March 15, 2023

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

Dear Dr. Laskowski:

The Clean Fuels Alliance America (Clean Fuels)[1] and California Advanced Biofuels Alliance (CABA)[2] appreciate the opportunity to provide comments on the February 22nd Low Carbon Fuel Standard (LCFS) workshop to discuss potential changes to the LCFS program. Clean Fuels and CABA have been longtime supporters of the state's overall climate and air quality improvement goals and have collaborated frequently with CARB staff toward achieving those goals. We continue to support California's efforts to decarbonize its economy, especially the transportation sector, with a comprehensive all-of-the-above suite of measures.

In addition, the comments below are supported by the American Soybean Association (ASA). ASA represents approximately 500,000 American soybean farmers on domestic and international policy issues important to the soybean industry and has 26 affiliated state associations representing 30 soybean-producing states. American soybean growers have long been committed to producing the world's food, feed, fuel, and thousands of other bioproducts in a sustainable and climate-smart way.

Clean Fuels and CABA California member producers and marketers support over 3,900 well-paying jobs in the state and about $960 million in economic activity each year. Further, the biodiesel, renewable diesel, and sustainable aviation fuel supplied to the state by our California and national members are collectively the single largest source of GHG reductions in the LCFS,

[1] Clean Fuels (formerly the National Biodiesel Board) is the U.S. trade association representing the entire supply chain for biodiesel, renewable diesel, and sustainable aviation fuel. The name change reflects our embrace of all the products Clean Fuels members and the U.S. industry are producing, which include biodiesel, renewable diesel, sustainable aviation fuel, and Bioheat® fuel for thermal space heating. Our membership includes over 100 farmers, producers, marketers, distributors, and technology providers, and many are members of environmental organizations supportive of state and local initiatives to achieve a sustainable energy future.

[2] California Advanced Biofuels Alliance is a not-for-profit trade association promoting the increased use and production of advanced biofuels in California. CABA represents biomass-based diesel (BMBD) feedstock suppliers, producers, distributors, retailers, and fleets on state and federal legislative and regulatory issues.

providing nearly half[3] (44-45%) of the carbon reductions since 2017, more than any other fuel including electricity, and 42% since the start of the LCFS. Our fuels have grown to the point where fully a third (33%) of each gallon on average of diesel fuel consumed in the state in 2021 – and about 46% of the diesel pool in the first three quarters of 2022 – consisted of our industry's low-carbon fuels.[4] Our sustainable replacements for petroleum diesel have been a major factor in driving California's continuing large-scale transformation of transportation from petroleum based toward a carbon neutral system. In short, the LCFS would not be the success it is today, and one the state is looking to export to other jurisdictions, without the key role our diesel replacements have played. More to the point, our liquid petroleum replacement fuels remain the only viable, large-scale alternatives for the next several decades to decarbonizing the most difficult-to-electrify sectors: heavy duty on- and off-road, marine, rail, and aviation.

To the extent our previous concerns have not been addressed in staff's proposed changes discussed at the February 2023 workshop, we reiterate and incorporate by reference our previous comments.[5] Many of the following points were also raised in Clean Fuels' presentation to CARB staff, which is included as Attachment 1.

Carbon Intensity (CI) Reduction Targets

Support for 30%/35% Targets Without Virgin-Oil Credit Cap. We commend CARB staff for maintaining a focus on strengthening the CI reduction targets through 2030. As noted in our prior comments, we continue to support the 30% and 35% CI reduction targets through 2030, with the important caveat that we strongly oppose a cap on virgin oil feedstock-derived credits for either target (as discussed further below). We believe such a cap is not supported by best available data, is contrary to a science- and market-based program like the LCFS and is counterproductive to the overarching goal of reducing greenhouse gas (GHG) emissions as quickly as possible. At a time when California is seeking more carbon reductions, CARB should not be proposing to limit any low carbon feedstocks, especially when such limits are not supported by meaningful data and science and the feedstocks being considered to be capped arbitrarily can provide the decarbonization in the most difficult to electrify transportation sectors California needs to meet its climate objectives.

2045 Target. While we understand CARB's desire to establish long-term certainty, it is virtually impossible to project at this time and with any certainty the viability of a 90% CI reduction target by 2045. We therefore reserve comment on that proposal and strongly encourage CARB staff to continue working collaboratively with the alternative fuels industry post-2030 to monitor the developments in the national and California fuels markets and revisit this target as we get closer to 2045. With that said, we would also strongly oppose any linkage of a 2045 target to a virgin oil cap.

[3] Biodiesel and Renewable Diesel provided 46% of the LCFS credits in Q1-Q3 2022. See LCFS Quarterly Data Spreadsheet (dated January 31, 2023).
[4] Ibid.
[5] See Clean Fuels/CABA comments dated December 21, 2022, September 19, 2022, and August 8, 2022.

Self-Adjusting CI Target Mechanism. We support the proposal to establish a self-adjusting mechanism as discussed in the workshop. While a lot of details still need to be developed for implementing such a mechanism, we agree with the proposal to keep the adjustment unidirectional to avoid backsliding and gaming with the CI targets, which would be detrimental to the substantial investments made by the alternative fuels industry.

Regulation of Conventional Intrastate Jet Fuel

While this proposal raises a number of jurisdictional questions, we support subjecting conventional intrastate jet fuel to its own set of CI reduction compliance curve. This would capture the deficits generated through the use of fossil aviation jet fuel used entirely within the state and establish a strong signal to reduce carbon emissions from this sector beyond those achievable through voluntary measures. The proposal would also help firm up credit prices for other alternative fuels in the program, consistent with the overarching objective of strengthening the LCFS market.

Inclusion of Distillers Corn Oil (DCO) as a Virgin Oil Feedstock

We strongly oppose the inclusion of DCO as a virgin oil feedstock; instead, CARB should return DCO to the waste oil category, where it currently resides in the LCFS program, like staff did with choice white grease (CWG) at the February 2023 workshop. No meaningful justification has been provided by CARB for reclassifying either DCO or CWG as a virgin oil feedstock; both feedstocks have been and continue to be treated as waste oils under the federal Renewable Fuel Standard (RFS) and the LCFS. More importantly, neither CARB nor any other stakeholder have provided a science-based justification for reclassifying these feedstocks as virgin oils. To illustrate, neither feedstock has been shown to be associated with significant indirect land use change (ILUC) effects, which is why both USEPA and CARB have treated these as waste oils since the start of the RFS and LCFS programs.

Capping Virgin Oil Feedstock Credits Is Not Based on Market Reality or Sound Science

A review of the February 22nd presentation suggests a misunderstanding of the lipids industry, and that misunderstanding has been informing the proposal to cap virgin oil feedstocks. Slide references are to the February staff presentation[6] unless otherwise noted.

Assumption that the LCFS Drives Overall Biomass-Based Diesel Volumes. The proposal to cap virgin oil feedstocks appears to be based on the assumption that the LCFS will grow the national or global demand for biomass-based diesel. But this ignores the reality that it is the federal RFS program that actually drives overall national volumes of biomass-based diesel volumes, and California's LCFS simply draws the cleanest feedstocks and fuels to meet the state's market

[6] See Slides 36-41, https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/lcfs_meetings/LCFSpresentation_02222023.pdf, visited March 14, 2023.

demand. The RFS currently sets the volume of BMBD consumed in the United States. California's LCFS incentivizes a subset of that consumption to occur in the state. So, increased BMBD consumption in CA does not directly increase BMBD consumption in the U.S., which is what matters when thinking about acreage expansion.

The BMBD consumption in California would have occurred elsewhere absent the LCFS because it would be needed to comply with the RFS. The feedstock mix would look different without the LCFS because the RFS doesn't differentiate RIN value according to feedstock, but the gallons would overall remain the same. Therefore, it is unlikely that California's increased consumption of vegetable oil BBD has encouraged any additional acreage expansion above the RFS.
To illustrate, the 98 million acres of land noted in the bullet on Slide 39 represents about 4.9686 billion bushels of soybeans (assuming 50.7 bushel/acre which is the average yield for the past 3 years in the US). This volume of soybeans represents more than 7 billion gallons of renewable diesel production, which is nearly double California's entire projected diesel fuel demand through 2030[7] and clearly cannot be attributed in its entirety to the LCFS.

California's Demand for Liquid Conventional and Biomass-based Diesel Fuel Will Be Met with a Mix of Waste and Virgin Oil Feedstocks. Slide 39 further appears to assume that the state's entire 3.63 billion gallon maximum demand for conventional and renewable diesel will be met solely by soy and canola feedstocks. Such an assumption ignores the significant contribution waste oil feedstocks have provided and will continue to provide to BD and RD volumes. To illustrate, in 2022, approximately 83% of the California demand for biomass-based diesel was derived from waste oil feedstocks.[8] Nationally, 53% of US produced biodiesel and renewable diesel was from vegetable oils (47% from soybean oil and the rest from canola oil). Although soybean and canola oil will be a significant and important feedstock for California moving forward, other feedstock supplies will continue to expand and play vital roles in California's program and the national RFS, as we noted to CARB staff in February (see Attachment A).

Feedstocks for Biodiesel, Renewable Diesel, and Sustainable Aviation Fuel Are Projected to Grow for Various Reasons and Without a Commensurate Increase in Land Conversion. Similarly, Slide 40 suggests a misunderstanding of the implications of the increased oilseed processing (crushing) capacity. The U.S. oilseed processing industry has responded to demand signals for biodiesel, renewable diesel, and sustainable aviation fuel by investing in capacity to increase supply of soybean oil. Increasing supply thus mitigates the higher prices of soybean oil that induce substitution to other oils. Based on industry announcements, 21 new processing plants or expansions to existing plants are planned to come online by 2026. These facilities would add approximately 650 million bushels of additional crush capacity, equaling nearly one billion gallons of additional soybean oil supplies.

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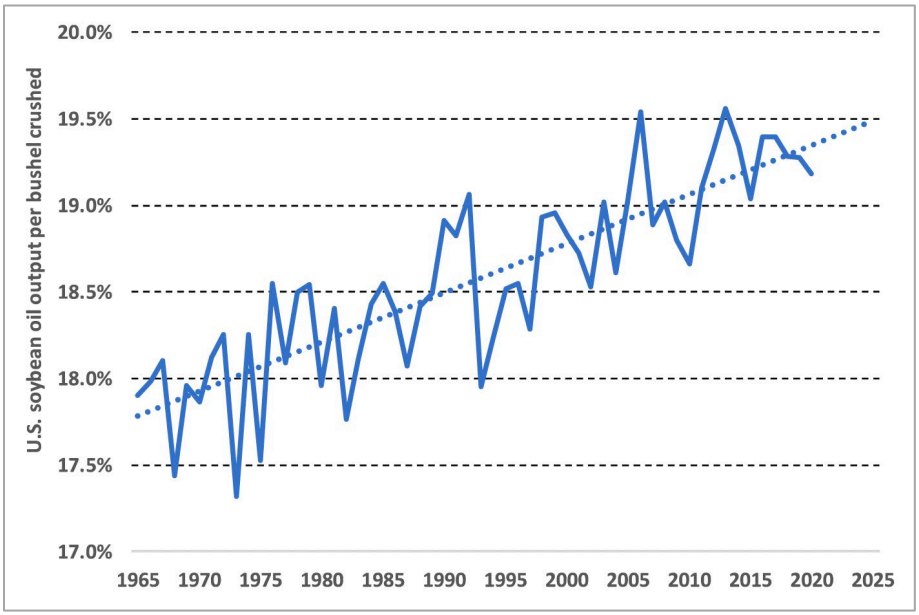
[7] California's demand for conventional and renewable diesel appears to reach a maximum of about 3.63 billion diesel gallon equivalents per year in 2023-2024 under the modeling done for the 2022 GHG Reduction Scoping Plan, AB 32 GHG Inventory Sectors Modeling Data Spreadsheet, Tab "Energy Demand: Transportation," visited March 14, 2023.
[8] LCFS Quarterly Data Spreadsheet, Jan. 31, 2023, visited March 14, 2023.

Along with expanding crush capacity, additional supplies of soybean oil will become available due to a continuation of improved soybean yields and increased oil yields from oilseed processers, as well as an overall expansion of domestic oilseed processing capacity. The most recent USDA Oil Crops Yearbook for soybean oil and soybeans shows that average yields in the 2021/22 marketing year were 11.86 pounds per bushel; 3.5 percent *above* 2010/11 levels.[9] That being said, there is considerable annual variation in soybean oil yields due to both environmental and market conditions. Agronomic factors such as growing conditions and the variety of soybean grown in any given year will impact how much oil is contained in the soybean itself. In addition, soybean processors will also vary oil extraction targets depending on the market value of soybean oil. Said another way, soybean processors are more likely to process the soybean further to extract additional oil from it should the value of soybean oil be relatively high to the value of soybean meal on a per bushel basis.

Further inspection of USDA's National Agricultural Statistics Services (NASS) crushing statistics shows there is a clear signal showing a long-run upward trend in soybean oil yields. In an assessment on lipid feedstock availability and supply LMC International conducted for Clean Fuels, LMC International found an increase in soybean oil yields over time by fitting a linear trend to annual observations from 1965 to 2020 (see **Figure 1**). There is no evidence to suggest that this trend will not continue. Indeed, soybean yields on the order of 56.5 bushels per acre in the 2030/31 timeframe would be expected on historical yield trends. This suggests about 609 million additional bushels in 2030 can be produced from the same acreage used in 2022.

Figure 1. U.S. soybean oil production as a percentage of soybean crush (LMC International 2022)[10]



[9] *See* USDA Economic Research Service, "Oil crops yearbook," https://www.ers.usda.gov/data-products/oil-crops-yearbook/.

[10] LMC International 2022. The Outlook for Increased Availability & Supply of Sustainable Lipid Feedstocks in the U.S. to 2025. Report for Clean Fuels Alliance America, *available at* Appendix A in Clean Fuels' comments to EPA on

In addition to increased soybean oil supply which will likely mediate substitution of soybean oil to other vegetable oils, winter annual oilseed crops will also supply an increasing share of oil to biofuel producers to use as feedstocks over the next five years. These advancements in feedstock supply will reduce pressure on soybean oil to meet demand as a biomass-based diesel (BBD) feedstock. Oilseed crops like camelina, CoverCress™, brassica carinata, and winter canola will relieve pressure on soybean oil to meet biomass-based diesel feedstock demand. For example, considering EPA's recent approval of canola oil pathways to renewable diesel, jet fuel, naphtha, liquefied petroleum gas, and heating oil under the RFS,[11] Canadian canola oil is expected to expand into the U.S. feedstock market. Indeed, according to LMC International, 5.8 billion pounds of Canadian canola oil is expected to be available *per year* for U.S. biofuel use by 2025, translating to more than 700 million gallons of biodiesel per year.[12]

Lastly, the concern about food price impacts and vegetable oil substitution suggests a fundamental misunderstanding of the impacts of soybean oil on consumer use. It should be noted that only a portion of edible soybean oil is consumed directly by the consumer, and even then, the virgin soybean oil represents only about half of the retail cost[13]. Most soybean oil is used by food manufacturers and food service. The retail effects of soybean oil on these food items tends to be minimal. Analysis has found that increasing soybean oil for biofuel use has almost no impact on the food at home CPI. This is because the slightly higher retail prices of products containing soybean oil is almost entirely offset by lower protein prices from increased soybean meal that results from more soybean processing[14]. In other words, the increases in soybean oil use for biofuels has almost no impact on overall food inflation.

Anticipated increased supplies of soybean and other oilseed oils, as noted, as well as imperfect substitution, as evidenced above, are important factors for CARB to consider for a better understanding of the soybean and soybean oil markets, both domestically and internationally.

<u>Suggested Metric for CARB to Monitor</u>

While the discussion in this letter and in our prior comments show the lack of a sound science basis for the proposed virgin oil feedstock cap, we acknowledge and share CARB's overarching concerns about deforestation and food price impacts. To this end and in response to CARB's request, we suggest a metric and action trigger for CARB to consider:

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the Renewable Fuel Standard Program: Standards for 2023-2025 and Other Changes, https://www.regulations.gov/comment/EPA-HQ-OAR-2021-0427-0805.

[11] 87 Fed. Reg. 73956 (Dec. 2, 2022).

[12] LMC International 2022.

[13] Dr. Jayson Lusk, "Soybean Oil Prices and Retail Food Costs." Center for Food Demand Analysis and Sustainability, Department of Agricultural Economics Purdue University. Feb 2022.

[14] Dr. Jayson Lusk, "Food and Fuel: Modeling Food System Wide Impacts of Increase in Demand for Soybean Oil." https://ag.purdue.edu/cfdas/wp-content/uploads/2022/12/report_soymodel_revised13.pdf

(1) Monitor the post-2023 volumes of biodiesel, renewable diesel, and SAF derived from soy and canola feedstocks and consumed in California;
(2) When the volumes in (1) reach 2.0 billion gallons per year[15], convene an Expert Working Group (EWG) to provide a third party evaluation of the situation and report back to CARB on its findings, along with any recommendations. Since the virgin oil cap issue is limited to vegetable oil feedstocks for biomass-based diesel and SAF fuels, we suggest the EWG follow a similar process to that used by CARB in the 2010 and subsequent rulemakings but with a narrower scope focused solely on virgin oil feedstocks and closely related areas. We recommend this EWG be comprised of soy/canola/other oilseed industry representatives, academia, and other key stakeholders who operate in this space and can provide expert evaluations on this topic. As an initial matter, the EWG's task should include an expeditious review of the data underpinning the LCFS' existing ILUC modeling to incorporate the most current scientific data at that time.

Conclusion

We strongly support a more stringent set of pre- and post-2030 CI reduction targets, in particular the 30% and 35% targets, but without a virgin oil cap. We remain deeply concerned with and are strongly opposed to any CI reduction targets premised on a cap on vegetable oil feedstocks as being unwarranted, not based in sound science, chilling of ongoing and future investments, and counterproductive to California's climate and carbon neutrality objectives. We also encourage CARB staff to reduce or eliminate those overly generous credit provisions that have outlived their usefulness.

Finally, we would like to endorse and incorporate by reference the comments filed by members and affiliates of Clean Fuels and CABA, including but not limited to ADM and the National Oilseed Processors Association.

Thank you for your consideration of these comments. We look forward to continuing our strong collaboration with CARB and staff.

Sincerely,

Floyd Vergara, Esq., P.E.
Director of State Governmental Affairs
Clean Fuels Alliance America

Rebecca Baskins
Executive Director
California Advanced Biofuels Alliance

[15] 2 billion gallons was the shock volume used in the 2020 Purdue paper on ILUC and substitution, which resulted in an ILUC estimated penalty that was substantially lower than CARB's value established in the 2015 rulemaking, which relied on datasets that are well over a decade old. See Taheripour and Tyner, US biofuel production and policy: implications for land use changes in Malaysia and Indonesia, *Biotechnol Biofuels* (2020) 13:11, https://doi.org/10.1186/s13068-020-1650-1

Attachment 1

Clean Fuels Presentation to CARB Staff
February 10, 2023

Clean Fuels
ALLIANCE AMERICA

VIRGIN OIL CAP CONCEPT

February 10, 2023

Floyd Vergara, Dir. of State Governmental Affairs

Clean Fuels ALLIANCE AMERICA

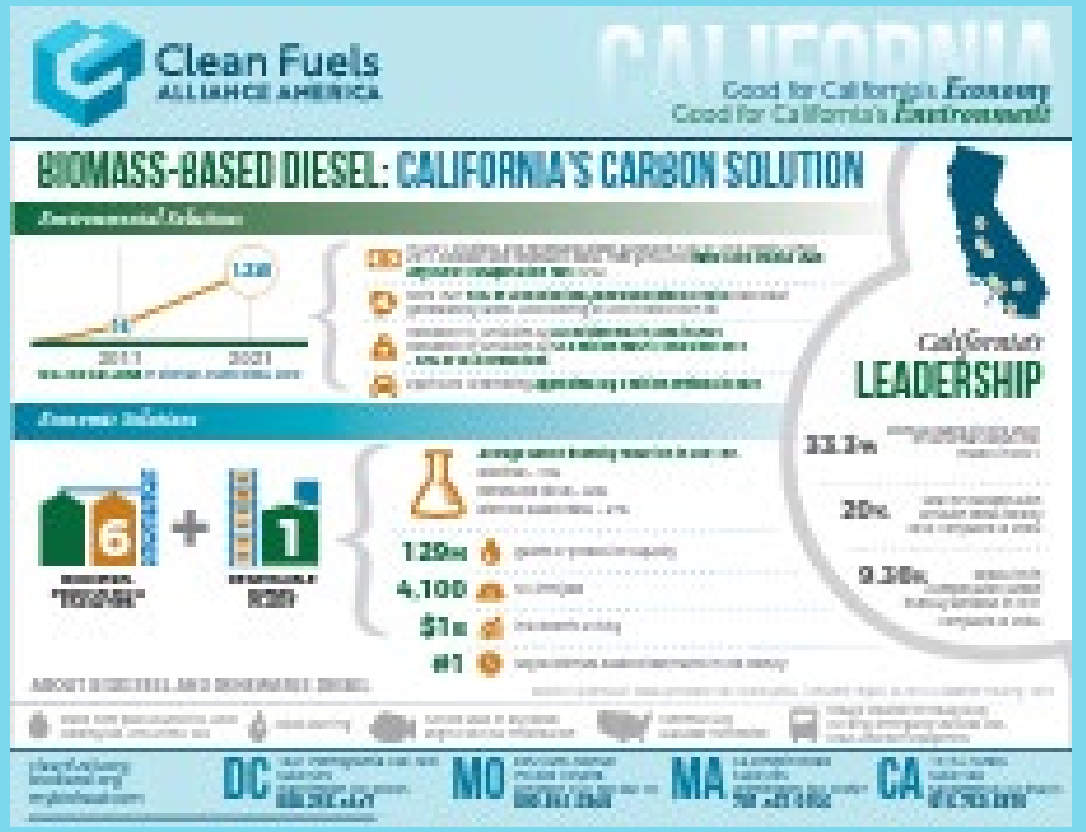
AGENDA

- Introductions
- Background
- Feedstock Supplies
- Other Considerations
- Q&A
- Follow-Up

BD/RD IMPORTANT ECONOMIC DRIVERS

In California:

- 6 Biodiesel, 1 Renewable Diesel plants
- Supports 4,100 full time jobs
- $1 billion in economic activity
- 129M gal production capacity



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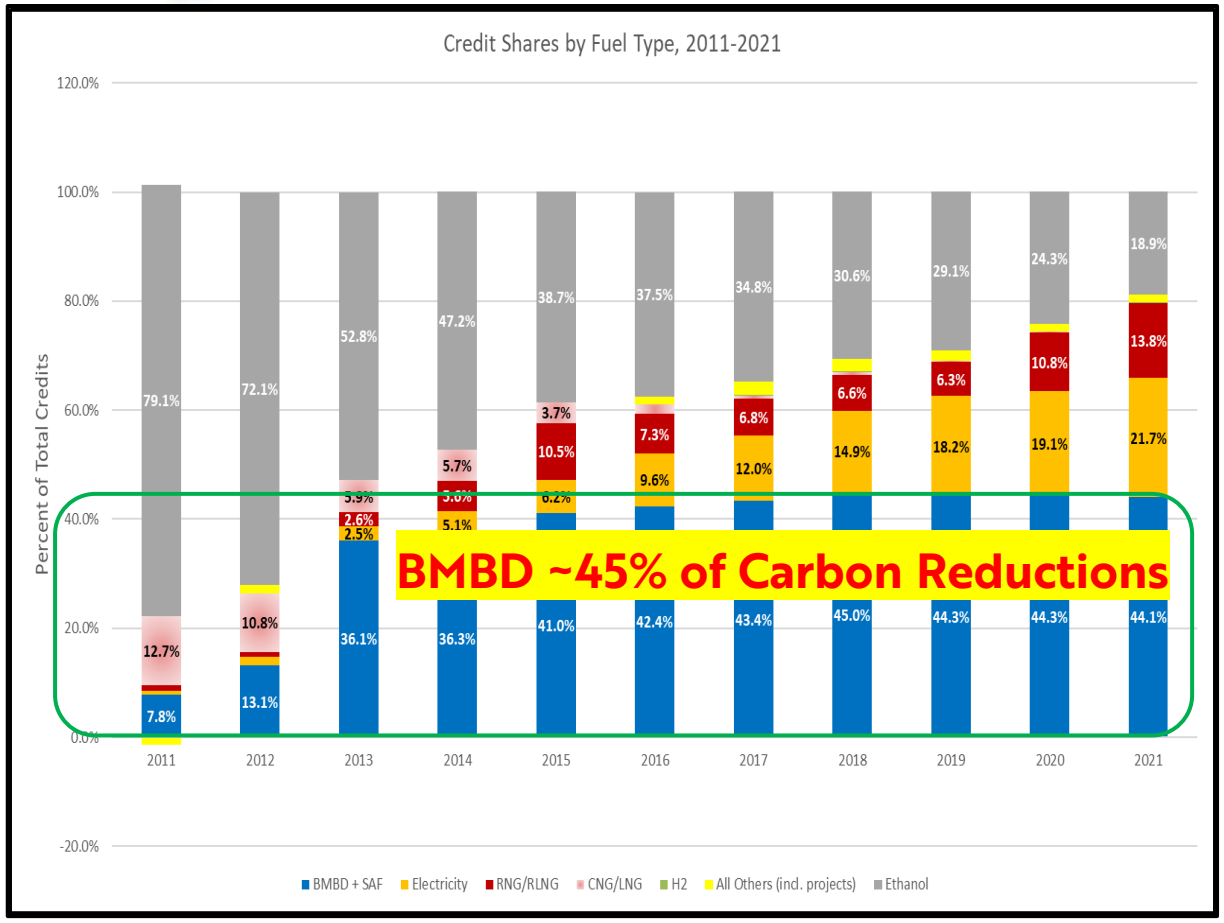
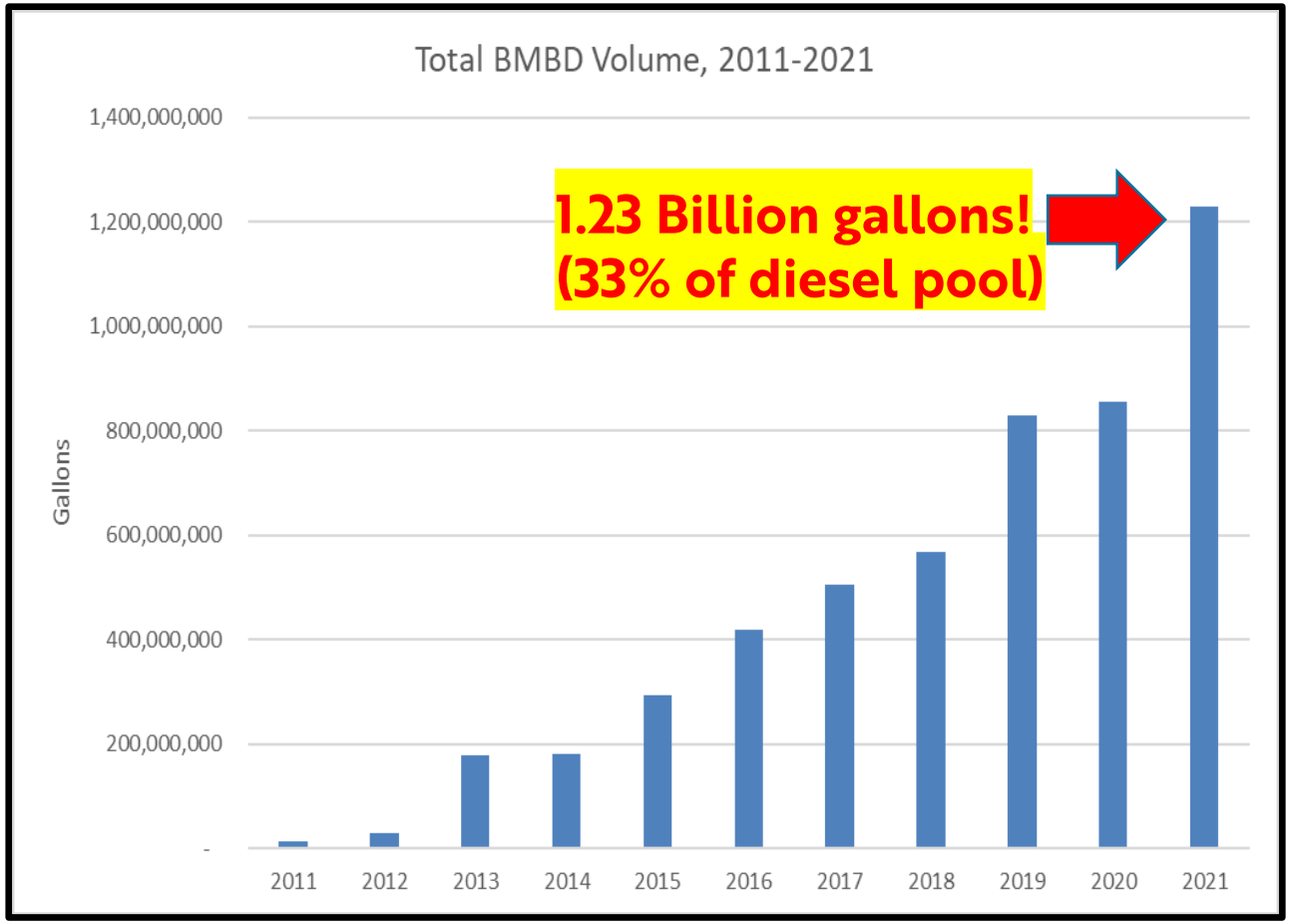
DROP-IN, LOW CARBON BDRD PLAYS KEY ROLE IN LCFS





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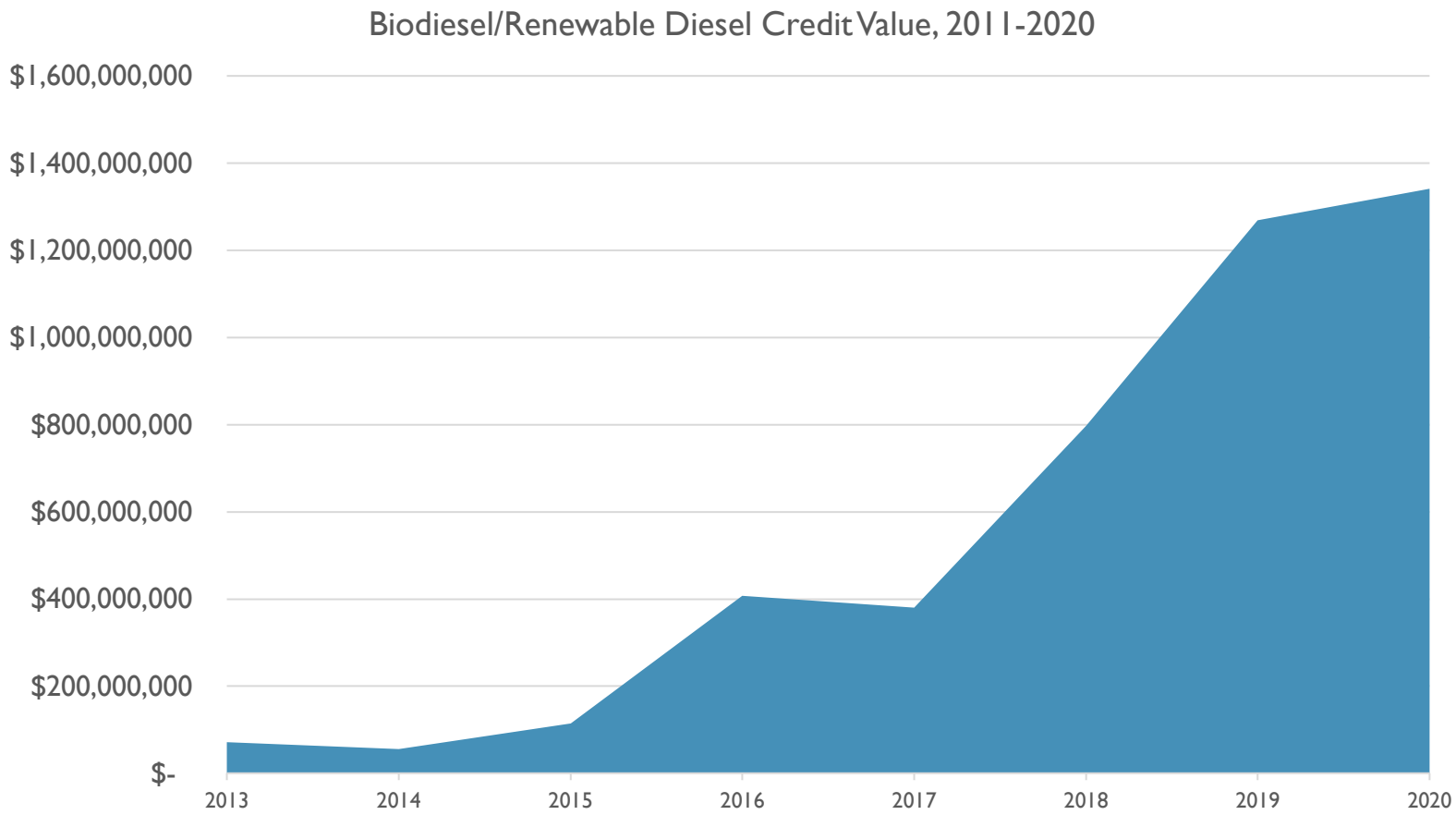
$4.4B BD/RD CREDITS GENERATED 2011-2020

- 6.8M credits generated in 2020 valued at **$1.34B** (at $199/credit)
- **$4.44B** credits since 2011
- ~$1.60/gal value from credits



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TRINITY STUDY SHOWS SIGNIFICANT HEALTH BENEFITS FROM B100

Switching to B100 in legacy vehicles would:

- **<u>For California (4 sites)</u>**
  - **Prevent 233 premature deaths/yr**
  - **Result in 30,800 fewer sick days/yr**
  - **Reduce 149,000 asthma cases/yr**
  - **Avoid $2.0 billion/yr in health costs**

- For all 28 sites
  - **Cancer cases reduced by nearly 9500 (over 70-yr timeframe)**
  - **Nearly 930 fewer premature deaths/yr**
  - **Over 456,000 fewer/reduced asthma cases/yr**
  - **Over 142,000 fewer sick days/yr**
  - **Nearly 829,000 fewer minor restricted activity days/yr**
  - **$7.7 billion in avoided health costs/yr**
- Transportation: switching to B100 in legacy vehicles reduces cancer risk by up to **45%** and yields **436,000 fewer/lessened asthma cases each yr**
- Heating oil: switching to 100% Bioheat reduces cancer risk by up to **86% and yields 20,000 fewer lung problems each year**
- These results for only 28 sites evaluated are **the tip of the iceberg**

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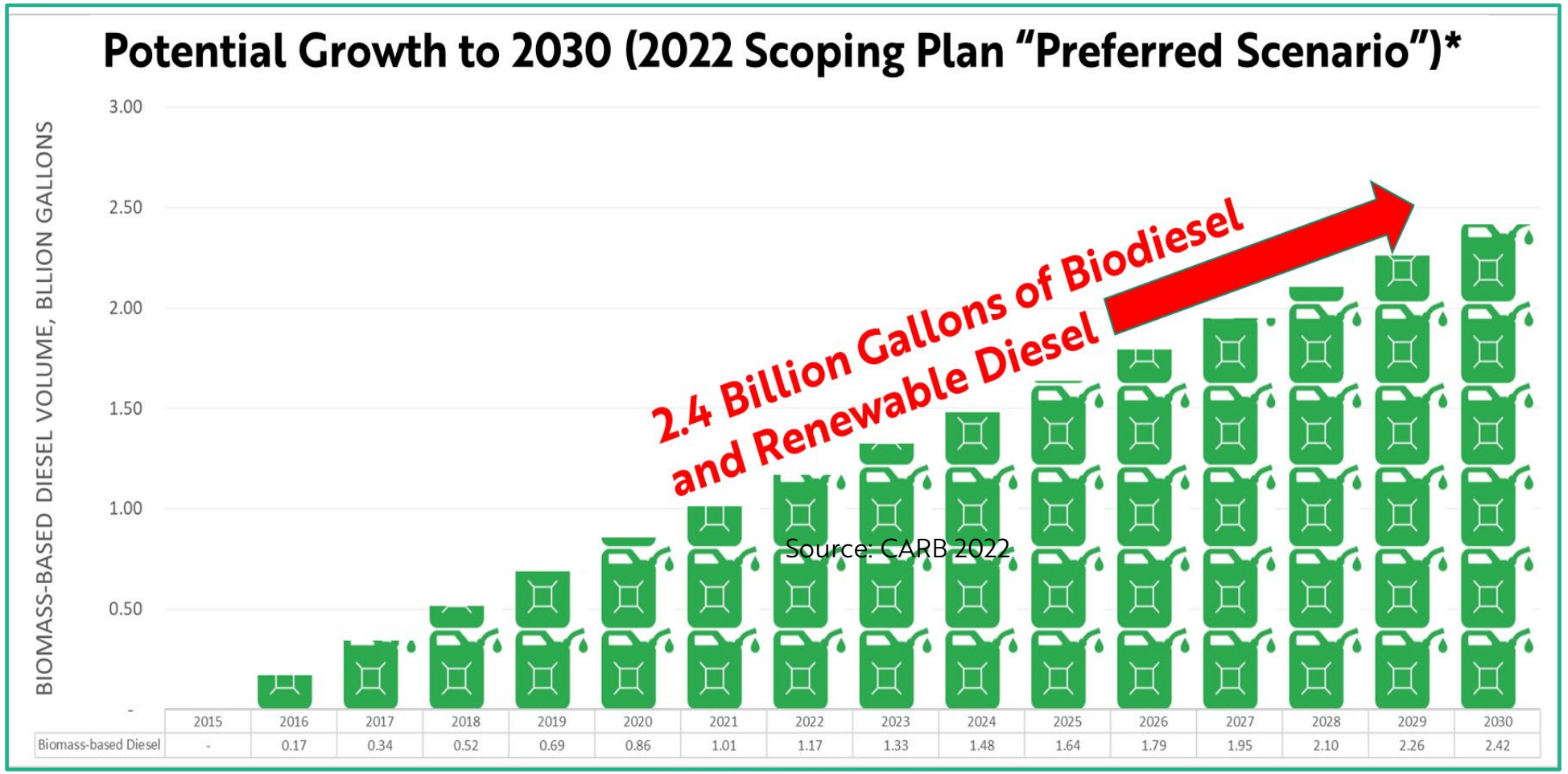
THE FUTURE? CONTINUED KEY ROLE FOR BD/RD IN CA



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Biomass-based Diesel	-	0.17	0.34	0.52	0.69	0.86	1.01	1.17	1.33	1.48	1.64	1.79	1.95	2.10	2.26	2.42

- cleanfuels.org -

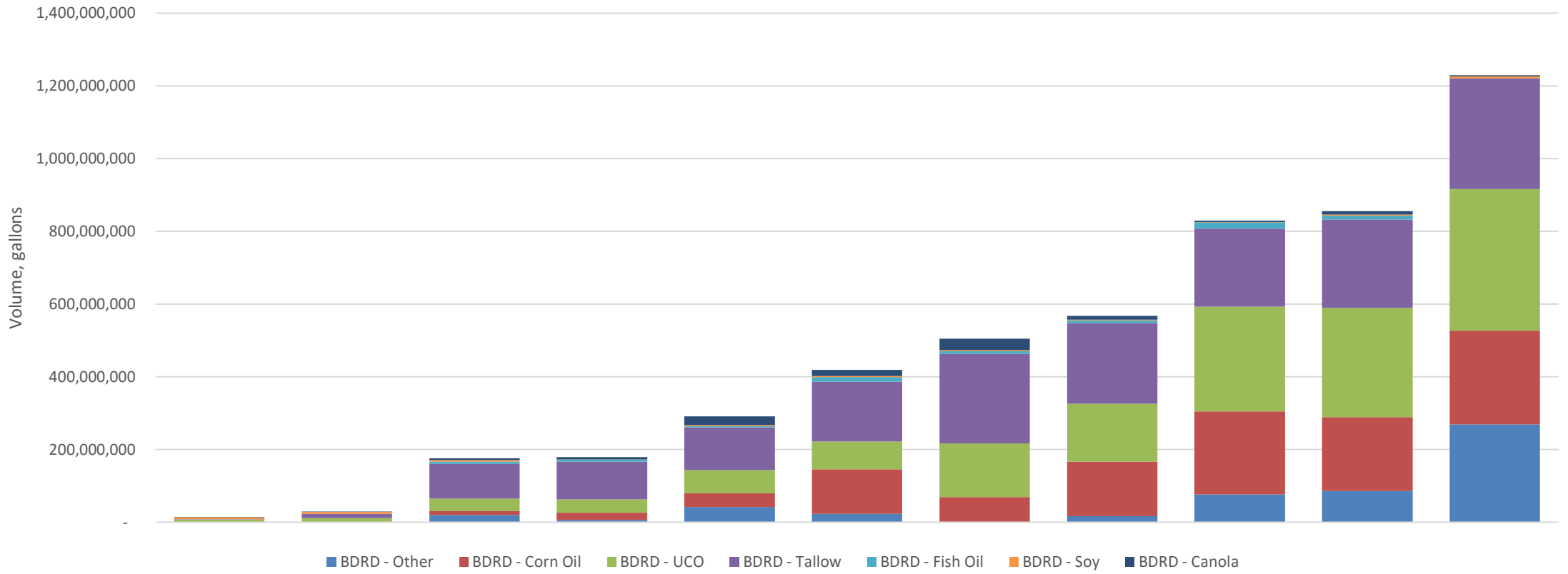
RECENT INCREASES IN SOY & CANOLA USE?

Number of pathways approved DOES NOT EQUAL likelihood of substantial increased use of soy or canola in RD

- Soy and canola significant disadvantage because of CI scores compared to waste lipids
- Only 50 pathways for soy, 20 for canola
  - Vast majority of these pathways are for biodiesel
  - Only 9 approved for soy RD (including Phillips 66, which CARB EO supported)
  - Only 2 approved for canola RD (both Phillips 66)
- Pathway applicants advised to keep applications simple for initial approval (i.e., specify soy or canola for pathway approval, modify with other feedstocks later)

Combined BD/RD Volumes By Feedstock, 2011-2021

(LCFS Quarterly Data, 01/31/2023)



BDRD Annual		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
BDRD - Other	gal	14,611	-	20,195,684	6,421,055	42,377,408	23,437,315	89,415	16,921,707	77,234,259	86,392,345	269,808,906
BDRD - Corn Oil	gal	173,259	73,298	10,903,945	20,274,104	38,087,045	122,768,211	69,479,219	149,886,523	228,087,052	203,154,819	257,203,815
BDRD - UCO	gal	7,040,873	12,315,915	33,923,098	36,487,901	63,220,035	76,339,919	148,067,079	158,942,261	287,924,465	300,358,470	389,113,352
BDRD - Tallow	gal	1,918,867	10,748,333	96,058,722	103,364,587	116,970,208	164,733,410	246,013,272	221,776,398	214,725,051	243,074,903	305,069,806
BDRD - Fish Oil	gal	-	-	6,085,604	6,158,851	4,126,288	12,309,269	6,524,719	7,917,685	16,955,205	9,850,120	-
BDRD - Soy	**gal**	**5,155,114**	**5,474,908**	**4,399,790**	**753,593**	**2,432,896**	**2,420,163**	**3,041,968**	**1,969,767**	**684,020**	**3,179,361**	**5,129,625**
BDRD - Canola	**gal**	**38,356**	**178,398**	**5,273,308**	**6,182,874**	**24,392,490**	**17,011,613**	**32,015,309**	**10,576,799**	**3,846,660**	**9,425,830**	**3,281,500**
Total Volume	gal	14,341,080	28,790,852	176,840,151	179,642,965	291,606,370	419,019,900	505,230,981	567,991,140	829,456,712	855,435,848	1,229,607,004

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SOY'S ROLE IN 2022

- Growth in Q1-Q3 2022 relative to previous years
- Increase is small compared to 2021-2022 growth in RD capacity
- Increase well within the 800M gal shock CARB used in original ILUC rulemaking
- Recent Purdue modeling used even larger shock, which resulted in smaller ILUC penalty than CARB uses
- Soy and canola continue to be the marginal gallon

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FEEDSTOCK SUPPLIES

Alan Weber, Partner, MARC-IV Consulting, Kearney, MO

CFAA Vision for 2030: Leveraging Virtual Acres

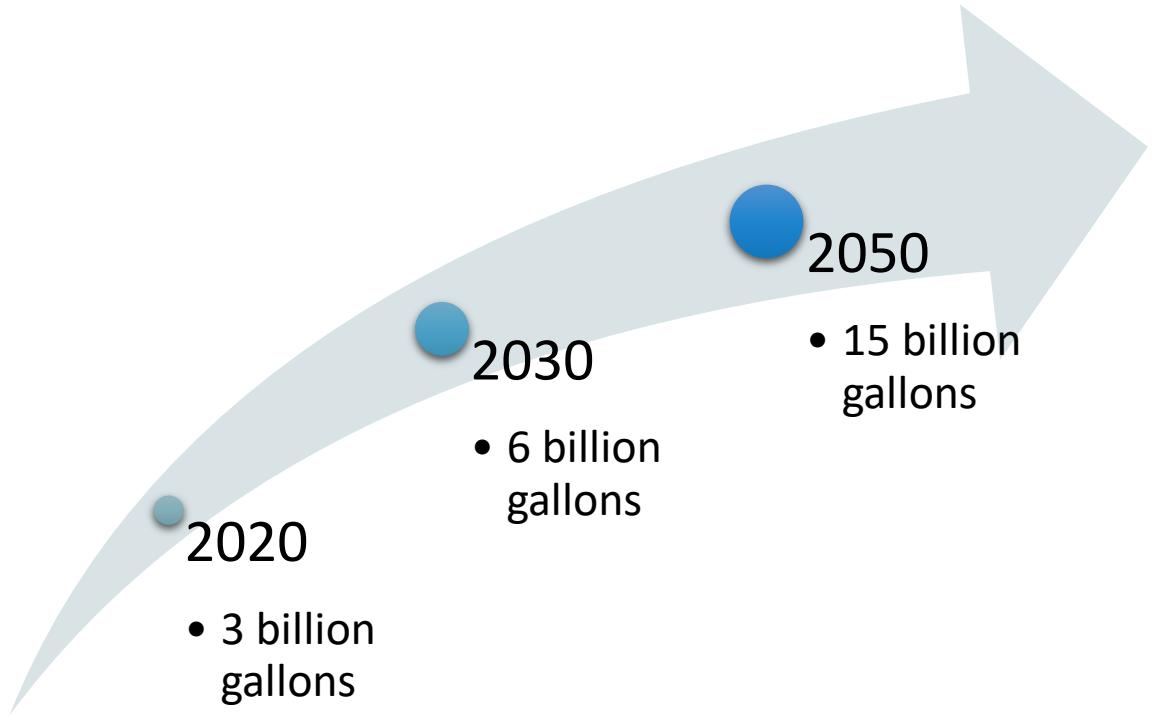
J. ALAN WEBER

M4 CONSULTING & SR. ADVISOR TO CLEAN FUELS ALLIANCE AMERICA

February 2023

CFAA Vision

- **Biodiesel, renewable diesel, and renewable jet fuel** will be recognized as mainstream low-carbon fuel options with superior performance and emission characteristics. In on road, off road, air transportation, electricity generation, and **home heating** applications, use will exceed **6 billion gallons by 2030**, eliminating over 35 million metric tons of CO_2 equivalent greenhouse gas emissions annually. With advancements in feedstock, use will reach 15 billion gallons by 2050.



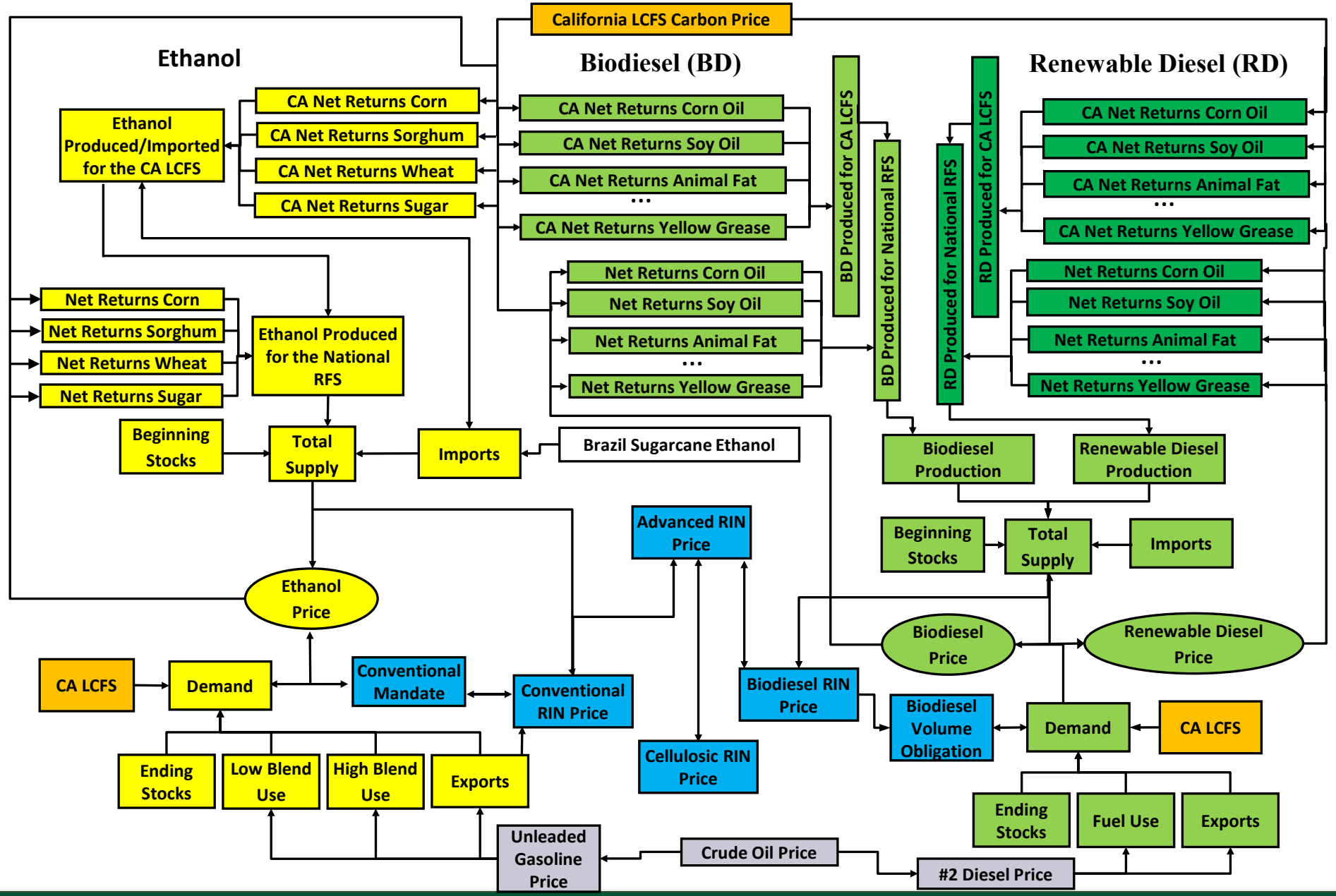
J. Alan Weber, M4

Analysis performed in 2019 by Dr. John Kruse (WAEES) and Alan Weber (M4 Consulting) to support the strategic effort.

- Utilized WAEES econometric model.
- Multiple industry surveys and data sources to develop important market trends.
- Effort positioned to examine market impacts of a six billion gallon market for biodiesel & renewable diesel.

Dr. John Kruse, WAEES

US Biofuels Partial Equilibrium Models



WAEES Model

- Domestic and International PE Model.
- Approximately 25,000 equations.
- Includes RFS with nested RIN structure.
- Includes California LCFS.
- Includes Canadian Clean Fuel Standard.

Trends Behind the Growth (2019/20)

Population/Protein Growth

As the world population grows, so will the demand for more protein, especially animal protein.

By 2030, protein meal demand is forecast to reach almost **400 million metric tons**

- Three-quarters of that meal will come from soy
- 300 million metric tons in 2019

Carbon Reduction

As the general population continues to push for **more carbon policies**, energy policy will be impacted.

Government, industry and others will continue to look at solutions to limit or eliminate CO2 in varying environments.

Electrification

Electrification will mostly impact the light-duty diesel market, with little impact to the heavy-duty market as fleet turnover is very slow.

Today, the heavy-duty diesel market is responsible for **83% of diesel** fuel demand.

Petroleum Shifts

The global petroleum industry faces some major challenges:

- Increased supply of sweet crude
- Rapid expansion of refineries engineered to maximize gasoline
- Regulations on ship emissions
- Lack of public confidence

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Feedstock Options for Biomass-based Diesel

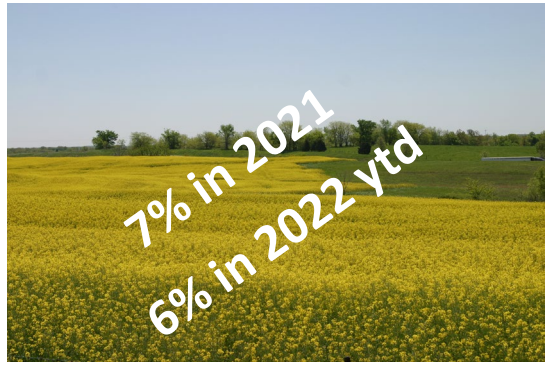
EPA approved pathways

Distillers Corn Oil

Animal Fats

Soybean Oil

Camelina

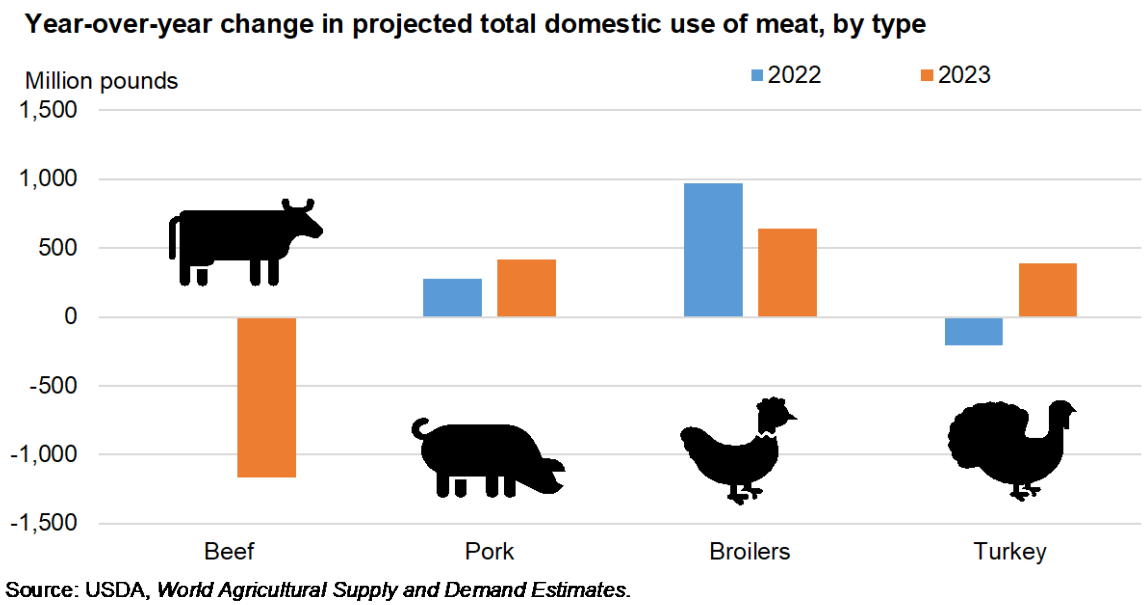


Canola Oil (biodiesel only)*

Used Cooking Oil/Yellow Grease

** Pathway now approved for Renewable Diesel*

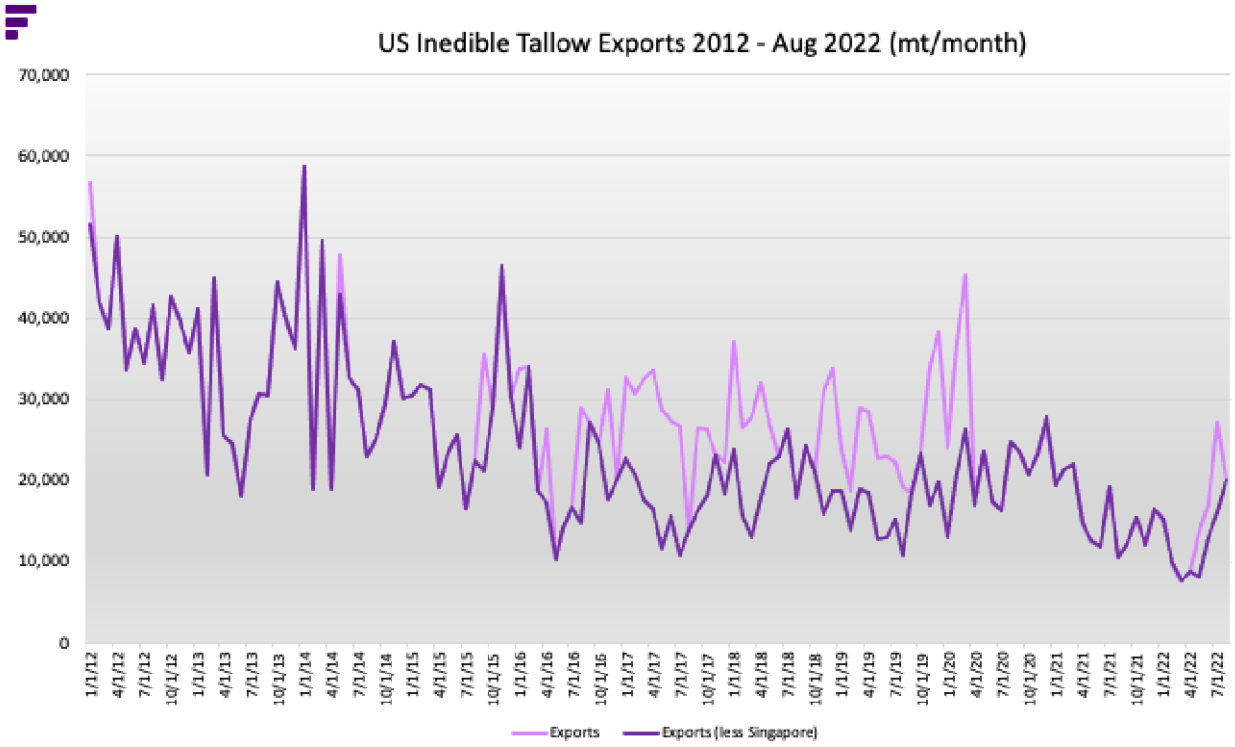
Animal Fats—Supply Prospects



Source: USDA, *World Agricultural Supply and Demand Estimates*.

- Animal fat supplies directly linked with red meat consumption (US & Globally)
  - Annual growth 1% or less through 2030; depending upon species
- Expansion of US slaughtering capacity.

US Inedible Tallow Exports



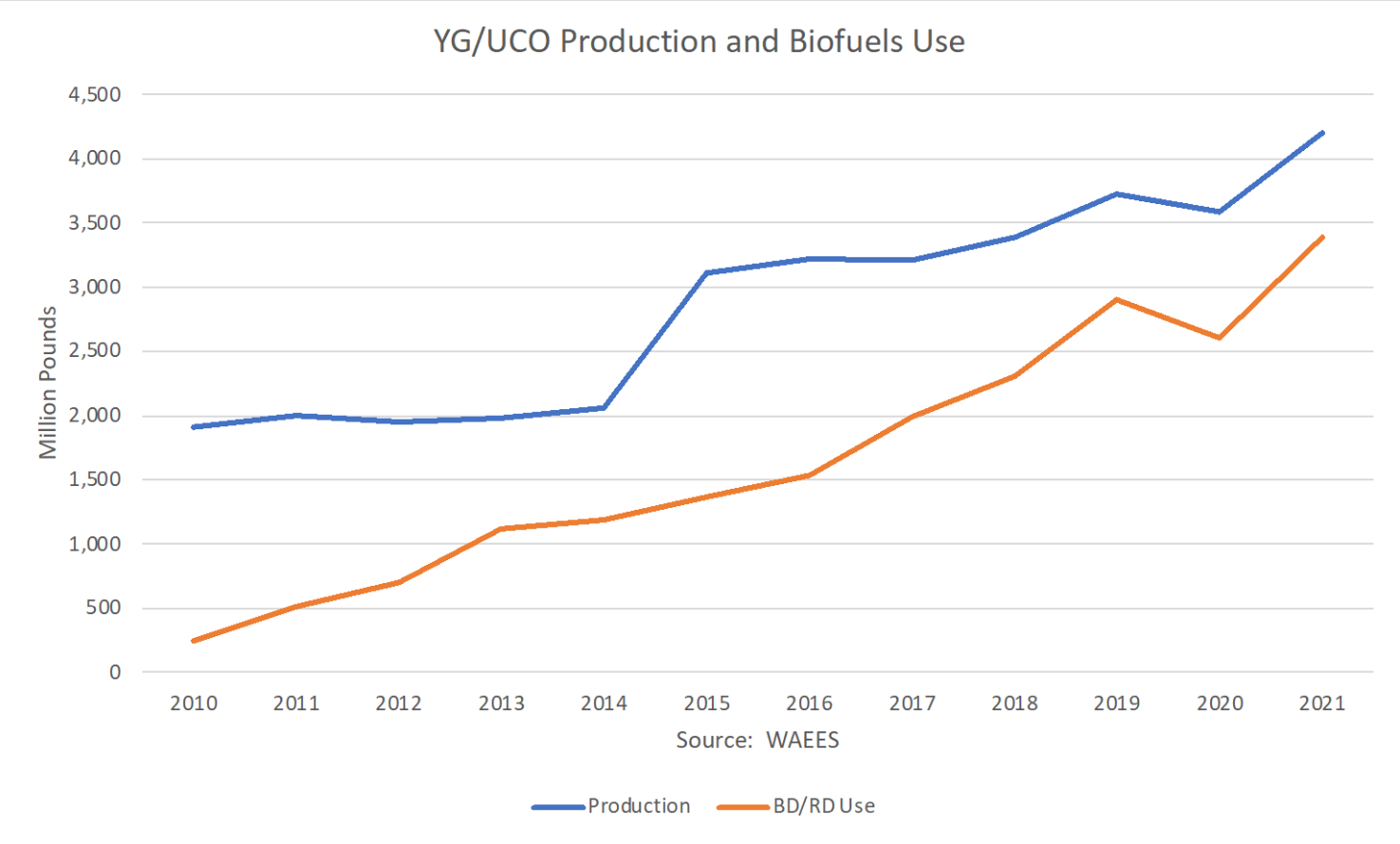
Source: Ryan Standard presentation at AFOA, Oct 2022

Exports down ~62 percent in 2021 vs 2012

In 2022 – mostly to Canada and Mexico

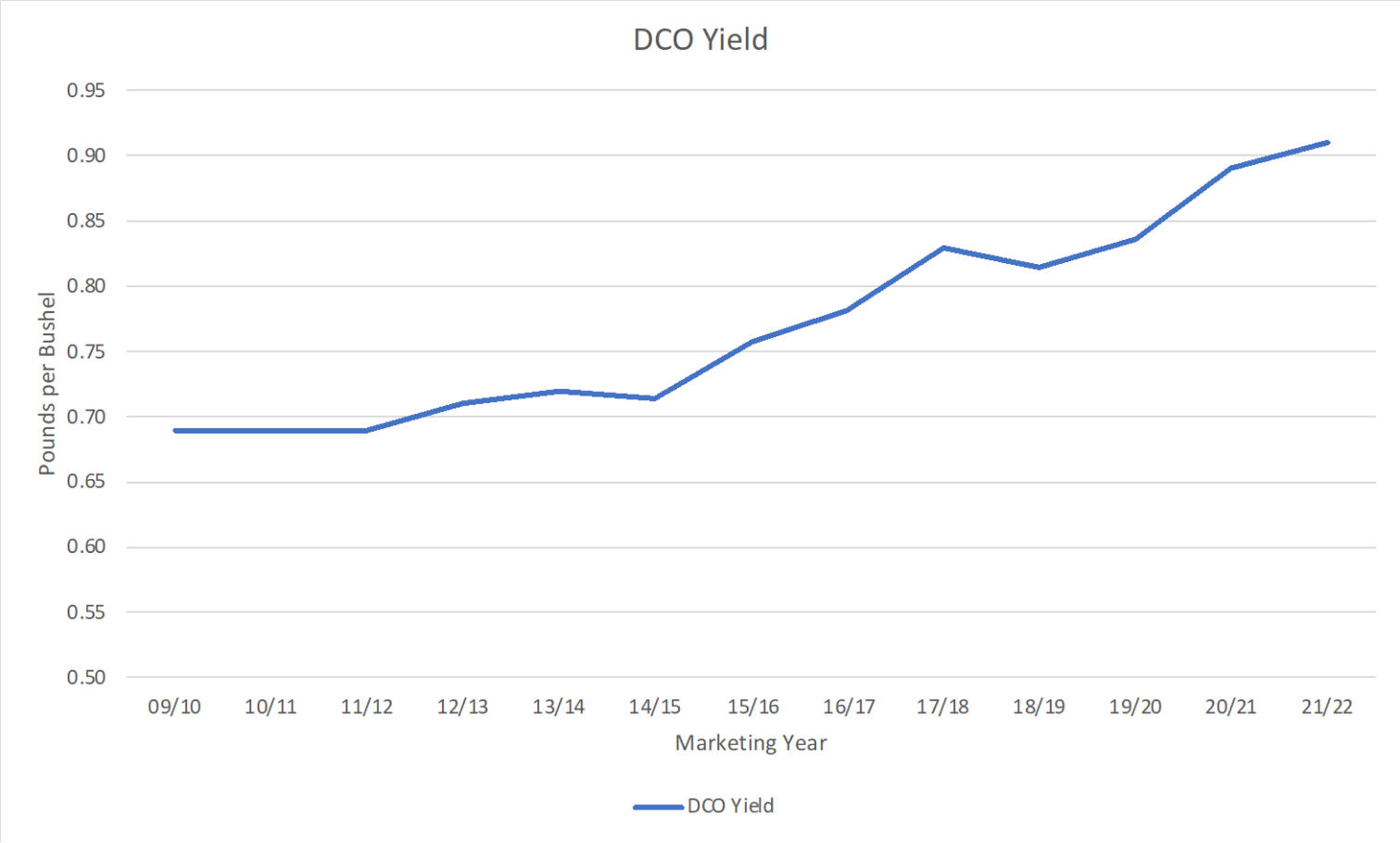
US became a net importer of tallow in 2021

UCO—Supply Prospects



- Used cooking oil continues to be a key low CI feedstock.
- Biofuels use approximately 80% of production.
- Valuation incentivizes production.

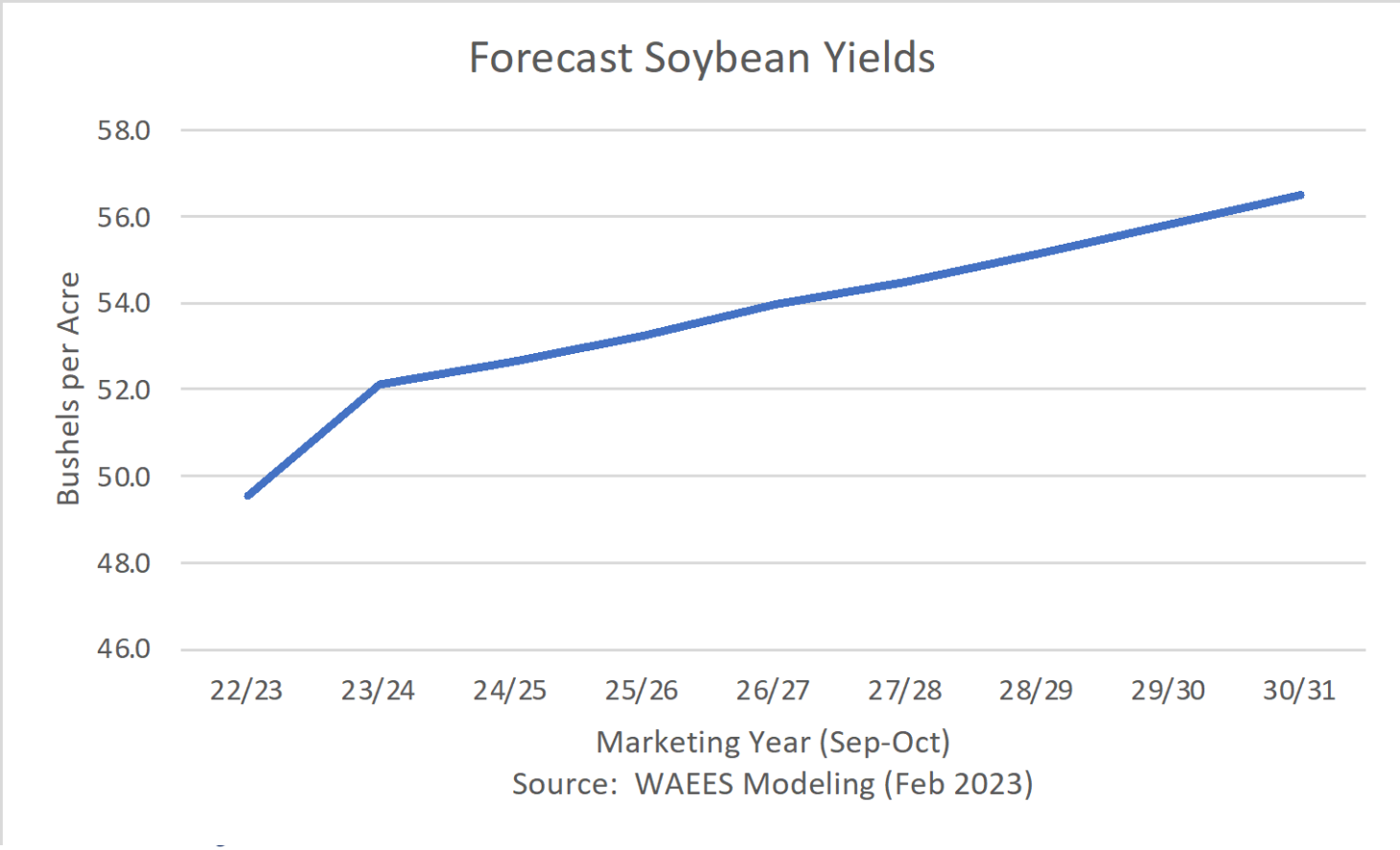
Distiller Corn Oil —Supply Prospects



- Additional ethanol production (e.g. mid level blends)
- Additional yield (lbs/bu)
  - Currently approximately .9 pounds of DCO per bushel.
  - Technology to increase up to 1.4 lbs/bu.
  - Perspective—Represents 2.7 billion pounds of potential at current corn use for ethanol (almost 340 million gallons of feestock)
- New technologies to utilize ethanol (e.g. ATJ)

Biotechnology (vegetable oils)

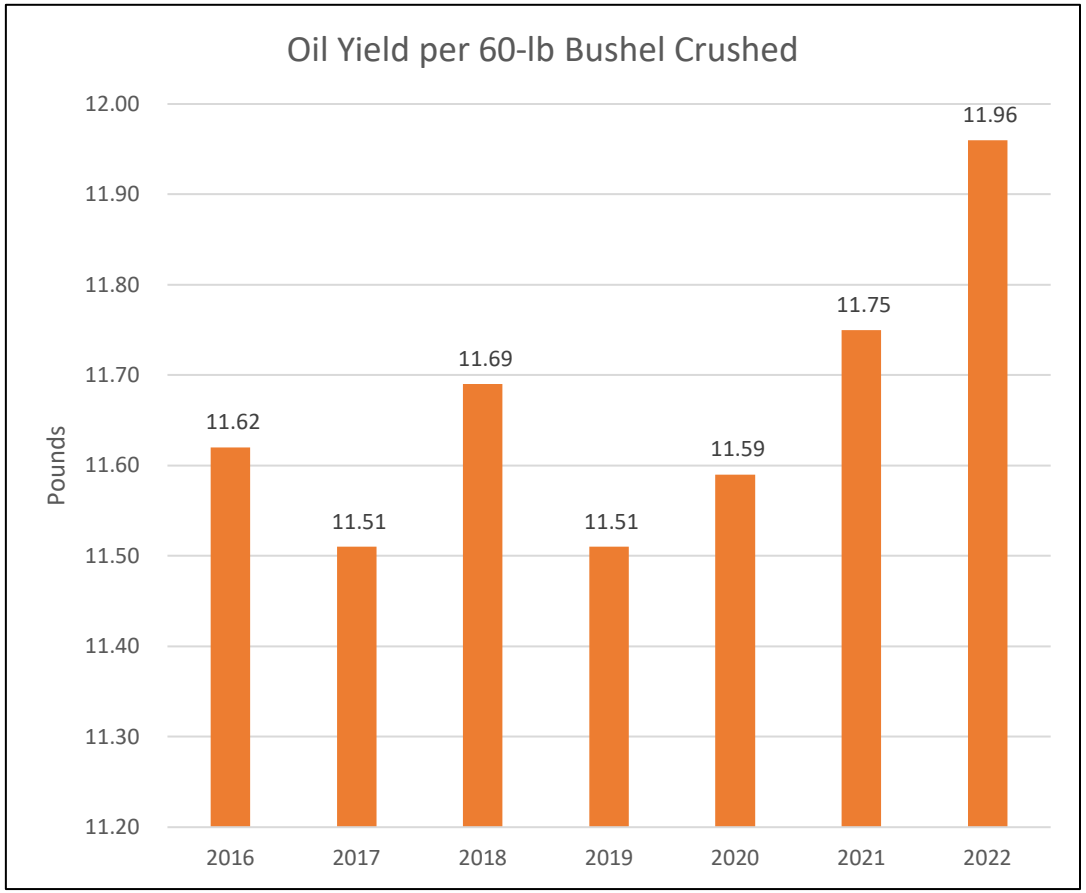
Biotechnology: Yield Advancements



- Expected soybean yields in MY2030/31 of 56.5 bu/ac.
  - Does not include stepwise changes in technology
  - Similar similar advancements for other major commodities
- Perspective—609 million additional bushels in 2030 from same acreage grown in 2022.
  - Represents more than 900 million additional gallons of BD/RD potential.

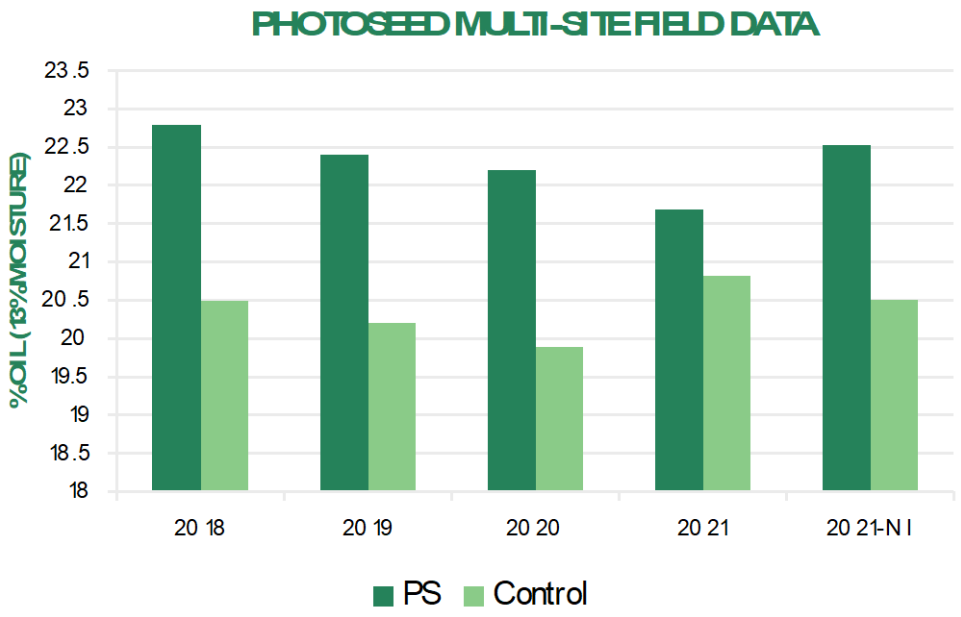
Additional Factors Impacting Supplies

- Acreage—Reasonable to assume some acreage shifting between major commodities due to changing market conditions.
  - Total cropland would NOT increase
  - Modeling suggests 2 to 3 million acre increase in soybeans (from other commodities)
    - But this is dependent upon market conditions.
  - Perspective—3 million added acres in 2030 generates 170 million additional bushels (250 million gallons)
- Increased Processing Yields
  - Data indicates increasing lipid yield per bushel over time.



Biotechnology: Trait Development

	PhotoSeed Soy	Soy Today
Oil Content (13% Moisture)	21-22%	19-20%
Meal Quality (%Protein)	+48%	46.5%



- Biotechnology enables a shift in traits to meet market conditions.
- Example: ZeaKal
  - Key market trait: Ability to increase lipid content in soybeans without penalty to protein quality/levels.
  - Perspective—2% increase in lipid content of soybeans could add 3.2 billion pounds (in 2030) in US alone equating to more than 400 million gallons of additional supply.

Winter Annual Oilseeds




Oilseed Crops with Eco-System Service Benefits of a Cover Crop

Brassica carinata

CoverCress™

Winter Canola

Camelina

CoverCress™

Example of winter annual oilseed

Fit in Rotation Key!!!!

Photo by Mike Wells

Trends Behind the Growth – Protein Demand

VEGETABLE OILS
54 PERCENT

Vegetable oils are positioned for growth in supply due to their ability to respond to demand shift and growing availability due to protein demand globally.

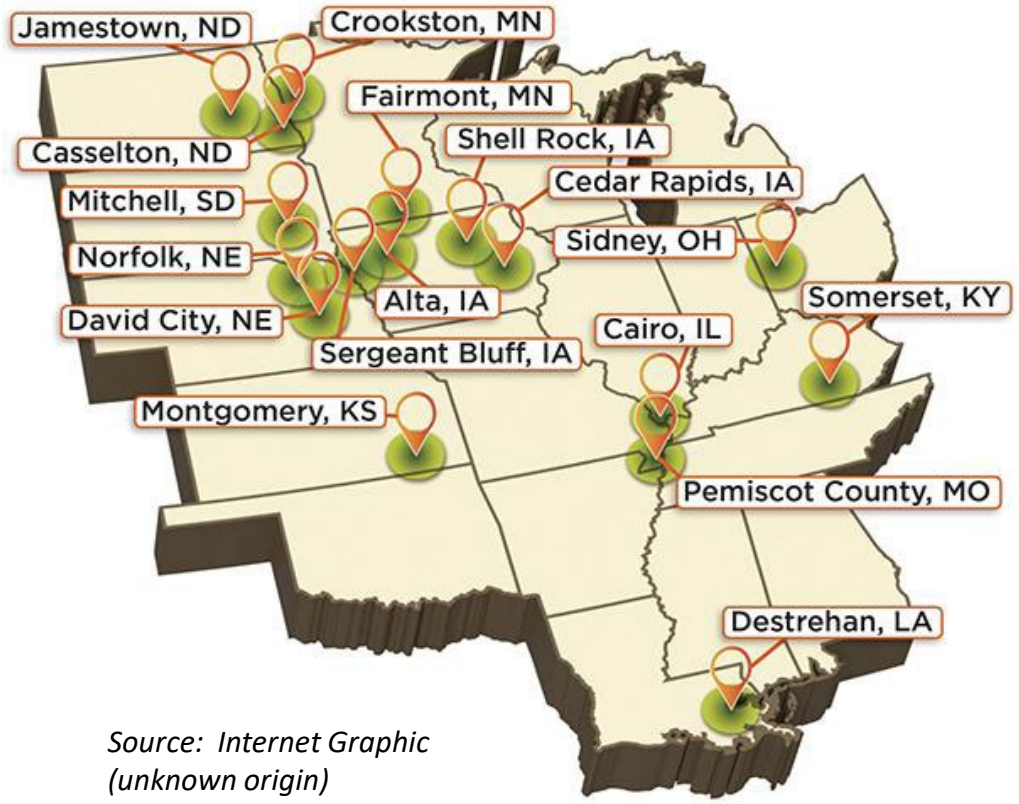
WINTER ANNUAL OILSEEDS
18 PERCENT

New supply for biodiesel & renewable diesel can come from winter annuals.

ANIMAL FATS, DISTILLERS CORN OIL AND USED COOKING OIL
28 PERCENT

Animal fats will also see an increase in supply from protein trends, but not at the rate of vegetable oils.

United States Crush Expansion



Source: Internet Graphic (unknown origin)

Additonal Oilseed Processing Summary					
		Annual (mil bu)	Location	est. completion	type
United States					
Shell Rock	soy	38.5	Shell Rock, IA	2022	new
CHS	soy	17	Fairmont, MN	2022	expansion
Continental Refining Co	soy	4	Somerset, KY	2022	new
Cargill	soy	3.5	Cedar Rapids, IA	2022	expansion
ADM	soy	52.5	Spiritwood, ND	2023	new
Cargill	soy	21	Sydney, OH	2023	expansion
AgProcessing	soy	8	Sergant Bluff, IA	2023	expansion
Oxbow	soy	10	Greenwood, MS	2023	expansion
Platnium Crush, LLC	soy	38.5	Alta, IA	2024	new
Bunge	soy	73.5	Destrehan, LA/Cairo, IL	2024	expansion
Bartlett	soy	38.5	Montgomery Co, KS	2024	new
CGB and MSP Joint Venture	soy	42.5	Casselton, ND	2024	new
Norfolk Crush	soy	38.5	Norfolk, NE	2024	new
Marquis Energy	soy	38.5	Hennepin, IL	2024	new
AgProcessing	soy	50	David City, NE	2025	new
SD Soy Processors	soy	35	Mitchell, SD	2025	new
Epitome Energy	soy	40	Grand Forks, ND	2025	new
Incobrasa (1st of 2 phases)	soy	20	Gilman, IL	2025	expansion
Cargill	soy	62	Pemiscot Co, MO	2026	new
Bunge	soy	4.5	Morristown, IN	2026	expansion

New processing facilities in Canada also being constructed or expanded, with 5.7 million metric tons being announced. Of those announcements, 80% are targeted to come on-line in 2024 and represents more than 500 million gallons of additional feedstock supplies.

Thank You

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Clean Fuels ALLIANCE AMERICA

QUESTIONS?

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