

March 15, 2023

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

**RE: Comments on Public Workshop (February 22, 2023), specifically the crop-based fuels concerns**

Dear Dr. Laskowski,

Thank you for the opportunity to comment on potential LCFS regulation amendment concepts contained in the webinar and presentation given on February 22, 2023.

Advanced Biofuels Canada is the Canadian national trade association for advanced biofuels and renewable synthetic fuels. ABFC members produce a portfolio of liquid low-carbon fuels, sustainable feedstocks, intermediary products, and produce/consume low carbon gaseous products, such as renewable natural gas ('RNG') and low carbon hydrogen. Our members operate over 6 billion gallons of low carbon fuel production capacity globally and are significant suppliers to renewable and low carbon fuel regulations in Canada, the US, and worldwide. Many of our members have operations in both the United States and Canada.

Our organization has a long, detailed perspective on the questions raised by a limit on the use of crop-based biofuels. We were directly engaged over a period of five years in the development of an ISO standard, Sustainability Criteria for Bioenergy (ISO 13065:2015). We have also long advised Canadian federal and provincial governments on aspects of biofuel sustainability, some arising from the 2008 energy crisis that precipitated an examination of role of biofuels in food, feed, and other markets.

ABFC agrees with the statement on slide 41 that 'biofuel production must not come at the expense of deforestation or food production'. We address these two issues (deforestation, food production) below.

**Regarding deforestation**, ABFC's view is that the means of achieving this requirement are already in place by virtue of the fuels used in California's LCFS being cross-compliant with the US Environmental Protection Agency's (EPA) definition of *renewable biomass* used in the US Renewable Fuel Standard (RFS). This definition includes the requirement that renewable fuel feedstock derived from planted crops and crop residue must be from land cleared or cultivated prior to December 19, 2007. Adherence to this definition effectively prohibits deforestation-derived material from being used under renewable fuel/low carbon fuel programs in the United States. The definition is as follows:

*(1) Planted crops and crop residue harvested from existing agricultural land cleared or cultivated prior to December 19, 2007 and that was nonforested and either actively managed or fallow on December 19, 2007.<sup>1</sup>*

---

<sup>1</sup> 40 CFR § 80.1401 - Definitions.

By virtue of the approved petition for aggregate compliance under 40 CFR § 80.1457, which exists for both the United States and Canada, planted crops and crop residues harvested in both countries meet the definition of *renewable biomass* and are monitored annually to ensure that net agriculture expansion is avoided.

**We recommend that there is no additional action needed by CARB to statutorily require that low carbon fuels not be derived from deforestation-related feedstock.**

**Regarding food production**, ABFC contends that crop-based fuels should not create food insecurity. Assessing causation between biofuel production and food insecurity should be approached with clear-eyed rigour by regulators. Our perspective is that the California’s LCFS and similar programs that utilize a carbon intensity-based approach (e.g., Oregon’s CFP, British Columbia’s LCFS, and the Canadian federal Clean Fuel Regulations) have the distinct benefit of driving innovation to produce low carbon fuels more efficiently, from co-product streams or wastes, and from innovative agricultural practices, all to yield lower CI fuels that generate higher compliance values.

We note that the most visible renewable fuel programs that have included crop-based feedstock limitations (e.g., the EU Renewable Energy Directive as revised in December 2018) do not include a CI-based approach that spurs feedstock innovation as California’s LCFS is demonstrably achieving.<sup>2</sup>

In other words, California’s LCFS has built-in features that moderate crop-based fuel use by advantaging waste and residue feedstocks through lower CIs that create greater compliance values. This has led to their increased utilization and increasingly effective supply chains to provide these feedstocks.

- This trend is demonstrated by increased US availability of Distillers Corn Oil (DCO, an advantaged feedstock with a CI of 27 compared with soybean oil with a CI of 57) which grew 6% year-on-year in 2022 as ethanol producers chose enzymes and production processes to optimize DCO production.<sup>3</sup> (Soybean oil is referenced as it is the feedstock referenced in slides 39 and 40).
- US biofuel production from Used Cooking Oil (UCO) increased by 47% year-on-year while US UCO production fell by 2%, indicating the ability of biofuel producers to source foreign supplies of UCO.<sup>4</sup>
- Analysis suggests that there is more availability for biofuels to utilize all categories of beef tallow and pork white grease rather than solely expanding crop-based feedstock use. In 2022, biofuels used 28% of available US tallow, which analysts indicate as having more opportunity for use. 50% of white grease was used as biofuel feedstock, a further indication that expansion is possible.<sup>5</sup>
- The proportion of non-crop feedstock use in biodiesel and renewable diesel is increasing: 2022 included 49% of biofuel production from non-crop feedstocks such as tallow, white grease and UCO,

---

<sup>22</sup> [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2018.328.01.0082.01.ENG&toc=OJ:L:2018:328:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG&toc=OJ:L:2018:328:TOC)

<sup>3</sup> TPH&Co, RD Feedstock Update, February 16, 2023 (provided as appendix to submission)

<sup>4</sup> Ibid.

<sup>5</sup> Ibid.

compared with 48% the previous year.<sup>6</sup>

In addition to the above, agricultural supply chains are developing increased capacity to provide feedstock for expanded renewable fuel production. Canadian oilseed processing capacity is expected to expand by up to 5.7 million tonnes of oilseed crushing by 2026, adding to the ~11 million tonnes of existing oilseed crush capacity.<sup>7</sup> These additions will add the equivalent of 650 million gallons of feedstock. The December 2022 approval by EPA of canola pathways for RIN generation under the RFS makes Canadian canola supplies relevant in the assessment of overall feedstocks available to the US biofuels market (that includes the California LCFS). As mentioned previously, Canada's approved petition for aggregate compliance under 40 CFR § 80.1457 will require any increased canola supply to avoid net agriculture expansion.

**We recommend that CARB avoid instituting limits on crop-based feedstocks under the LCFS program in favour of allowing the market-signal of the LCFS's CI-based approach to drive innovation in the feedstock market. We recommend that CARB continue to publicly assess the relationship between deforestation, food insecurity, and crop-based biofuel feedstock to determine if there is rationale for specific action.**

We acknowledge the comment by Staff in slide 37 that the submissions received to the July 7, 2022, Public Workshop featured 'limited data, analysis and supporting documents'. In response to this, we append two publicly available reports that we believe will be useful to CARB as they assess this specific issue.

- TPH & Co., *RD Feedstock Update*: February 16, 2023
- LMC Lipid Feedstock Outlook to 2030, December 22, 2021

As per our August 2022 submission, ABFC respectfully submits that a limit on crop-based biofuels should not be advanced, and that imposing such a limit would significantly imperil California's transportation sector GHG reduction targets. Further, adoption of a crop-based limitation would be a significant material change to the regulatory signal, with repercussions on low carbon fuel supply chain investments.

We believe that maintaining the stability of the LCFS program is critical to attracting innovative technologies, while incenting incumbent sectors to improve their environmental performance. The continuous improvement in lowering registered CI score of biofuels over the past decade demonstrates the positive impact of the LCFS regulatory design.

Thank you for this opportunity to provide comments.

ADVANCED BIOFUELS CANADA

---

<sup>6</sup> Ibid.

<sup>7</sup> Canola Council of Canada, Canadian Canola Growers Association 2021

<https://www.ourcommons.ca/Content/Committee/432/RNNR/Brief/BR11459062/br-external/Jointly1-e.pdf>



### RD Feedstock Update

Encouraging trends in low-CI feedstock availability, with both underlying growth as well as biofuels taking share

February 16, 2023



Matthew Blair, CFA  
mblair@tphco.com

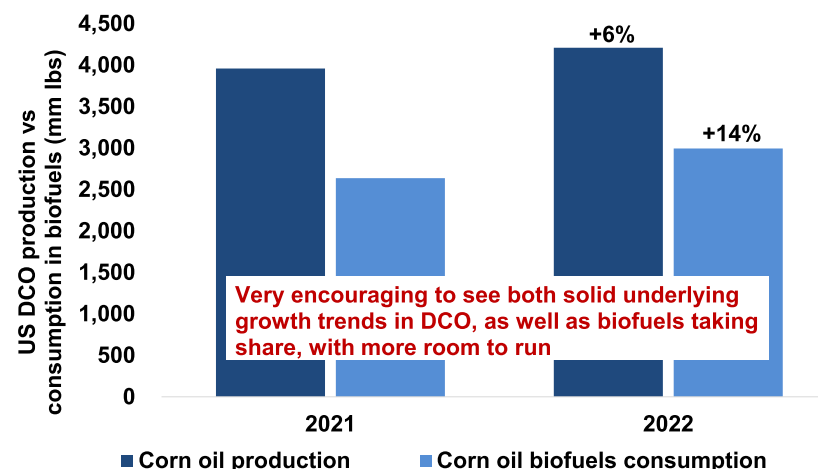
Kian Hidari  
khidari@tphco.com

Mike Chorney, CFA  
mchorney@tphco.ca

# RD Feedstock Update

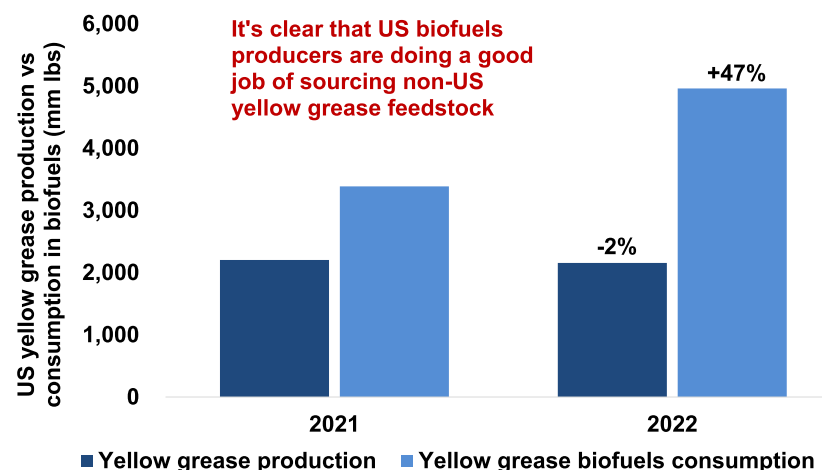
- **Positive.** Amidst a big wave of new renewable diesel (RD) capacity and legitimate questions on where the feedstock supply will come from, we are encouraged to see both underlying growth in low-carbon intensity feedstock production as well as biofuels taking share in these prized feeds.
- **Perhaps the most encouraging area is distillers corn oil**, which features a CI score of 27gCO<sub>2</sub>e/MJ, much lower than soybean oil at 57g. Underlying US DCO production rose +6% y/y in 2022, ahead of ethanol production at only +2%, as ethanol producers optimized enzymes to take advantage of attractive DCO pricing. Furthermore, biofuels consumption of DCO increased +14% last year as its share increased to 71% from 67%.
- **We also like the trends in yellow grease**, which has an even lower CI (21gCO<sub>2</sub>e/MJ). True, US yellow grease production eased up -2% last year and still remains below 2019 levels, which is a little bit of a headscratcher consider easing COVID restrictions that should allow consumers to return to restaurants. But it's clear that biofuels producers have done an excellent job of sourcing non-US yellow grease feedstocks, as consumption of yellow grease rose +47% last year and remains well above US production levels.

**US DCO production vs consumption in biofuels (mm lbs)**



Source: USDA, EIA, TPH

**US yellow grease production vs consumption in biofuels (mm lbs)**



Source: USDA, EIA, TPH

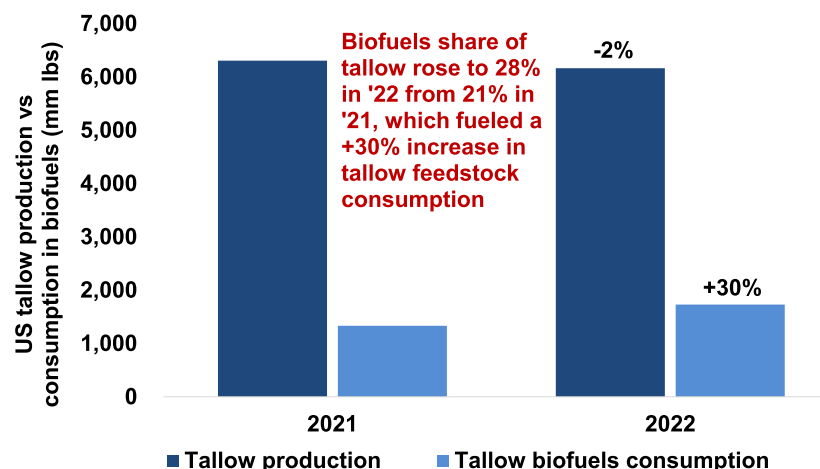
This report is intended for mblair@tphco.com. Unauthorized distribution prohibited.



# RD Feedstock Update

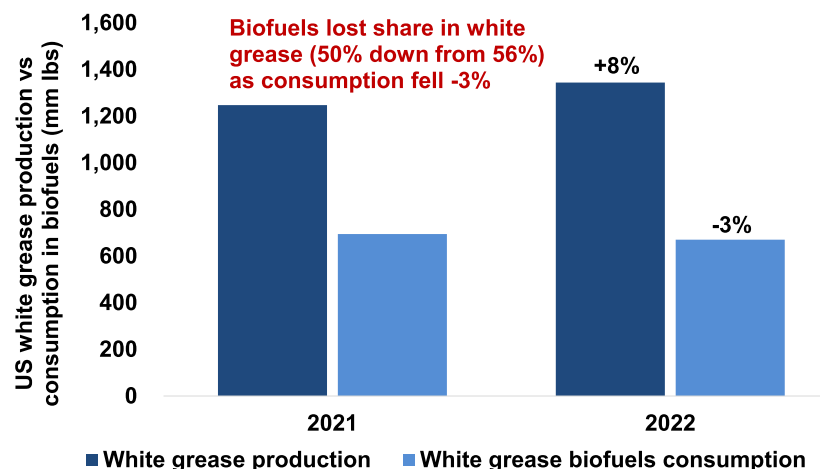
- **We see tallow (35gCO<sub>2</sub>e/MJ) as another area with plenty of opportunity.** US tallow production eased up -2% last year, moderately underperforming beef production rates, which rose +1%. However, tallow is still above pre-COVID levels. On the bright side, biofuels took share in tallow, with consumption rates rising a substantial +30%. There is plenty of room to run here, with biofuels currently only at 28% share in tallow.
- **The one area that was a little surprising was white grease (36gCO<sub>2</sub>e/MJ),** which actually featured the best underlying growth rate at +8%. This was much better than pork production rates that came off -2%. However, biofuels lost share in white grease (50% down from 56%) as consumption fell -3%. We still view white grease as an attractive area going forward.
- **Putting it all together, while US RD and BD production rose at least +24% in 2022, low-CI feedstock share actually slightly increased to 49% from 48% the year before.** We think this result would have been fairly surprising to market expectations from a few years ago. While pure-play biofuel names like DAR and NESTE are pretty set on low-CI feedstocks, this news is incrementally positive for new entrants to the space like CVI, DINO, MPC, PBF, and PSX, among others.

**US tallow production vs consumption in biofuels (mm lbs)**



Source: USDA, EIA, TPH

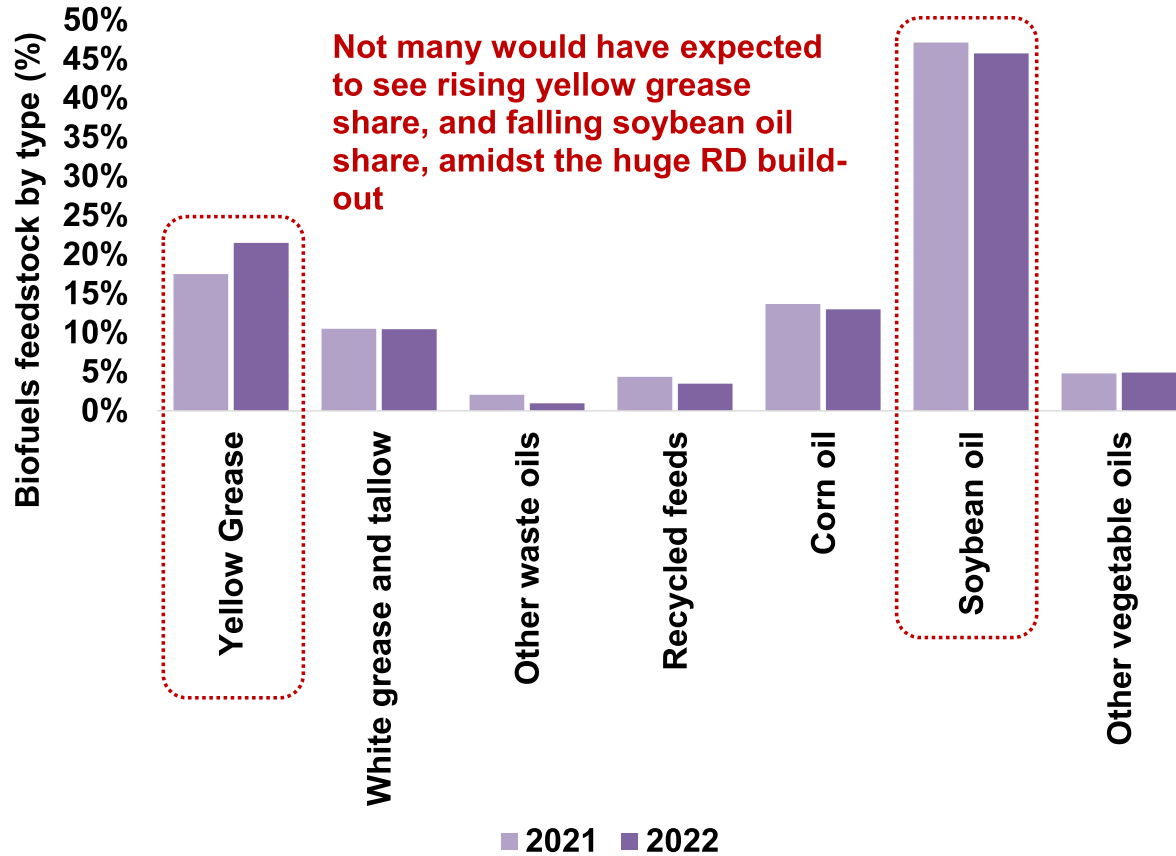
**US white grease production vs consumption in biofuels (mm lbs)**



Source: USDA, EIA, TPH

# RD Feedstock Update

*US RD/BD feedstock mix in 2021 vs 2022 (%)*



Source: EIA, TPH

# Renewable Fuels Comp Sheet

Company	Ticker	2/15/23 Price (per shr)	TPH Analyst	Rating	Target Price (per shr)	Expected Return (%)	Market Cap (\$/€mm)	Enterprise Value (\$/€mm)	Net Debt/Cap (%)	Dividend Yield (%)	Stock Performance (%)															
											2019	2020	2021	2022	YTD'23											
<i>Renewable Diesel</i>																										
Darling Ingredients	DAR	\$68.47	Matthew Blair	Buy	\$78.00	14%	\$11,175	\$15,494	46%	0.0%	46%	105%	20%	-10%	9%											
Neste Corp	NESTE	€45.39	Matthew Blair	Hold	€48.00	6%	€34,863	€36,212	14%	1.8%	42%	94%	-25%	1%	6%											
<i>RNG</i>																										
Aemetis	AMTX	\$4.93	Matthew Blair	Hold	\$8.00	62%	\$171	\$392	977%	0.0%	37%	200%	394%	-68%	24%											
Clean Energy Fuels	CLNE	\$5.97	Matthew Blair	Buy	\$7.50	26%	\$1,327	\$1,334	0%	0.0%	36%	236%	-22%	-15%	15%											
Montauk Renewables	MNTK	\$10.91	Matthew Blair	Sell	\$8.00	-27%	\$1,557	\$1,524	-17%	0.0%	nmf	nmf	7%	8%	-1%											
OPAL Fuels	OPAL	\$7.90	Matthew Blair	Buy	\$10.00	27%	\$0	\$597	40%	0.0%	nmf	nmf	nmf	-27%	9%											
<i>Ethanol</i>																										
Alto Ingredients	ALTO	\$3.16	(Not covered)	Not rated	nmf	nmf	\$229	\$257	7%	0.0%	-25%	735%	-11%	-40%	10%											
Andersons	ANDE	\$43.58	(Not covered)	Not rated	nmf	nmf	\$1,460	\$2,297	36%	1.7%	-13%	0%	61%	-8%	25%											
Green Plains	GPPE	\$36.76	(Not covered)	Not rated	nmf	nmf	\$2,180	\$2,350	19%	1.3%	20%	-15%	164%	-12%	21%											
<b>Average</b>						<b>18%</b>			<b>125%</b>	<b>1%</b>	<b>20%</b>	<b>194%</b>	<b>73%</b>	<b>-19%</b>	<b>13%</b>											
												<b>EPS (\$/€ per shr)</b>					<b>Free Cash Flow (\$/€mm)</b>					<b>Recurring EBITDA (\$/€mm)</b>				
Company		2021	2022e	2023e	2024e	2025e	2021	2022e	2023e	2024e	2025e	2021	2022e	2023e	2024e	2025e										
<i>Renewable Diesel</i>																										
Darling Ingredients		\$4.06	\$5.25	\$6.26	\$6.60	\$6.52	\$424	\$537	\$943	\$1,281	\$1,249	\$1,235	\$1,554	\$1,934	\$1,972	\$1,933										
Neste Corp		€1.53	€3.04	€3.29	€2.39	€2.24	€1,017	(€548)	€1,519	€810	€680	€1,915	€3,472	€3,554	€2,770	€2,640										
<i>RNG</i>																										
Aemetis		(\$1.26)	(\$1.19)	(\$0.16)	(\$0.05)	\$0.80	(\$47)	(\$54)	(\$71)	(\$246)	(\$127)	(\$7)	(\$3)	\$44	\$71	\$170										
Clean Energy Fuels		\$0.04	(\$0.05)	\$0.05	\$0.49	\$0.83	\$18	\$5	(\$67)	\$225	\$255	\$57	\$56	\$88	\$201	\$284										
Montauk Renewables		(\$0.02)	\$0.31	\$0.22	\$0.43	\$0.59	\$33	\$58	\$16	\$48	\$73	\$28	\$77	\$61	\$97	\$125										
OPAL Fuels		(\$0.57)	\$1.26	\$2.17	\$3.75	\$6.97	(\$71)	(\$72)	(\$163)	(\$57)	\$67	\$41	\$60	\$105	\$183	\$298										
<i>Ethanol</i>																										
Alto Ingredients		\$0.39	\$0.23	\$1.84	\$2.99	\$2.97	(\$7)	\$27	\$179	\$398	\$398	\$61	\$54	\$167	\$255	\$305										
Andersons		\$2.68	\$3.47	\$2.92	nmf	nmf	nmf	nmf	nmf	nmf	nmf	\$324	\$365	\$323	nmf	nmf										
Green Plains		(\$0.83)	(\$1.79)	\$1.16	\$2.66	\$4.34	(\$162)	(\$285)	(\$6)	\$173	\$438	\$112	\$51	\$262	\$375	\$500										
												<b>PE Ratio (x)</b>					<b>FCF Yield (as % of Market Cap)</b>					<b>EV/EBITDA Multiple (x)</b>				
Company		2021	2022e	2023e	2024e	2025e	2021	2022e	2023e	2024e	2025e	2021	2022e	2023e	2024e	2025e										
<i>Renewable Diesel</i>																										
Darling Ingredients		17x	13x	11x	10x	11x	4%	5%	8%	11%	11%	10.7x	10.0x	8.2x	7.6x	7.4x										
Neste Corp		34x	15x	14x	19x	20x	3%	-2%	4%	2%	2%	20.6x	10.4x	10.1x	13.0x	13.8x										
<i>RNG</i>																										
Aemetis		nmf	nmf	nmf	nmf	6x	nmf	nmf	nmf	nmf	nmf	nmf	nmf	10.2x	9.6x	4.8x										
Clean Energy Fuels		nmf	nmf	nmf	12x	7x	1%	0%	-5%	17%	19%	32.8x	23.8x	20.7x	9.0x	6.2x										
Montauk Renewables		nmf	35x	nmf	26x	19x	2%	4%	1%	3%	5%	51.8x	19.7x	25.2x	15.8x	12.1x										
OPAL Fuels		nmf	6x	4x	2x	1x	nmf	nmf	nmf	nmf	nmf	nmf	2.2x	2.9x	2.1x	1.1x										
<i>Ethanol</i>																										
Alto Ingredients		8x	14x	2x	1x	1x	nmf	12%	78%	174%	174%	4.2x	4.7x	1.5x	1.0x	0.8x										
Andersons		16x	13x	15x	nmf	nmf	nmf	nmf	nmf	nmf	nmf	7.1x	6.3x	7.1x	nmf	nmf										
Green Plains		nmf	nmf	32x	14x	8x	nmf	nmf	0%	8%	20%	20.9x	nmf	9.0x	6.3x	4.7x										
<b>Average</b>		<b>19x</b>	<b>16x</b>	<b>13x</b>	<b>12x</b>	<b>9x</b>	<b>3%</b>	<b>4%</b>	<b>14%</b>	<b>36%</b>	<b>39%</b>	<b>19.9x</b>	<b>11.0x</b>	<b>10.5x</b>	<b>8.0x</b>	<b>6.4x</b>										

nmf: not meaningful, Neste figures in Euros

Source: Company filings, Bloomberg, FactSet, TPH



## Disclosure

### GENERAL DISCLOSURES

For a glossary of oil patch terms, abbreviations, slang and stock tickers, click here: [TPH&Co. Glossary](#).

Securities offered through Tudor, Pickering, Holt & Co. Securities, LLC: Member - FINRA/SIPC and Tudor, Pickering, Holt & Co. Securities – Canada, ULC: Member - New SRO/CIPF. FINRA Rule 2241 and IROC Rule 3600 Part B require certain disclosure and compliance in research reports. Specifically, we are required to provide disclosure of potential conflicts of interest between TPH&Co. and our clients. The conflicts which must be disclosed include: **(1)** Whether or not TPH&Co. and its affiliates own 1% or more of the outstanding shares of any active covered company in our research universe. **(2)** Whether or not one or more of the TPH&Co.'s Research Analysts (or members of their household) have a long or short position in the debt or equity securities of the subject company of a research report. **(3)** Any services provided to a subject company of a research report by any Partner, Director, or Officer of TPH&Co., or the Analyst(s) involved in the preparation of the report, other than services provided in the normal course of investment advisory or trade execution services for remuneration during the 12 months immediately preceding the date the research report or recommendation was issued. **(4)** Any investment banking services or non-investment banking services provided by TPH&Co. or its affiliates to the subject company of a research report for remuneration during the 12 months immediately preceding the date the research report or recommendation was issued. **(5)** The name of any Partner, Director, Officer or employee of TPH&Co. who is also a Partner, Director, Officer or employee of the subject company of a research report, or who serves in an equivalent advisory capacity to the subject company. **(6)** If the Analyst(s) received any compensation from the subject company in the previous 12 months. **(7)** If TPH&Co. is making a market in any equity security or equity related security of the subject company of a research report. **(8)** If within the past 12-months of the date of publication of a research report and while employed by TPH&Co., the publishing Canadian Analyst(s) responsible for creating the report have visited the operations of the subject company. **(9)** Any other material conflict of interest known to the Analyst(s) at the time of publication. **Where TPH&Co.'s response to any particular conflict disclosure is to the negative, then no disclosure for that conflict will be provided.** TPH&Co. does not receive compensation for any non-securities related services.

**This product constitutes a macro/sector report or a "compendium report"** (i.e., it covers six or more subject companies). As such, TPH&Co. chooses to provide specific disclosures for the subject companies by reference, where applicable. To access conflict of interest and other disclosures for the subject companies, please refer to [https://tphco.bluematrix.com/sellside/ Disclosures.action](https://tphco.bluematrix.com/sellside/Disclosures.action) and select the company from the drop-down list provided at the top of the page.

### REGULATORY DISCLOSURES

**Analyst Certification:** The following individuals do hereby certify that, to the best of their knowledge, the views and opinions in this research report accurately reflect their personal views about the company and its securities. They have not nor will they receive direct or indirect compensation in return for expressing specific recommendations or viewpoints in this report: Matthew Blair, Kian Hidari and Mike Chorney

**Analyst Compensation:** The compensation of Research Analysts is intended to reflect the value of the services they provide to the Firm. As with most other employees, the compensation of Research Analysts is impacted by the overall profitability of the firm, which may include revenues from corporate finance activities of the Firm's Investment Banking department. A Research Analyst's compensation is not, however, directly or indirectly related to any specific investment banking transaction or any recommendation or view expressed in a research report.

**Content Creation - US:** The following analysts were involved in creating or supervising the content of this research report: Matthew Blair and Kian Hidari. Tudor, Pickering, Holt & Co. Securities, LLC contributed to this research report.

**Content Creation - Canada:** The following analysts were involved in creating or supervising the content of this research report: Mike Chorney. Tudor, Pickering, Holt & Co. Securities – Canada, ULC contributed to this research report.

**Foreign Research Analyst Disclosure:** The following individuals contributed to this research report. These individuals are employed by Tudor, Pickering, Holt & Co. Securities – Canada, ULC and are not registered / qualified as a research analyst with FINRA. Further, these individuals are not associated persons of Tudor, Pickering, Holt & Co. Securities, LLC and, as such, are not subject to FINRA Rule 2241 restrictions on communications with subject companies, public appearances and trading securities held by a research analyst account: Mike Chorney.

**Dissemination of Research:** The Firm's investment research is available to our clients on a confidential basis. Clients of the Firm may request to receive our research reports by email or hardcopy. Requests for access to our research should be sent to the Research Department at [TPHEnergyResearch@tphco.com](mailto:TPHEnergyResearch@tphco.com). Senior management of the Securities Department reviews all requests to receive research reports and related information. Approval to receive our Firm's investment research is based on the given client being in good standing with the Firm and in compliance with regulatory requirements. The Firm's research reports are for the exclusive use of the client to which the research report was sent by the Firm and may not be reproduced or redistributed without the Firm's express written consent.

**Institutional Communication Only:** Under FINRA Rule 2210, Tudor, Pickering, Holt & Co. Securities, LLC email communications are deemed institutional sales material and are not meant for distribution to retail investors. Recipients should not forward TPH&Co. email communications to a retail investor.

**OTHER DISCLOSURES: Trade Name:** TPH&Co., TPH & Co. and Tudor, Pickering, Holt & Co. are the global brand names for Tudor, Pickering, Holt & Co. Securities, LLC (TPHS), Tudor, Pickering, Holt & Co. Securities – Canada, ULC (TPHC), Perella Weinberg Partners LP (PWP), and Perella Weinberg UK Limited (PWUK). **Legal Entities Disclosure:** U.S.: TPHS is a member of FINRA and SIPC. Canada: TPHC is a member of New SRO and CIPF. **Canada:** This report is not, and under no circumstances should be construed as, a solicitation to act as securities broker or dealer in any jurisdiction by any person or company that is not legally permitted to carry on the business of a securities broker or dealer in that jurisdiction. To the full extent permitted by law neither TPH&Co. nor any of its affiliates, nor any other person, accepts any liability whatsoever for any direct, indirect or consequential loss arising from, or in connection with, any use of this report or the information contained herein. No matter contained in this document may be reproduced or copied by any means without the prior written consent of TPH&Co. in each instance. All opinions and estimates contained in this report constitute TPH&Co.'s judgement as of the date of this report, are subject to change without notice and are provided in good faith but without legal responsibility. Nothing in this report constitutes legal, accounting or tax advice or individually tailored investment advice. This report is not an offer to sell or a solicitation of an offer to buy any securities. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. In accordance with the Canadian Anti-Spam Legislation, TPHC has implied consent from you as a member of the investment community with whom we have already established a relationship through business discussions or dealings, or your email address was made available to TPHC. However, if you are Canadian and wish to stop receiving ANY emails from TPHC (and its affiliated companies), please send an email to [UnsubscribeCanada@TPHco.com](mailto:UnsubscribeCanada@TPHco.com). Please note that this does not apply if you are an existing client and New SRO rules and regulations require us to continue to send you critical email communications. **United Kingdom:** This publication is produced by Tudor, Pickering, Holt & Co. Securities, LLC which is regulated in the United States by FINRA. It is to be communicated only to persons of a kind described in Articles 19 and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005. It must not be further transmitted to any other person without our consent. Any other person should not rely on or act upon the content of this publication. Persons falling within Article 19 include authorised or exempt investment firms, UK or overseas governments, UK or overseas local authorities or international organisations. Person falling within Article 49 include companies or unincorporated associations with net assets or called-up share capital of £5 million or subsidiary companies of the same that have net assets or called-up share capital of £500,000. **Copyright TPH&Co. 2023**

# LMC Lipid Feedstock Outlook to 2030

## Rationale for the Study

- Demand for biofuels globally is growing strongly, particularly for biomass-based diesel, as countries aim to meet environmental goals.
- The Advanced Biofuels Association has set a goal for the U.S. to reach 21 billion gallons of biomass-based diesel (BBD) to replace fossil fuels by 2040.
- To reach this goal means 9 billion gallons of BBD by 2030.
- **The critical question: *Will there be enough lipid feedstock to meet this demand?***
- The ABFA commissioned LMC International<sup>1</sup> to forecast the outlook for supply of lipid feedstocks to determine their ability to meet the ABFA's goal.

## Lipid supply outlook to 2030

LMC International forecasts total global lipid supply to increase from 246 million metric tons in 2020 to 330 million metric tons in 2030. We include all lipid sources<sup>2</sup> in our analysis to form a full picture of the global market. (Diagrams 1-3)

**In 2030, this volume of lipids will be the equivalent of 93 billion gallons of renewable diesel (RD), if all global lipids are converted to RD. (Diagram 1)**

- Of this total, **RFS-approved feedstocks** are rising by 55 million metric tons to 171 million metric tons in 2030.

This is equivalent to **55 billion gallons** of RD in 2030.

- **Potentially approved feedstocks** are rising by 25 million metric tons to 134 million metric tons in 2030.

This is equivalent to **38 billion gallons** of RD in.

- **Other oils**<sup>2</sup> are rising by 4 million metric tons to 25 million metric tons in 2030.

This is equivalent to **7 billion gallons** of RD.

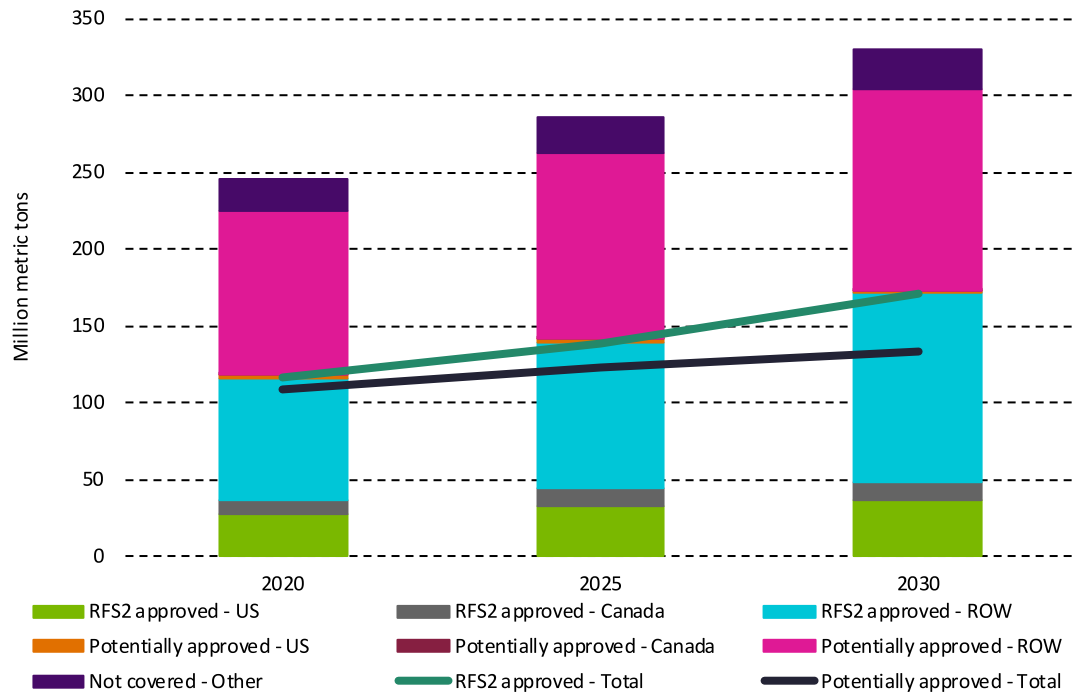
---

<sup>1</sup> LMC International is a consulting firm specializing in global economic and market analysis of agricultural feedstocks and their major end products, with a special focus on biofuels.

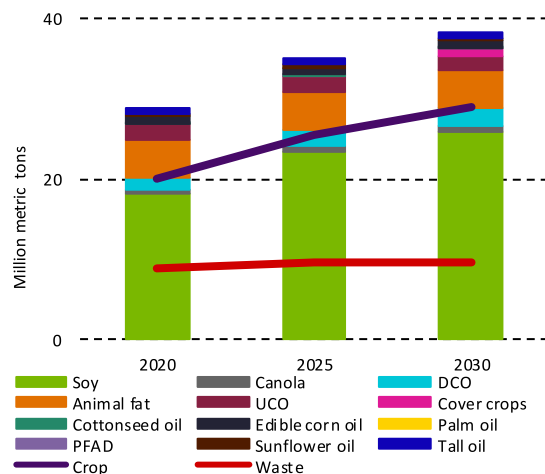
<sup>2</sup> Other oils includes oils such as palm that are not RFS-approved and are ruled out of several biofuel policies, but that are a significant source of vegetable oil for a range of end uses around the world. We include more niche or specialty oils, too, in our total, although they are not analyzed in detail.

*Note:* It is important to include both RFS-approved and other lipid sources, as our objective is to look at demand for lipids from all end uses from all countries. So, to exclude a source of supply would create a false deficit.

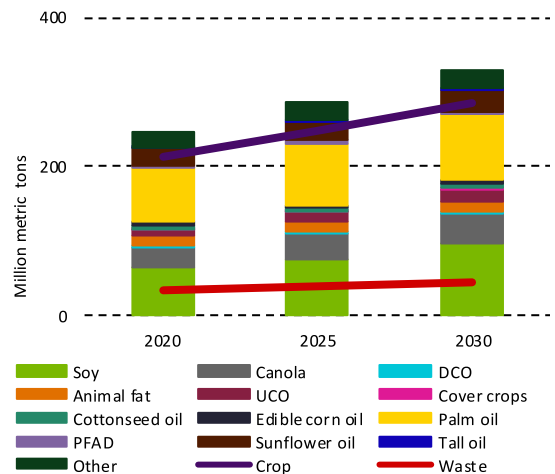
**Diagram 1: Global oils and fats supply forecast to 2030**



**Diagram 2: U.S. feedstock supply forecast to 2030 – by feedstock**



**Diagram 3: Global feedstock supply forecast to 2030 – by feedstock**





**In the U.S.**

- Soy oil has the most potential for growth in the U.S. We forecast volumes in terms of oil-in-seed. If more beans are crushed locally, that could increase available oil supplies compared to current U.S. production.
- Waste oils have only limited potential for increased growth in the U.S., as collection and extraction rates are already high.

**Outside North America**

- There is greater potential for growth in waste oils supply in countries with less developed collection networks. These supplies could be even higher than assumed in our forecasts, if prices are high enough to incentivize collection/extraction.
- Palm oil is a significant source of lipid supply to the world market. However, palm oil growth is set to slow and other oils will make up a growing proportion of the market.

**Lipid demand to 2030**

To assess whether the U.S. will be able to meet the ABFA goal, we take a tiered approach.

1. First, we remove the supply needed to meet demand from non-biofuel end uses (food, feed and oleochemicals). These end uses are inelastic – the need for them is relatively fixed and is not impacted by price.

*It is important to note that our analysis allows fully for food requirements before evaluating the feedstock supply for biofuels.*

2. Then, we remove the demand from biofuels in four other markets with strong biofuel policies. (This is arguably overly conservative in that the U.S. might well come 2nd in line for feedstocks, after the EU, not 5th. In addition, of course, if policies in the U.S. change, the relationship with other markets with biofuels policies could change.)
3. The remaining volume is then compared to the required volume needed to meet ABFA's U.S. biofuel target.

**In 2030, demand for lipids in non-biofuel end uses plus biofuels in the four countries outside of the U.S. with strong environmental biofuel policies is set to rise to 260 million metric tons. This leaves 70 million metric tons available for use in the U.S. (as well as other countries), equivalent to 19 billion gallons of RD.**

- Global demand for non-biofuel end uses (food, feed and chemicals) is forecast to rise from 168 million metric tons in 2020 to 210 million metric tons in 2030.
- Demand for lipids from biofuels in the four key biofuel consuming countries is forecast to reach 51 million metric tons in 2030, up from 24 million metric tons in 2020 (assuming all biomass-based diesel fuels are made solely from lipids).

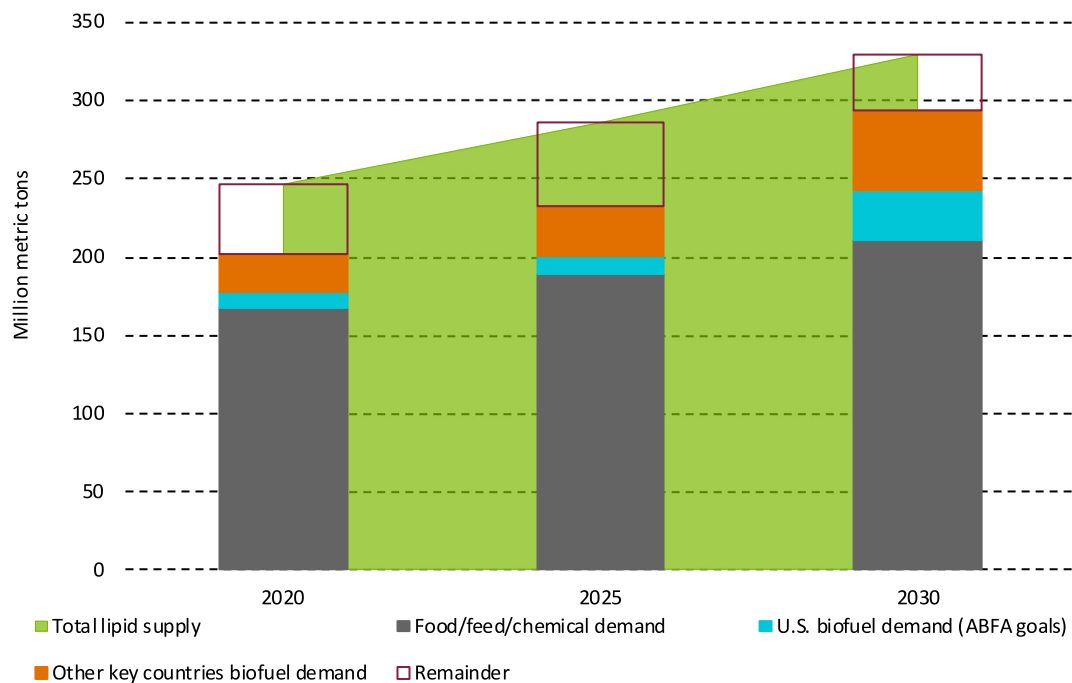
## Conclusions

To meet the ABFA goal of 21 billion gallons of biomass-based diesel in 2040, we estimate that consumption will need to reach close to 9 billion gallons in 2030.

If all of this volume is produced from lipid feedstocks, it will require 32 million metric tons of lipids.

To 2030, feedstock supplies available for use in the U.S. are more than enough to meet our forecast demand, *after accounting for food*.

Diagram 4: Global lipid market forecast to 2030, supply vs. demand



In the long term, other technologies will need to progress to produce increasing volumes of sustainable aviation fuel (SAF) to allow for the ambitious growth targeted in the U.S. and around the world.<sup>3</sup>

<sup>3</sup> The exact amount of lipids required will depend on the type of biomass-based diesel produced, the feedstock, and the technology used, as conversions vary with each factor. Our estimate of lipid demand is based on LMC’s assumptions of the progression of biodiesel (BD), renewable diesel (RD) and SAF. The conversion factors assumed are:

BD: 1.05 mt lipids per 1 mt of BD, 299.2 gals per mt

SAF: 1.4 mt lipids per 1 mt of SAF, 348.2 gals per mt

RD: 1.2 mt lipids per 1 mt of RD, 339.3 gals per mt

**U.S. supply of RFS-approved feedstocks**

Currently, U.S. demand for lipid feedstocks for biofuels can be met easily by U.S. oils supply, taking just over one-third of the total in 2020.

By 2030, U.S. biofuel use will require close to 90% of total U.S. supply of RFS-approved feedstock.

**Diagram 5: RFS-approved feedstock supply vs. demand for lipids for U.S. biofuels**

