N EF from N fertilizer is 0.60%.

N2O and CH4 from vinasse transportation – eliminate such emissions.
CA-GREET 3.0 considers CH4 and N2O emissions from open channel transportation of vinasse, with an impact of approximately 0.24 gCO2e/MJ ethanol. Even though vinasse unlined tanks and open channels feature conditions that may lead to methane emissions (N2O emissions are very low), such transportation strategy does not reflect the regulatory conditions of vinasse logistics in Brazil. Regulations in the state of São Paulo, for example, have established back in 2005 schedules for impermeabilization of vinasse tanks and channels[9]. Furthermore, mills have also adopted systems based on closed tanks and pipes, which further reduce methane emissions during vinasse transportation[10]. Therefore, we recommend CARB to disregard CH4 and N2O emissions from open vinasse channels as a representative condition considered in CA-GREET as such conditions does not represent real practice.

Credits for electricity surplus –
One important revision is the value of electricity surplus credits kg CO2eq/MWh for sugarcane ethanol. The surplus electricity from sugarcane mills plays a fundamental role in the Brazilian electricity mix. Hydropower, which relies on water reservoirs and rainfall regimes, accounted for most of the electricity production in Brazil. Hydroelectric environmental restrictions often push the electric system to other sources (such as natural gas, or diesel) with much higher cost and emissions, but more reliability.
The periods of heaviest use of high-cost electricity sources are marked with “red flags,” as presented in figure 1. This occurs in the dry season (winter), when the reservoir levels of the hydroelectric plants are low, and the sugarcane harvesting is at its highest levels, avoiding the use of oil and natural gas power plants.

---

[7] The default value for EF_1 has been set at 1% of the N applied to soils or released through activities that result in mineralization of organic matter in mineral soils. But in the 2019 Refinement to the 2006 IPCC Guidelines, alternative emission factors, disaggregated by climatic zone and fertilizer type, are provided. In wet climates, the default value has been set at 0.6% of organic N inputs and 1.6% of synthetic N inputs. For $Frac_{LEACH-(H)}$ and EF_5, the new aggregated default values are 0.24 and 0.011, respectively.
[8] J. L. N. Carvalho, B. G. Oliveira, H. Cantarella, M. F. Chagas, L. C. Gonzaga, K. S. Lourenço, R. O. Bordonal, and A. Bonomi, ‘Implications of regional N2O–N emission factors on sugarcane ethanol emissions and granted decarbonization certificates’, Renewable and Sustainable Energy Reviews, 149 (2021), 111423.
[9] CETESB, São Paulo. Portaria CTSA – 01, de 28 de novembro de 2005. Dispõe sobre os prazos e procedimentos para a impermeabilização de tanques de armazenamento de vinhaça e de canais mestres ou primários, já instalados, de uso permanente para a distribuição da vinhaça destinada à aplicação no solo. São Paulo, 2005, publicada no Diário Oficial do Estado de São Paulo de 29 de novembro de 2005.
[10] Oliveira, et al.,2017. Methane emissions from sugarcane vinasse storage and transportation systems: Comparison between open channels and tanks. Atmospheric Environment. Volume 159, June 2017, Pages 135-146.

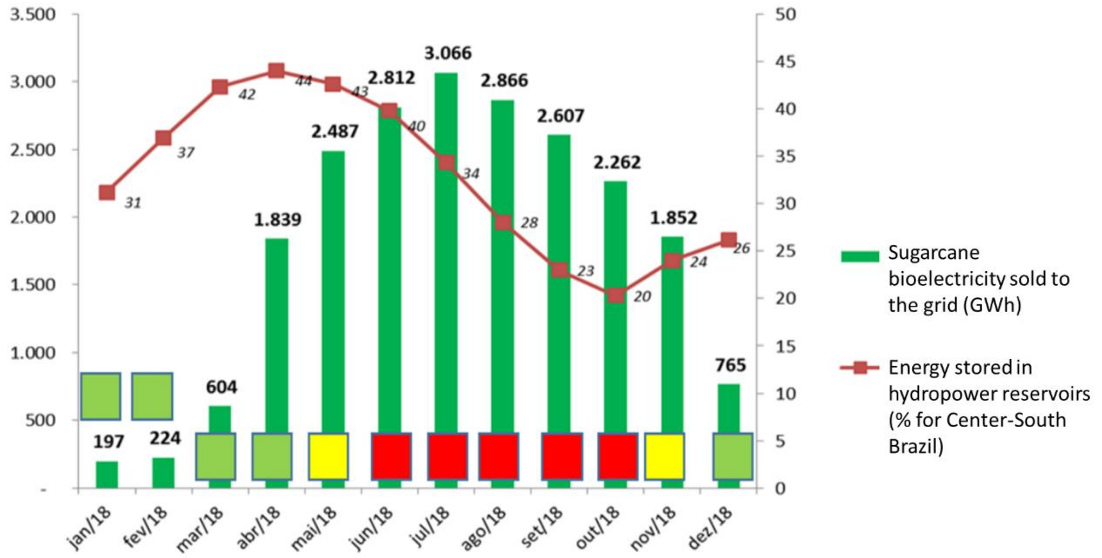

Figure 2: Production of bioelectricity versus hydroelectric reservoirs
Source: UNICA (2019)[11]

Therefore, the correct assumption to calculate electricity credits in Brazil is using electricity at the margin. This approach was taken by CARB in the initial regulation and should be reinstated.

Further, in Tier1 applications CARB is excluding export electricity credits generated in the off-season months from sugarcane ethanol CI calculations. Mills in Brazil have the option to store their own bagasse to produce electricity to be used in the off-season months to be exported to the grid, avoiding other more polluting sources from being tapped for energy. Brazilian sugarcane ethanol should not be penalized for this practice, and we urge CARB to reconsider this assumption and allow the use of these credits by Brazilian mills, especially considering that the calculator already backs out the electricity exports eventually generated from third party biomass, which excludes the possibility of gearing.

Allow optimization in international transport: Registration of more than a single logistical route for the same facility
Due to the geographical location of Brazil and some methodological choices made by CARB, logistics represent an important share of sugarcane ethanol emissions in the LCFS. The Tier 1 calculator does not allow for a mill to register more than one logistic route with different CIs. Due to this restriction, mills must register the most conservative logistical route.
As a result, there is no benefit in choosing the most optimized logistic with lower CI. This is an unnecessary burden for the LCFS program (and ultimately to Californians) and does not help to guide better decisions considering their environmental costs.
Further, we understand there is precedent of this pledge in the LCFS program, as one single mill can register more than one pathway. In at least one case, a single renewable diesel facility has different CIs depending on the origin of its feedstock. Similar flexibilities seems to be granted for RNG from manure. We would very much welcome the opportunity to engage in this discussion with staff.
As we mentioned below, maritime and onshore logistics can be easily tracked, particularly now that LCFS has third party verification. This also applies to pipeline logistics, which represents

[11] UNICA, "A bioeletricidade da cana," 2019, [Online]. Available: https://www.unica.com.br/wp-content/uploads/2019/07/UNICA-Bioeletricidade-julho2019-1.pdf.

much lower emission levels than the direct alternative in Brazil (trucks) but not currently captured in the modeling.

Maritime Transportation – backhaul

Evidence shows that back-haul penalties for maritime transportation of Brazilian ethanol to California is significantly overestimated. CARB's assertion that ocean tankers bringing ethanol fuel from Brazil to California will return empty to Brazil lacks evidence. CARB made clear that back-haul emission penalty is due to an overly conservative approach in case such empty (unlikely) return trips happen in the future so it can treat all biofuels fairly.

As previously mentioned, different UNICA member companies have tracked the vessels that transport their fuel to California and verified that they do not return empty to Brazil. Those companies traced at least 20 vessels from 2019 and 2020 shipments. The information provided by vessel´s operators corroborate to our explanation about logistics regarding oil/chemicals ships discharging ethanol in California, that they do not travel back empty to Brazil in any circumstances. They normally reload in the same port or somewhere else around US West Coast. If no option there, they usually load Vegoils out of Vancouver, or even Gasoline and Diesel in Central America. In the last case, they move to the Golf Coast to load chemicals like Styrene, EDC, Caustic Soda and others.

As for the logistics before loading in Brazil, our country is a net oil products (derivates) importer, as our national refining capacity is much lower than the local demand for fossil fuels, mainly diesel and gasoline. Also, Brazil imports a significant amount of ethanol annually. This scenario results at an over-supply of ships available for loading ethanol to exportation in our main ports. The reason is that these ships bring much more oil products and ethanol to Brazil than the amount of fuel we export. The graphs below illustrate the Brazilian balance for the export and import of oil products and ethanol.

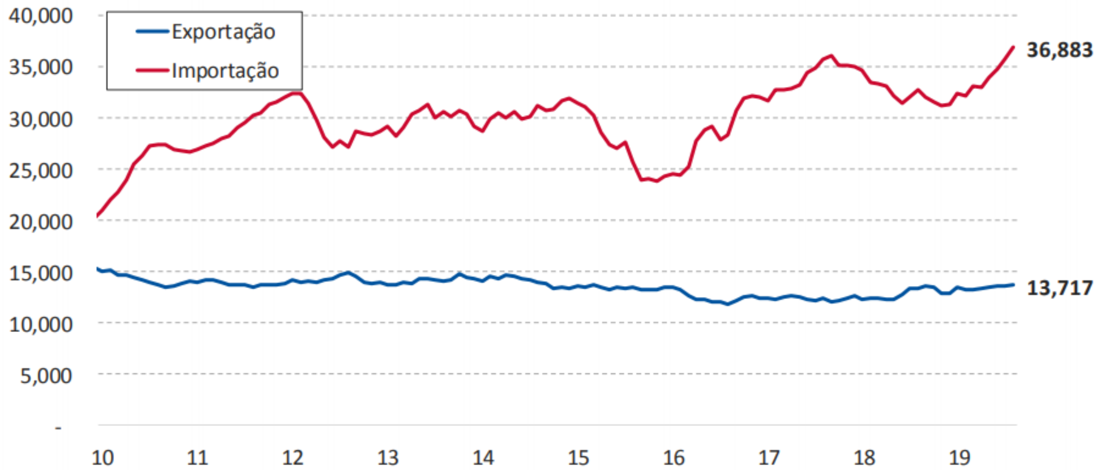

Figure 3: Brazil´s Import and Export of oil products derivates, in millions of liters, from 2010 to 2019.

Source: ANP 2020 (Oil and gas national agency)

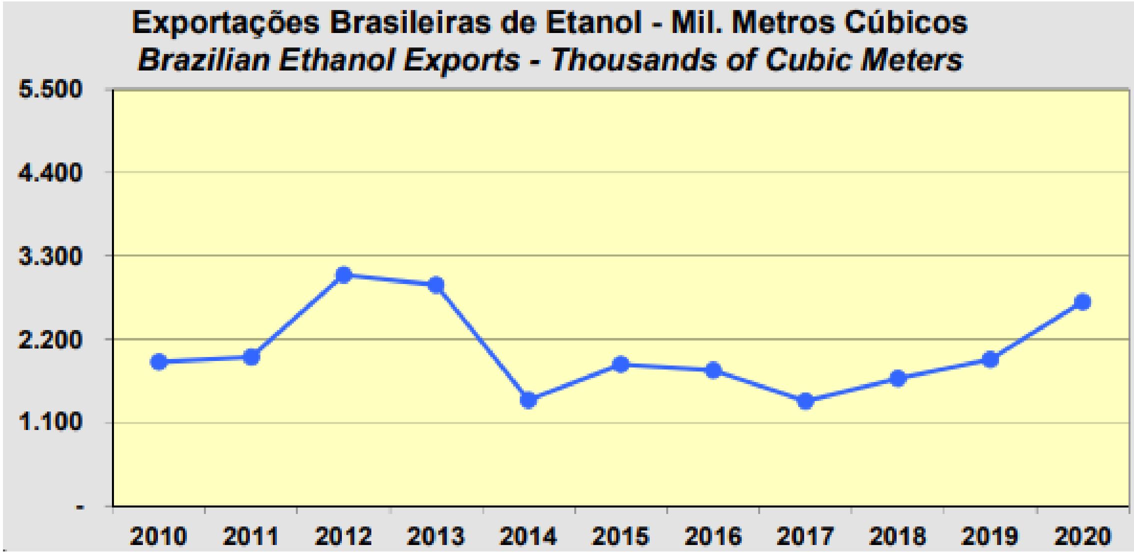

Figure 4: Brazilian Ethanol Exports, in millions of liters, from 2010 to 2020.
Source: UDOP 2020 – Bioenergy National Union

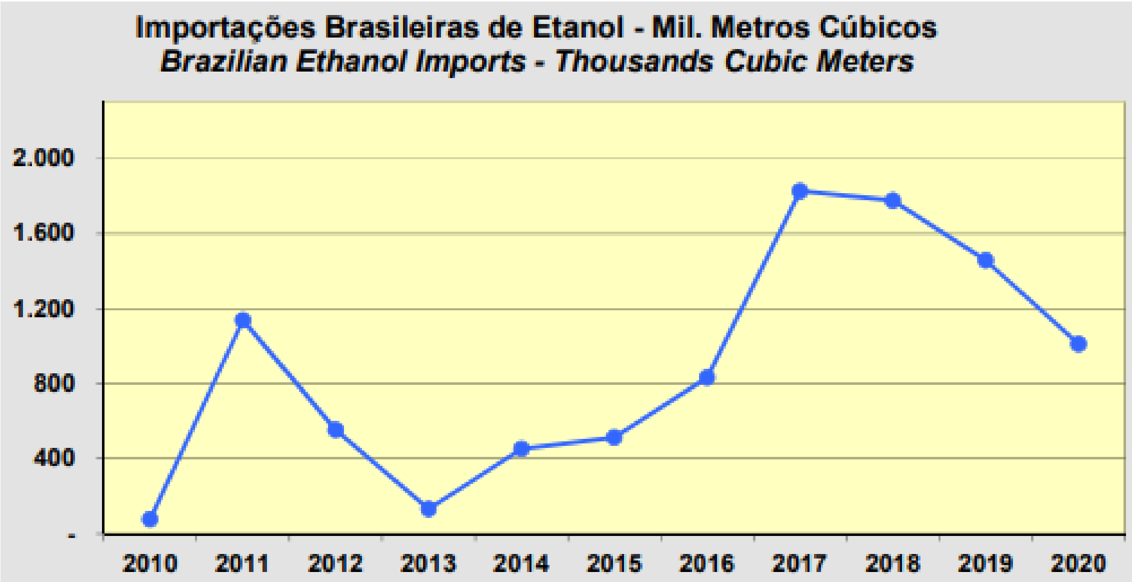

Figure 5: Brazilian Ethanol Imports, in millions of liters, from 2010 to 2020.
Source: UDOP 2020 – Bioenergy National Union

Taking the year of 2019 as reference, Brazil has imported 36.8 and exported 13.7 billion liters of oil products, resulting in 23.1 billion liters deficit of oil products. Also, Brazil has imported around 1.5 and exported 1.77 billion liters of ethanol.
This shows us that a significant higher volume of fuels (oil derivates) arrives in Brazil rather than leave the country annually, corroborating to the scenario stated by our mill's shipping chartering team and vessels operators that there is an over-supply of liquid fuel´s ships in Brazil.
It means that Brazilian´s fuel supplier companies do not need to hire empty vessels from overseas to export their products. These vessels are constantly available in our ports (mainly Santos port) and they have preference to load ethanol or oil products at the same port where they discharged in Brazil than travel to another place to load again due to the simple fact that this is more economically attractive.
Assuming the energy consumption and associated emissions of the ocean tanker's round trip be attributed to sugarcane ethanol is speculative and arbitrary. This approach causes a tremendous damage to Brazilian ethanol competitiveness in the California market.

We urge staff not to impose backhaul penalties on Brazilian sugarcane ethanol, since these penalties are not supported by data or shipping practices. Maritime logistics can be easily tracked, particularly now that the LCFS has third party verification, and the agency should defer to verification bodies to make a decision on such penalty, based on their traced data.

Recognize climate-smart agriculture practices in Brazil. Allow for gains in Soil Organic Carbon (SOC) that are supported by scientific literature and verifiable.

From Agroecological Zonings to the current Sao Paulo state's Greener Ethanol Protocol, there are several initiatives to consolidate and advance sustainable management practices in the sugarcane sector in Brazil. We now have a far greater understanding of the changes in C stocks when climate-friendly management practices such no till, crop rotation, conservation of riparian vegetation, sugarcane green harvesting, pasture recovery, and integrated systems are adopted. Unfortunately, most land use models (including the GTAP-AEZ_EF) didn't incorporate those improvements, nor did the LCFS. Although updated versions of those models should include scientific evidence in their structure, those gains can also be recognized at the field level using accurate indicators. Here we present evidence on the positive impacts of green harvesting compared to "burned fields" baseline and multicopying against "single cropping".

Sugarcane green harvesting

In areas previously occupied by sugarcane, changes in SOC for sugarcane depend on the harvesting technique. Sugarcane fields are replanted only after 5-6 years; thus, "perennial crop" is a better representation than "long-term cultivated crop" of all harvesting techniques. In contrast to traditional manual harvesting systems (where cane used to be burned in the pre-harvest), green harvest system can uptake as much as 1.02 to 1.87 Mg C ha-1 year-1 in topsoil when compared to areas under the traditional pre-harvest burning practices (La Scala Jr. et al., 2012[12]). Recent studies have shown a positive correlation between post-harvest straw maintenance and increased soil carbon content in Brazil (Cerri et al., 2014[13]; Ferreira et al., 2016[14]; Carvalho et al., 2017[15]; Bordonal et al., 2018[16]). According to a study developed by Ferreira et al. (2016), sugarcane absorbed 7.6 kg ha−1 of N (average of two sites) from the straw after 3 years of maintenance in the field Cerri et al. (2014) analyzed the impact of burning and unburned sugarcane straw on soil carbon content in two areas cultivated with sugarcane in the municipality of Ribeirão Preto-SP, one with clayey soil and another with sandy soil. The authors observed that in the clayey soil area, the unburned cane system stored 6.5 t C more than the burned cane system in the 0-20 cm layer. Even in the sandy soil environment, the increase was 4.87 t C/ha (Cerri et al., 2014). The authors conclude that preserving plant biomass makes it possible to sequester C in the studied soils. Carvalho et al. (2017) evaluated the impacts of sugarcane residue removal on soil C stocks in two areas of the state of São Paulo. In one of the sites, soil C stocks were reduced with the total removal of shoot residues, while the partial removal of sugarcane residues did not reduce soil C stocks in any of the areas (Carvalho et al. al, 2017).

Multicropping

---

[12] La Scala N Jr, De Figueiredo EB, Panosso AR (2012) A review on soil carbon accumulation due to the management change of major Brazilian agricultural activities. Braz J Biol 72:775–785. https://doi.org/10.1590/S1519-69842012000400012

[13] Cerri et al., 2017. CARBON STOCK IN SOIL AND GREENHOUSE GAS FLOWS IN THE SUGARCANE AGRO-SYSTEM. p.203-216. In Luis Augusto Barbosa Cortez (Coord.). Sugarcane bioethanol — R&D for Productivity and Sustainability, São Paulo: Editora Edgard Blücher, 2014. http://dx.doi.org/10.5151/BlucherOA-Sugarcane-SUGARCANEBIOETHANOL_23

[14] Ferreira et al., 2016. Contribution of N from green harvest residues for sugarcane nutrition in Brazil. GCB Bioenergy, 8, 859–866, 2016. doi: 10.1111/gcbb.12292.

[15] Carvalho JLN, Hudiburg TW, Franco HCJ, DeLucia EH (2017) Contribuição de resíduos de culturas de bioenergia acima e abaixo do solo para o carbono do solo. Glob Change Biol Bioenergy 9:1333–1343. https://doi.org/10.1111/gcbb.12411

[16] Bordonal et al., 2018. Sustainability of sugarcane production in Brazil. A review. Agronomy for Sustainable Development (2018) 38: 13. https://doi.org/10.1007/s13593-018-0490-x

La Scala et al. (2012) reviewed on the accumulation of SOC due to the change in the management of the main Brazilian agricultural activities[17]. The study review indicates that in soybean-corn and related rotation systems, there is significant soil carbon uptake throughout the year of conversion from conventional practices to no-till, with an average rate of 0.41 Mg C ha-1 yr-1. According to Dieckow et al. (2005, cited by La Scala et al., 2012), the main factors that contribute to the accumulation of C in the soil of annual crops are no-tillage and crop rotation with leguminous plants, which remove atmospheric nitrogen through a symbiotic interaction, leaving large amounts of dry matter on the soil surface. Petter et al. (2017) evaluated the effect of different agricultural management systems on carbon stocks in Latosols in southern Amazonia, in the Brazilian state of Mato Grosso[18]. The authors emphasize that the "management systems traditionally used in the Cerrado region characterized by the cultivation of soy monoculture and/or soybeans in the summer with second crop corn may not be sufficient to maintain C stocks in the Amazon", but the soybean-corn rotation system showed higher C stocks than the single soybean.

By-Products Optimization

The use of new technologies in the sugarcane industry has advanced significantly in recent years, especially regarding the potential to extract the energy content of its by-products, wastes and residues. A great example of this is the production of biogas from vinasse and filter cake, whose energy content of these residual raw materials can be extracted via the metagenesis process, without removing its nutritional characteristics, which are reused in sugarcane fields. In turn, the generated biogas can be purified and produce biomethane, a renewable gas that can directly replace natural gas in several industrial processes, or even diesel in automotive vehicles.
In this context, new investments for the energy reuse of sugarcane by-products can be unlocked with the support of decarbonization programs such as LCFS/CARB, and thus provide greater potential for reducing carbon emissions globally and support the program itself on reaching its carbon intensity reduction targets smoothly and within potential lower costs than other unproved technologies.
For that, we asked CARB to introduce the discussion of recognizing the reduction of carbon emissions generated by sugarcane by-products when displacing a fossil fuel, through the sugarcane-ethanol CI´s reduction. In our understanding, this recognition is provided for in the life cycle analysis methodology through the expansion of the LCA system´s boundaries, based on the consequential approach used by LCFS/CARB

***

We appreciate the opportunity to submit this feedback and we look forward to discussing with CARB staff the improvements to the scoring methodology in this upcoming rule making process.

Count on our continued support.

---

[17] La Scala Júnior, N., De Figueiredo, EB. and Panosso, AR. A review on soil carbon accumulation due to the management change of major Brazilian agricultural activities. Braz. J. Biol., v. 72, n. 3 (suppl.), p. 775-785, 2012. https://doi.org/10.1590/S1519-69842012000400012
[18] Fabiano André Petter, Larissa Borges de Lima, Leidimar Alves de Morais, Renan Francisco Rimoldi Tavanti, Marcos Eusébio Nunes, Onã da Silva Freddi, Ben Hur Marimon, Carbon stocks in oxisols under agriculture and forest in the southern Amazon of Brazil, Geoderma Regional, Volume 11, 2017, Pages 53-61, ISSN 2352-0094, https://doi.org/10.1016/j.geodrs.2017.09.001.

Sincerely,

Leticia Phillips

Representative-North America