



Growth in renewable diesel production



The impact on vegetable oil refining

Foreword



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Tore Alden began his career as an analyst for the Agricultural Marketing Group at Smith Barney. Before joining The Jacobsen, Tore covered the oilseed complex for Informa Economics. He now covers the Vegetable Oils Bulletin for The Jacobsen.

The Jacobsen was recently acquired by Fastmarkets to further bolster our expertise in the agriculture market. We provide over 1,000 proprietary prices in the agriculture market, as well as the latest news, market trends and forecasting.

In the US, the Renewable Fuel Standard and the more recent Low Carbon Fuel Standard program are reshaping the economics of the biomass-based diesel market. As demand for biomass-based diesel continues to grow, we are seeing soybean oil prices pushed to the highest levels since 2008. We are also seeing an impact on vegetable oil refining capacity, and announcements of expansions in US soybean crushing and vegetable oil refineries.

In this report, we give you insights into the expansion plans on the horizon across North America, as well as detailed balance sheets for crude and refined US soybean oil. Read on to find out more about the impact of growing renewable diesel production on vegetable oil refining, and why it needs to be on our radar.

A handwritten signature in black ink that reads "Tore M. Alden".

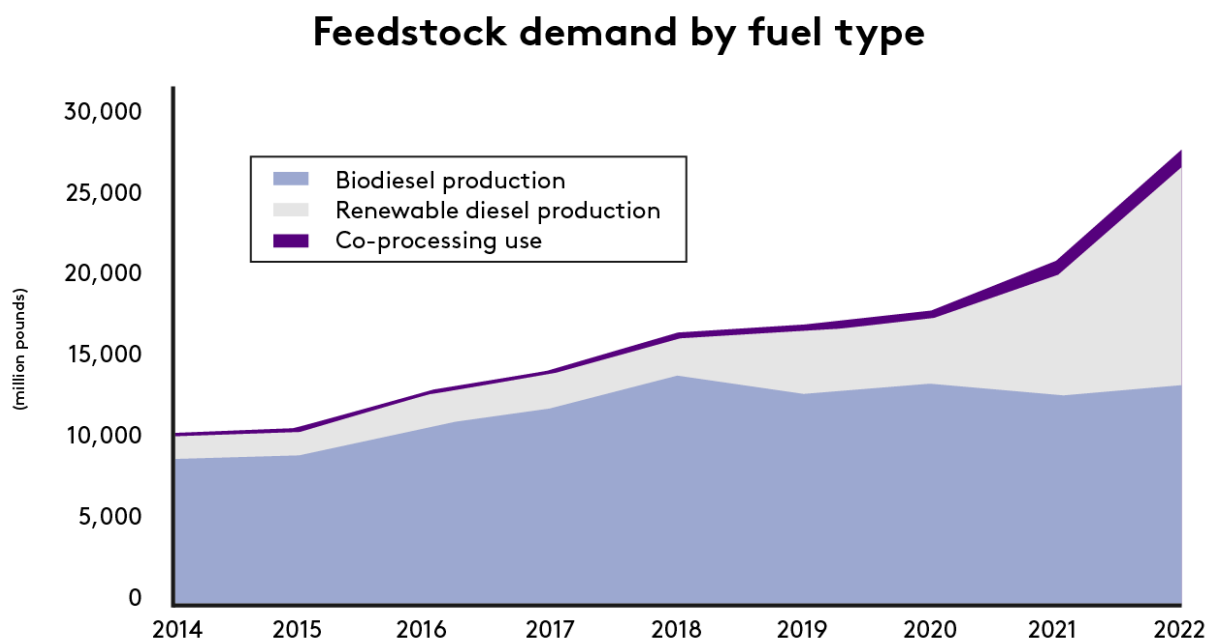
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The impact of growing renewable diesel capacity on soybean oil refining capacity

The Low Carbon Fuel Standard (LCFS) program in California has reshaped the economics of the biomass-based diesel industry. As a result, large vegetable oil refiners and renewable diesel producers have announced and built new renewable diesel capacity. This has dramatically increased the demand for biomass-based diesel feedstocks.



Source: EIA and The Jacobsen

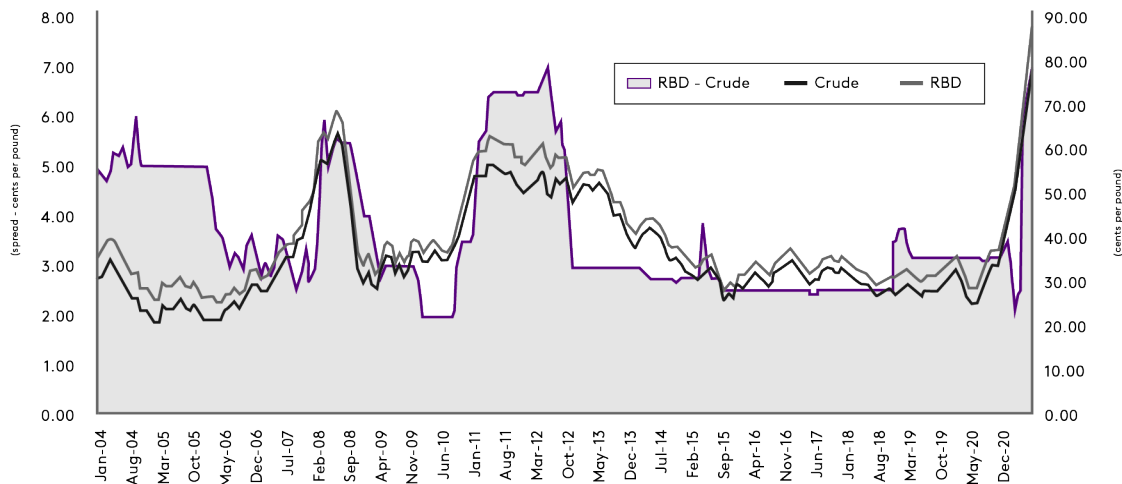
The surge in demand has pushed soybean oil prices to the highest level since 2008. This was when the initial passage of the Renewable Fuel Standard (RFS) drove soybean oil prices to record levels.

While there are similarities between the 2021 rally and 2008, the main difference is the likely sustainability of the price increase. In 2008, soybean oil used in biomass-based diesel production totalled 3.32 billion pounds, or about 16 percent of soybean oil production. In 2021, we predict soybean oil used in biomass-based diesel production will total just over 12 billion pounds or about 45 percent of U.S. soybean oil production.

Growth in renewable diesel production in 2020/21 has already driven the spread between crude degummed soybean oil and RBD to a record level. This precedes a substantial expansion in production capacity in the fourth quarter of 2021.

We predict an annual renewable diesel production capacity of 894 million gallons on 1 January 2021. The yearly capacity suggests monthly production of just over 62 million gallons per month, assuming the industry operates at 90 percent capacity, compared with data from the Environmental Protection Agency (EPA) indicating month average production of 44.5 million gallons in 2020.

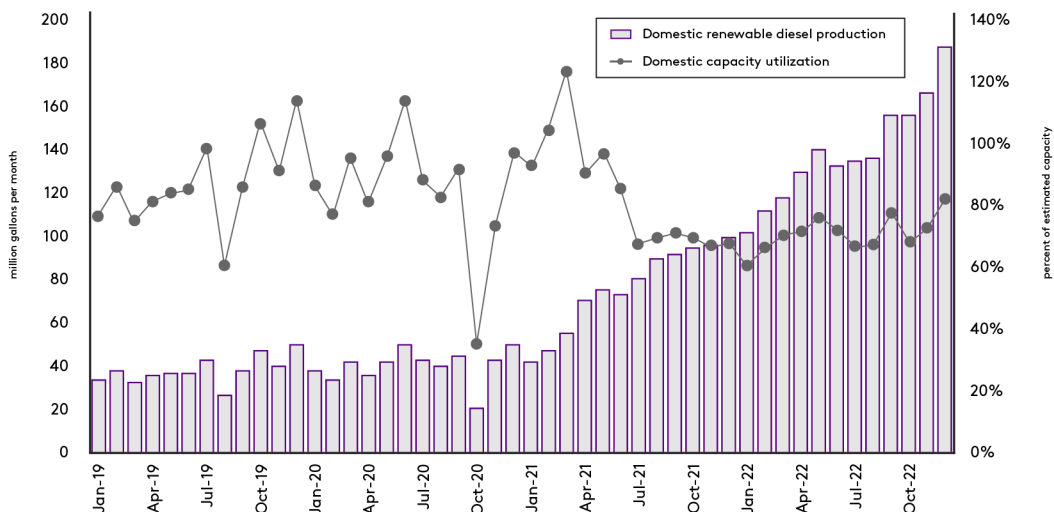
Central Illinois soybean oil spread: crude degummed - RBD



Source: The Jacobsen

Early 2021 production has been below the implied total, but output in March of 59 million gallons, the highest for the year, was close to our predicted 90 percent of operating capacity. If all of the plants operating or announced they would begin operations in 2022 are open, domestic U.S. renewable diesel output could reach 2.2 billion pounds by the end of the year.

Renewable diesel production vs. capacity utilization



Source: EPA and The Jacobsen

Expansion plans

There have been many recent announcements of expansion in US crushing and refining capacities. Primarily, this is because of three key forces at play:

1. Increased production capacity for renewable diesel and sustainable aviation fuels
2. Expectations of more stringent mandates arriving for transportation that will drive more demand
3. Historically, high soybean oil prices that have delivered record vegetable oil refining margins.

Current announcements include:

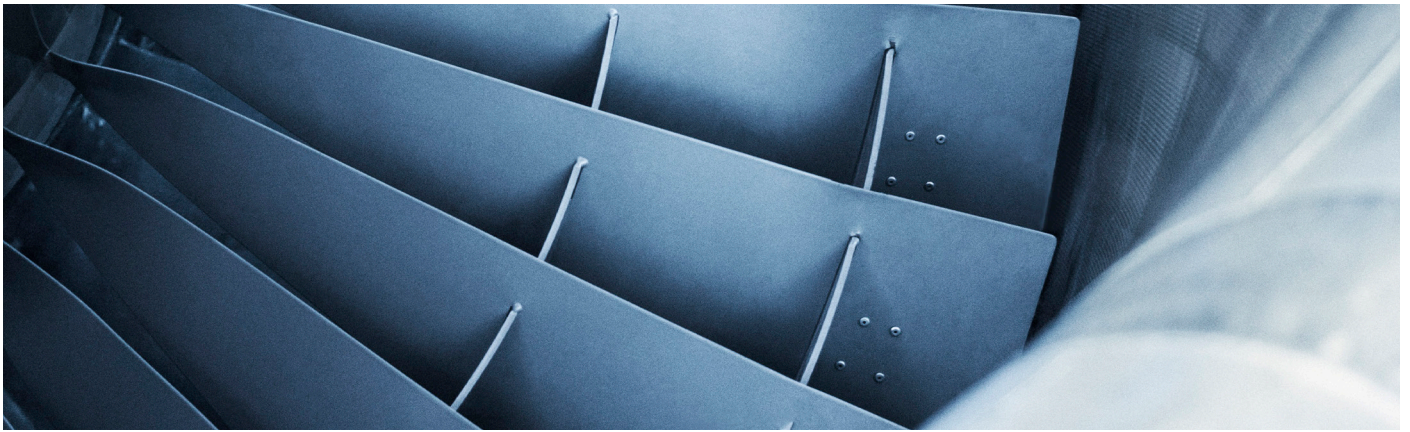
- Cargill will double soybean processing capacity at its plant in Sidney, Ohio, and expand processing by 10% in Cedar Rapids, Iowa.
- ADM plans to improve efficiency at its plants to provide incremental supply.
- ADM also announced it is building a new crushing plant in Spiritwood, North Dakota. ADM plans to complete the facility before the 2023 harvest. It will have a yearly crushing capacity of 52.5 million bushels of soybeans.
- Bunge is increasing tank-storage capacity and improving the efficiency of its refineries.
- CHS soybean crush plant in Fairmont, Minnesota, is on schedule for completion in late 2021. Once complete, CHS plans to expand its crush capacity upwards of 72 million bushels of soybeans.
- Shell Rock Soy Processing, a new player in the market, plans to open its crush plant in 2022. The plant will crush 38.5 million bushels of soybean annually.

US crushing capacity

By the end of 2023, operational will increase our estimated crush capacity to 2.35 billion bushels, soybean oil production to almost 27 billion pounds, and vegetable oil refining to 16.8 billion pounds.

While the increases are substantial, vegetable oil refining capacity still falls short of our prediction of demand. This is mainly down to the potential for 15.8 billion pounds of demand from the biofuel industry alone in 2021/22.

As a result of the refining shortfall, some renewable diesel producers are refining feedstocks in their plants. We believe renewable diesel producers could refine as much as 5.6 billion pounds of vegetable oil per year.



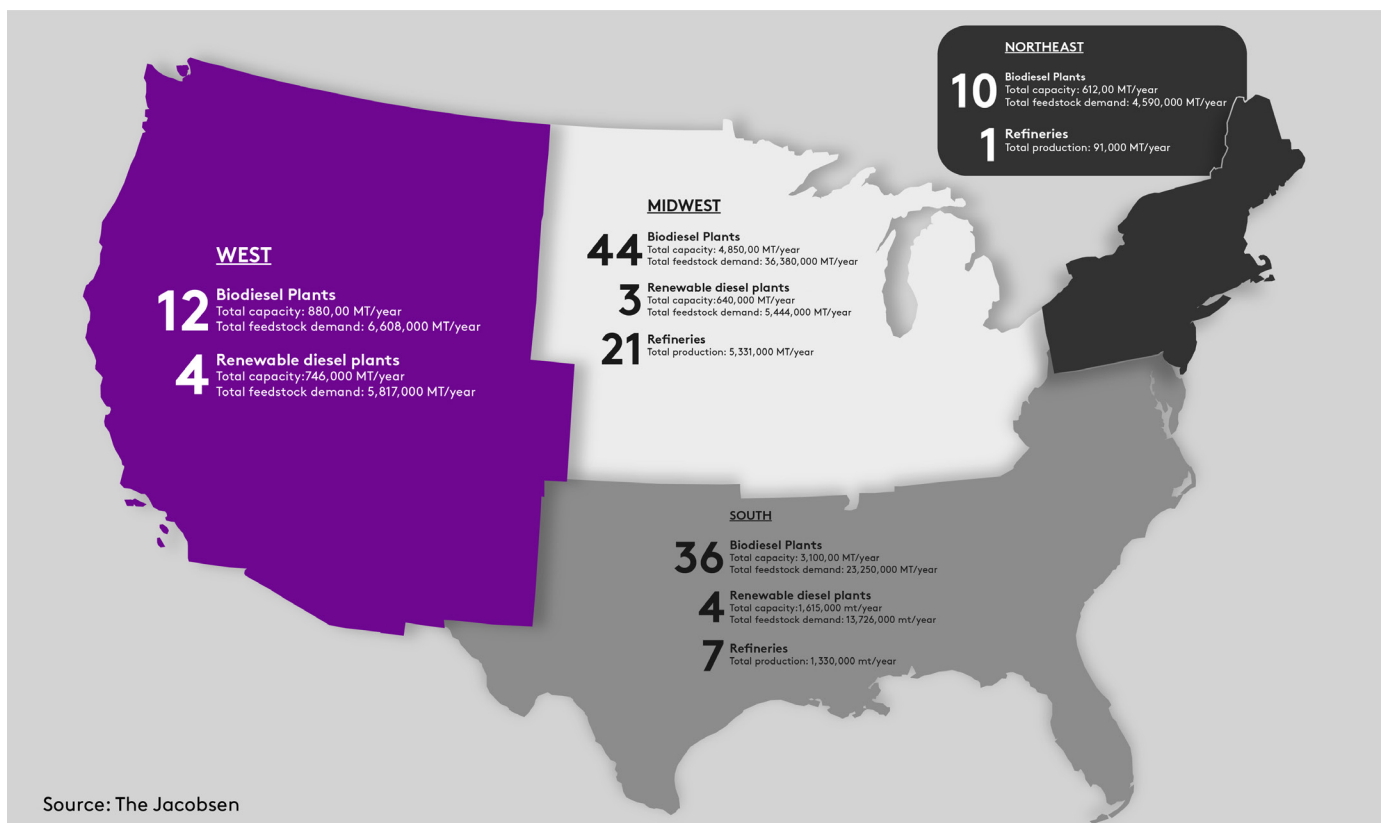
Location and growth

Renewable diesel producers are combatting a shortage of refining capacity by building at the front of their plants. However, there is also a mismatch between crushing and refining facilities' location and growth in renewable diesel production. Crushers and refiners are generally located in the Midwest and south. Areas that will see the fastest growth will be in the west and north east.

While some expansions are likely to be in areas further west than existing facilities, most will remain within the Midwest, the heartland of US soybean and corn production. Supply deficits in the western and north-eastern US provide an incentive for renewable diesel producers to add vegetable oil refining capacity.

U.S. Refineries, biodiesel & renewable diesel plants

*as of January 2021



Reconciling demand

Detailed balance sheets for crude and refined soybean oil provide insight into the impact of the shortage in refining capacity. Unfortunately, reconciling the demand categories in the crude and refined balance sheets to specific categories in the combined balance sheet is impossible. Understanding exactly which classes supply the biofuel industry is unfeasible. However, it is still helpful to precisely understand how much crude production refiners process and how usage could change in the coming years.

We expect the most significant change in crude soybean oil use from 2019/20 to 2021/22 to be the predicted drop in exports. USDA's May supply and demand projections confirmed our expectation that exports would decline sharply in the next marketing year. The other notable change is the increase in edible consumption. We believe that at least a portion of the crude oil refined by renewable diesel producers will come from this category.

For refined use, the only substantial change from 2019/20 to 2021/22 is the increase in refining as more capacity comes online and soybean oil production increases. The rise in supply allows similar increases in the domestic demand categories. However, we expect to see a reduction in the relatively limited exports of refined soybean oil.

We predict stocks for both categories to tighten and believe inventories could fall to pipeline levels. That is, to the lowest level possible given the volume of soybean oil moving through the value chain at any given point in time.

Although we cannot reconcile the crude and refined balance sheets with the traditional soybean oil balance sheet, it is still helpful to understand the changes in the demand structure over the next several years.

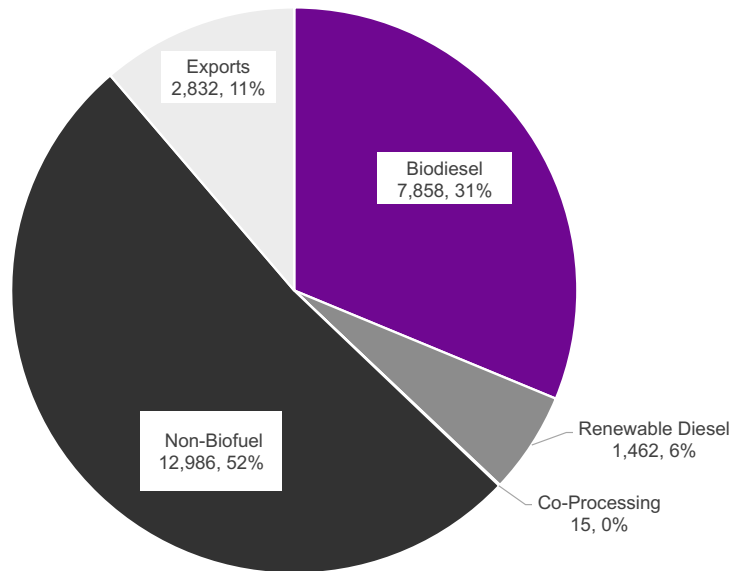
U.S. Crude soybean oil supply and demand		
(million pounds)	2019/20	2021/22
Beginning Stocks	1,401	1,681
Production	24,911	27,388
Imports	54	296
Total Supply	26,366	29,365
Domestic Use	22,412	27,178
Refining	18,377	20,204
Refining Loss	443	487
Inedible Use	1,327	1,522
Residual Use	2,265	4,966
Exports	2,446	1,166
Total Demand	24,858	28,344
Ending Stocks	1,507	1,020

Source: USDA and Fastmarkets The Jacobsen

U.S. Refined soybean oil supply and demand		
(million pounds)	2019/20	2021/22
Beginning Stocks	375	450
Production	17,935	19,718
Imports	266	1,454
Total Supply	18,575	21,622
Domestic Use	17,844	21,213
Inedible Use	4,982	5,799
Edible Use	13,127	15,280
Residual Use	(265)	134
Exports	386	184
Total Demand	18,230	21,397
Ending Stocks	345	224

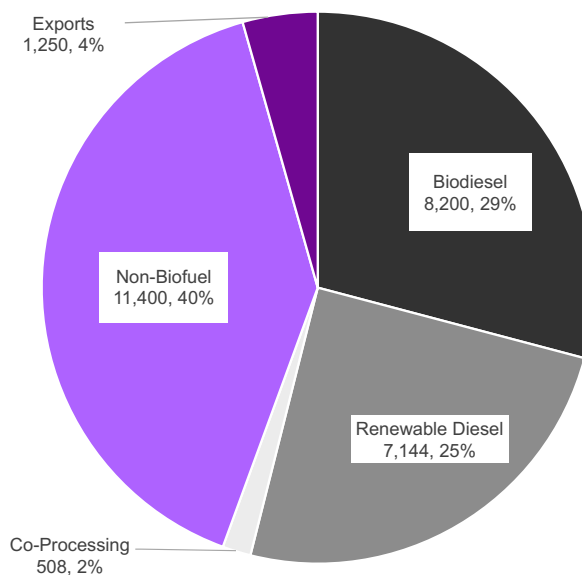
Source: USDA and Fastmarkets The Jacobsen

Soybean oil demand 2019/20



Source: USDA and The Jacobsen

Soybean oil demand 2021/22

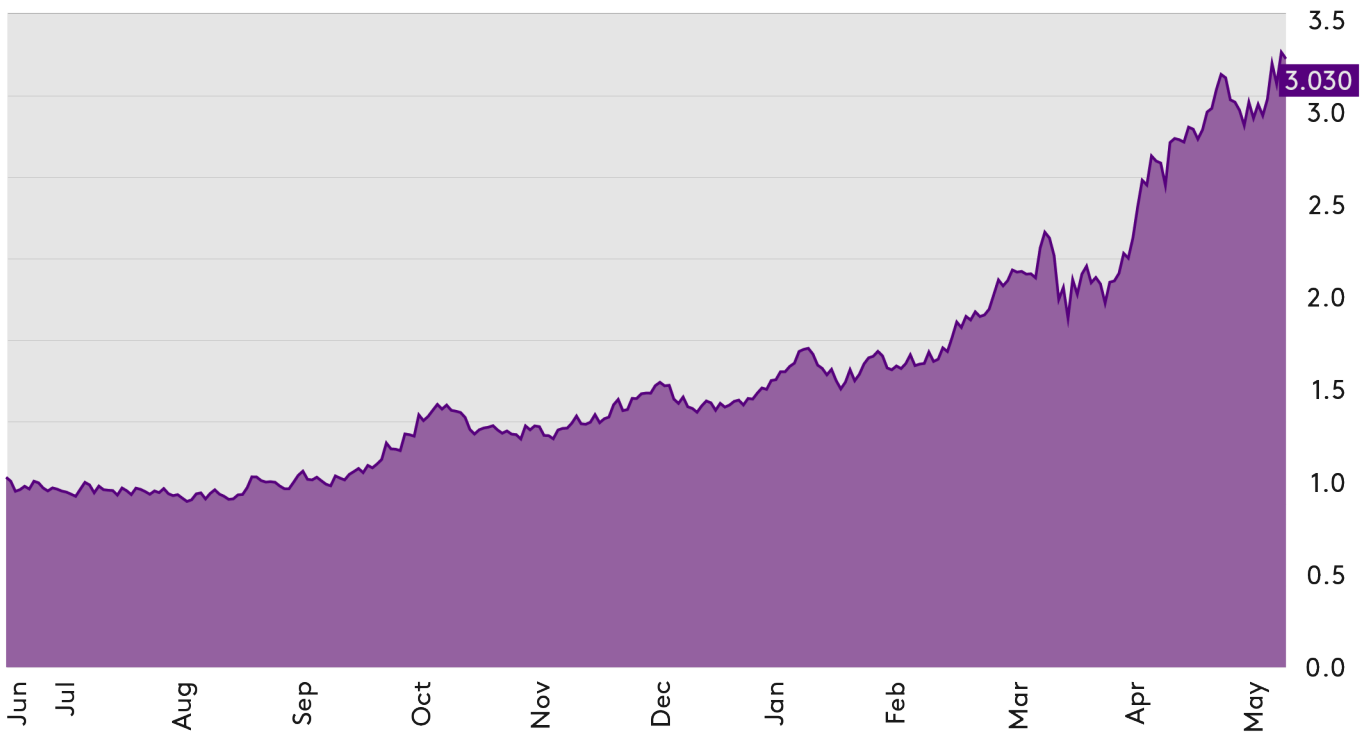


Source: The Jacobsen

The most significant change in the demand structure is represented by the biofuel industry. We believe 2020/21 is likely to be the last where biofuel production represents less than 50 percent of the total demand.

The shift in demand and lack of refining capacity will substantially impact the economics of using soybean oil as a feedstock. The surge in soybean oil prices, and the heating oil futures (HOBO) spread, has driven our estimates of net margins negative for both renewable diesel and biodiesel production. This is even when including the value of the various credits generated by producers. While negative margins will likely have a short-term impact on production, it will not slow the development of plants.

Spread between July soybean oil and heating oil futures



Source: CME

Fuel and feedstocks

The economics may also drive a shift in the feedstock mix away from soybean oil. However, given that the supplies of competing feedstocks are limited, soybean oil will be the largest component of the feedstock mix. Particularly until advanced feedstocks can displace a significant portion of the feedstock mix. For the foreseeable future, soybean oil will be the primary feedstock for the biofuel industry.

We expect the interaction between soybean oil prices and the profitability of renewable fuel production to drive periods of expansion in vegetable oil production and refining capacity over the next decade. This is as renewable diesel capacity comes online, and absent the development of advanced biomass-based diesel feedstocks.

Periods of tight stocks will provide an economic incentive for development in crushing and vegetable oil refining, which will expand supply sufficient to meet the demand for several years. However, continued expansion in renewable fuel production will ultimately tighten stocks to the point where the economics of vegetable oil refining justify further development ■

To gain more insights in the oilseeds and renewable diesel markets, visit us [online here](#).