



March 2024

**Inside this Issue...**

*Introduction* ..... 2

*Soybean Oil's Role in Meeting RD Demand*..... 3-4

*Capacity and Risk* ..... 5-7

*Alternative/Competitive RD Feedstocks* ..... 8-9

*The Soybean Meal Question* ..... 10-15

*Outlook* ..... 16

*Conclusions* ..... 17

# Rapid Expansion of Soybean Crush Capacity Risks Exceeding Growth of Renewable Diesel

**Key Points:**

- The push for renewable diesel is boosting demand for soybean oil as a feedstock. Soybean crush capacity in the U.S. is expected to expand 23% over next three years to meet the growing demand. While demand puts upward pressure on soybean prices, U.S. soybean exports will slow and imports will rise, thereby moderating soybean prices.
- Competition from imported vegetable oils like canola oil and palm oil, imported fats such as tallow, and imported used cooking oil are also increasing. While U.S. tallow production and imports are not expected to rise substantially, imports of vegetable oils are expected to continue growing, pressuring soybean oil prices. Long term, growing global demand for biofuel feedstock will tighten supplies and slow imports into the U.S. Used cooking oil from China is also suspected of being palm oil, which if true, could result in import restrictions.
- The soybean meal surplus will grow. Domestic demand is expected to increase, but not at the same pace as supply, requiring the U.S. to increase exports. However, global opportunities are murky and export competition is rising, particularly in South America.
- The record crush margins of the last 2-3 years are likely in the rearview mirror with low to moderate margins expected for the near term until policy and industry production targets align on volume levels for renewable diesel. This raises the margin risk on newly built plants with high breakeven costs of production, or destination plants with higher costs of acquiring and transporting soybeans.



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## Introduction

A renewable diesel (RD) boom is underway, thanks to several years of government standards and incentives to produce alternatives to fossil fuels. RD's appeal is its refining process, which allows it to replace diesel without the blend limitations and storage concerns of fatty acid methyl ester (FAME) traditional biodiesel. The RD production boom of the past three years has created enormous demand for feedstock, which has largely been met by soybean oil. According to University of Illinois agricultural economists, almost no soybean oil was used to produce renewable diesel before 2018, yet by 2022, its market share had risen to 26.9%.

Soybean crush capacity in the U.S. has grown 7% in the past three years, and is expected to grow 23% in the next three. Most of the capacity growth is in the construction of greenfield facilities with 11 new plants expected to be built in the next three years, while four plants are expanding capacity or are being retrofitted to process oilseeds. Over half of the future expansion is slated to occur in just four states – North Dakota, Nebraska, Wisconsin and Missouri.

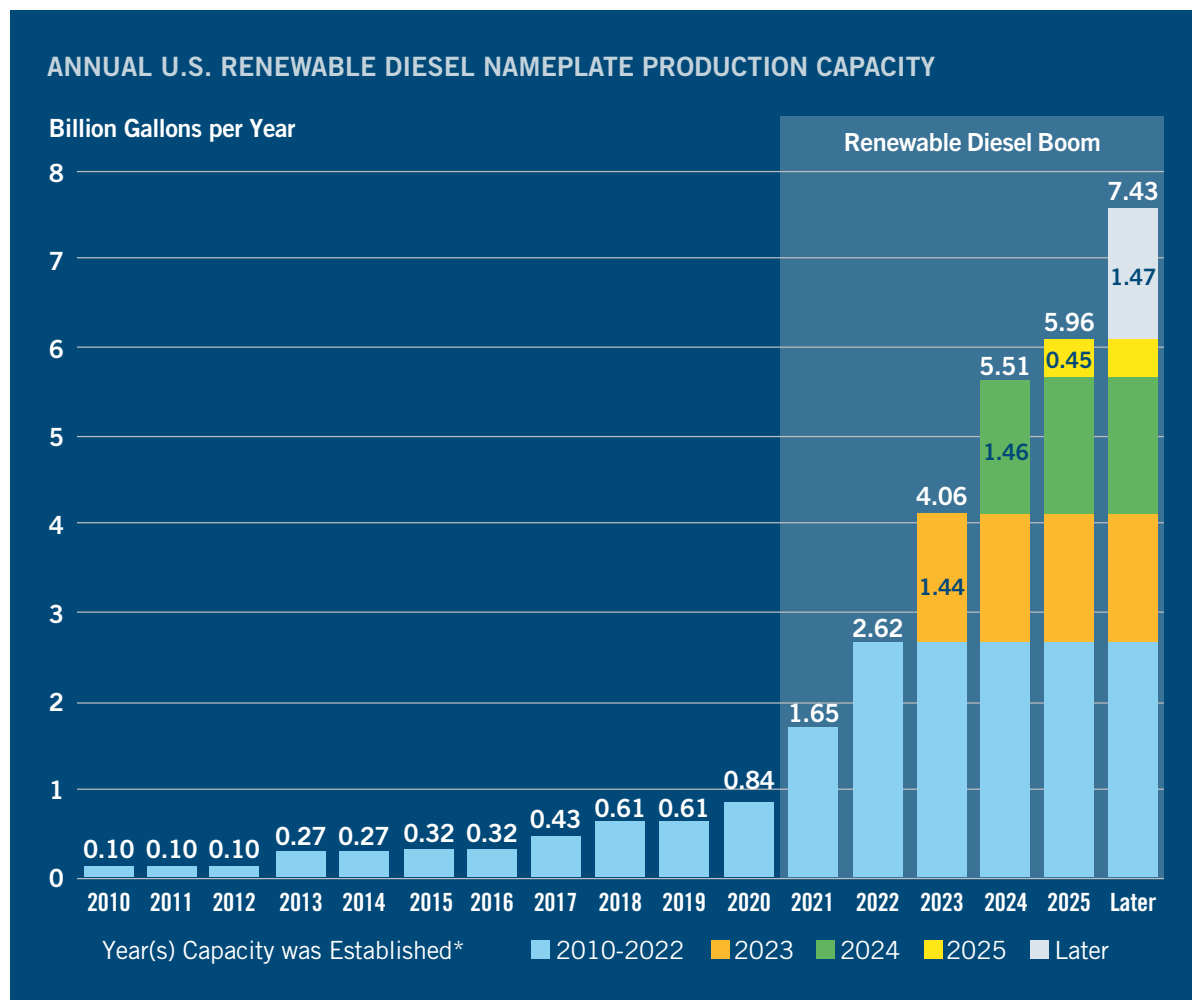
Soybean oil is the largest feedstock for biobased diesel production and has the greatest capacity for growth due to ample domestic availability compared to other feedstocks. But soybean oil is far from the only feedstock that can be used in renewable diesel production. With an exceptional CI (carbon intensity) score compared with other oil substitutes, tallow and other animal fats and oils are an attractive feedstock. To help meet rising demand for renewable diesel feedstocks, imports of fats and oils have climbed to record highs while exports have fallen sharply, thereby creating more flexibility for renewable diesel producers in sourcing feedstocks. This increased availability of alternative feedstocks and record flow of vegetable oil imports has created competition for soybean oil and capped soybean oil prices.

Along with record soybean oil production is record soybean meal production. Soybean meal stocks have held within historical norms due to strong exports to Southeast Asia in the absence of export competition from Argentina – historically the world's largest exporter for soybean meal and oil. The record pace of U.S. soybean meal production and the moderate growth in domestic demand requires a robust export program to clear inventories in the U.S. However, the opportunity for soybean meal disappearance in global markets is murky.

## SOYBEAN OIL'S ROLE IN MEETING RD DEMAND

### Renewable diesel is the preferred low-carbon diesel solution

The U.S. market is moving to blend greater amounts of renewable diesel, especially with state and federal policies providing tax credits and incentives to blend lower carbon fuels. The refining process for renewable diesel allows it to replace diesel without the blend limitations and storage concerns of fatty acid methyl ester (FAME) traditional biodiesel. The U.S. blenders tax credit provides \$1 for each gallon of RD and FAME biodiesel blended. Low-carbon fuel standards (LCFS) in California, Oregon and Washington have resulted in higher blend rates of RD; in California, RD now makes up the bulk of the state's diesel consumption. Lower prices of renewable identification numbers (RINs) in recent months may reduce plant utilization or cause planned RD expansion to slow or be shelved. RD production will continue to climb to meet continuing demand for lower-carbon fuels, which is expected to grow 83% in the next five years. If all RD projects begin operations as scheduled, U.S. renewable diesel production capacity could reach 5.96 billion gallons by the end of 2025. ■

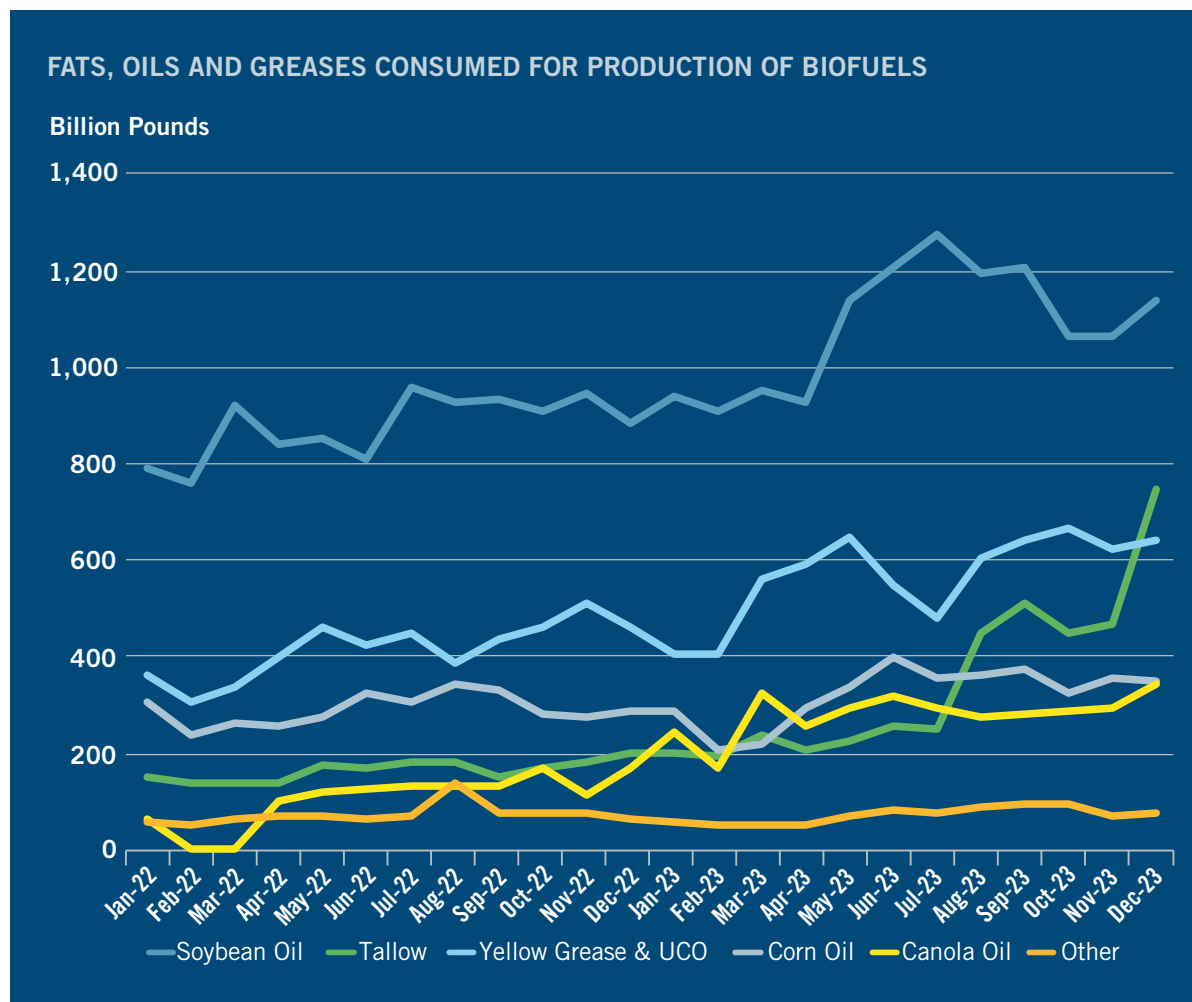


Source: EIA, Rener and Biodiesel Magazines, and other industry sources per farmdoc daily, March 29, 2023.  
 \*Actual for 2010-2022 and projected for 2023-2025 and later.

## SOYBEAN OIL'S ROLE IN MEETING RD DEMAND

### Soybean oil is the largest feedstock source for biobased diesel

Soybean oil is the largest feedstock for biobased diesel production, accounting for roughly 35% of monthly feedstock usage – down from over 50% a year ago as usage of competing fats, greases and oils increases. Tallow in particular has climbed to over 20% of total feedstocks, while yellow grease and used cooking oil (UCO) account for 20%. Corn oil and canola oil both account for roughly 10%. While processor margins on processing soybean oil for RD are the lowest of all the feedstocks, soybean oil still has the greatest capacity for growth due to ample domestic availability compared to other feedstocks. Yellow grease and corn oil have lower carbon intensity scores, which translates into higher dollar credit values per gallon in the California LCFS program. If soybean oil can claim a lower CI score, there may be opportunities to encourage higher blending of soybean oil at RD plants. ■

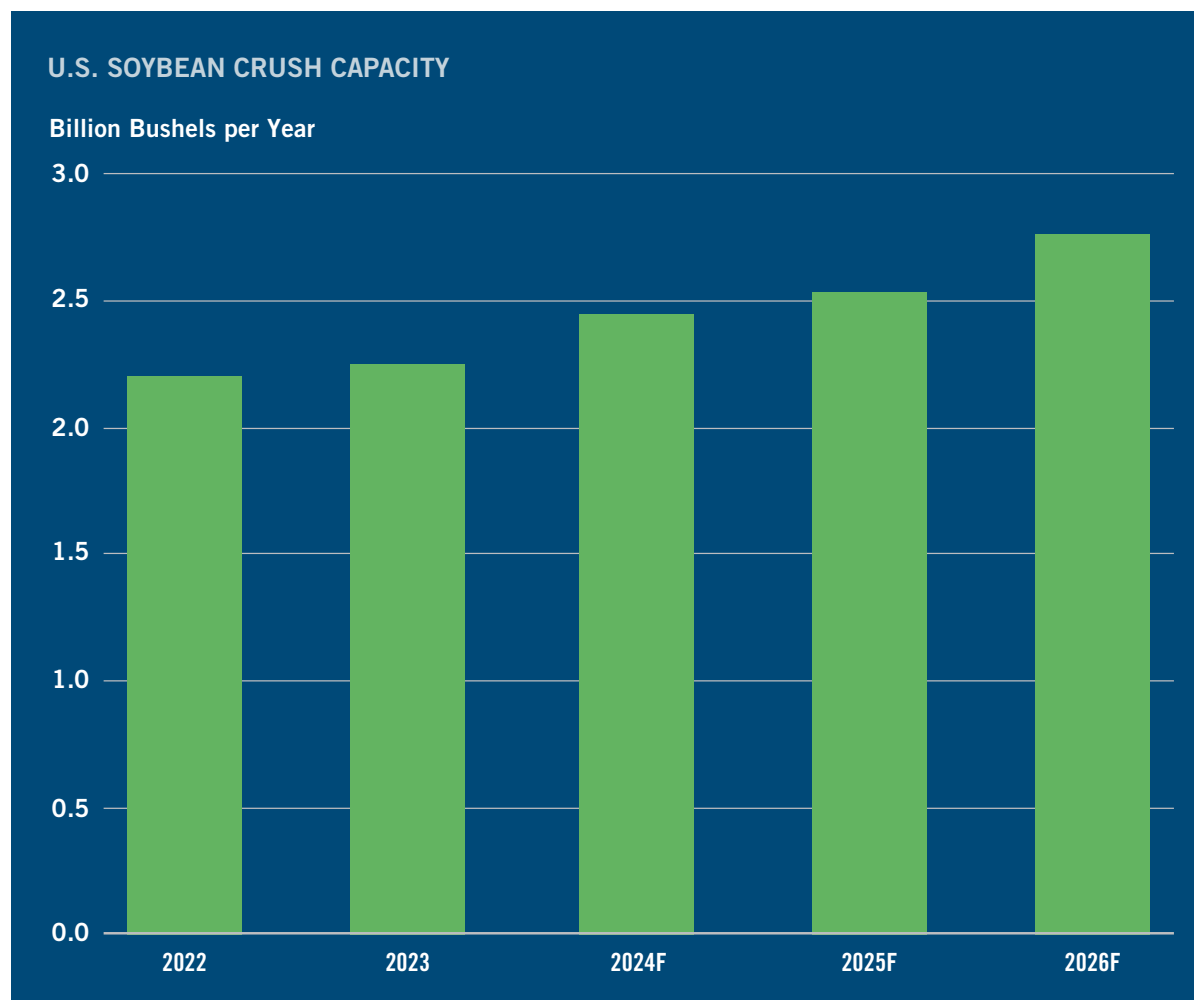


Source: EIA Monthly Biofuels Capacity and Feedstocks Update

## CAPACITY AND RISK

### U.S. soybean crush capacity expected to rise 23% in the next 3 years

With the U.S. growing up to 4.5 billion bushels of soybeans each year, and with soybean acreage expansion in South America able to fill the void of reduced U.S. exports, soybean crush capacity in the U.S. is able to continue expanding domestic usage. Rising soybean imports into the U.S. from South America are also expected to lend more flexibility in supply to meet to the expansion of U.S. demand for soybeans. Total soybean crush capacity is expected to climb 23% in the next three years with most of the growth occurring from the construction of greenfield plants in the Midwest. Eleven new plants are planned for construction, while four plants are slated for expansion or retrofitting to process oilseeds. ■

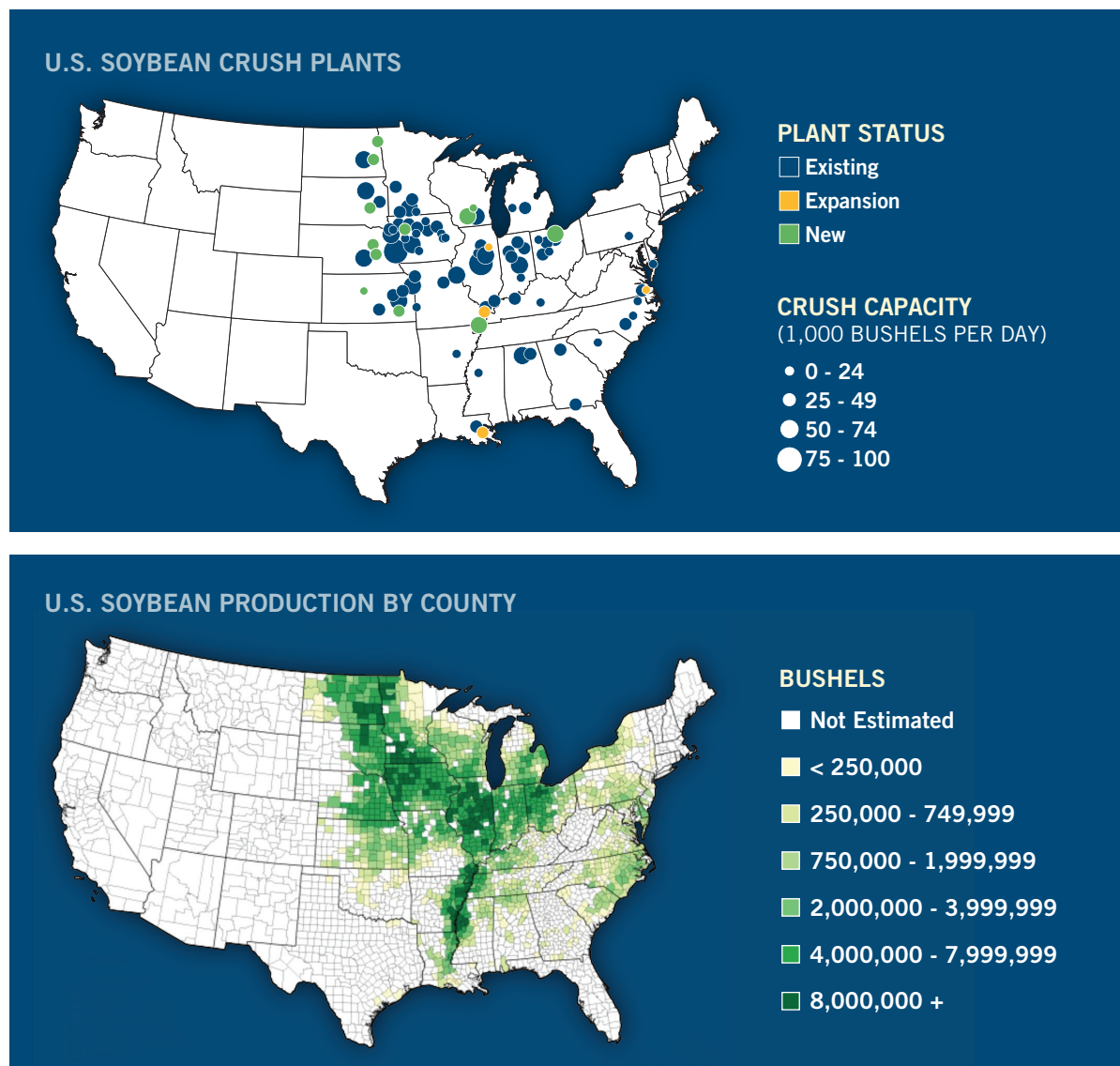


Source: American Soybean Association

## CAPACITY AND RISK

### Crush capacity growth is highly concentrated

Current and future soybean crush plants are clustered in the central U.S. near soybean production. North Dakota, Nebraska, Wisconsin and Missouri alone account for just over half of the new crush capacity. Ohio, Kansas, Illinois, Louisiana, Iowa, South Dakota and Virginia are also expected to see capacity growth. The growth in capacity will likely put upward pressure on local soybean basis. Basis risks will become exceptionally tight in regions where plants will be in competition for local soybeans, or in regions competing with strong export bids. Destination plants – or plants located outside of soybean-growing regions – are of greater financial risk due to increased reliance on transportation to acquire soybeans. Plants in close proximity to each other also risk having short supplies in tight years. Years of tight supply or rising transportation costs will be particularly painful for plants in remote locations. ■



Sources: USDA-NASS, CoBank

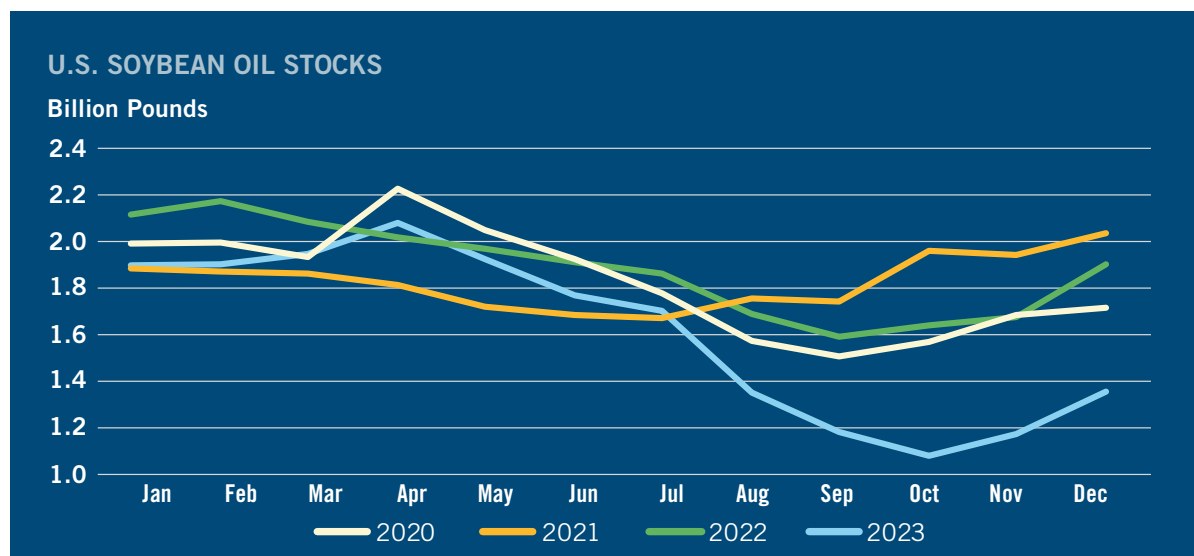
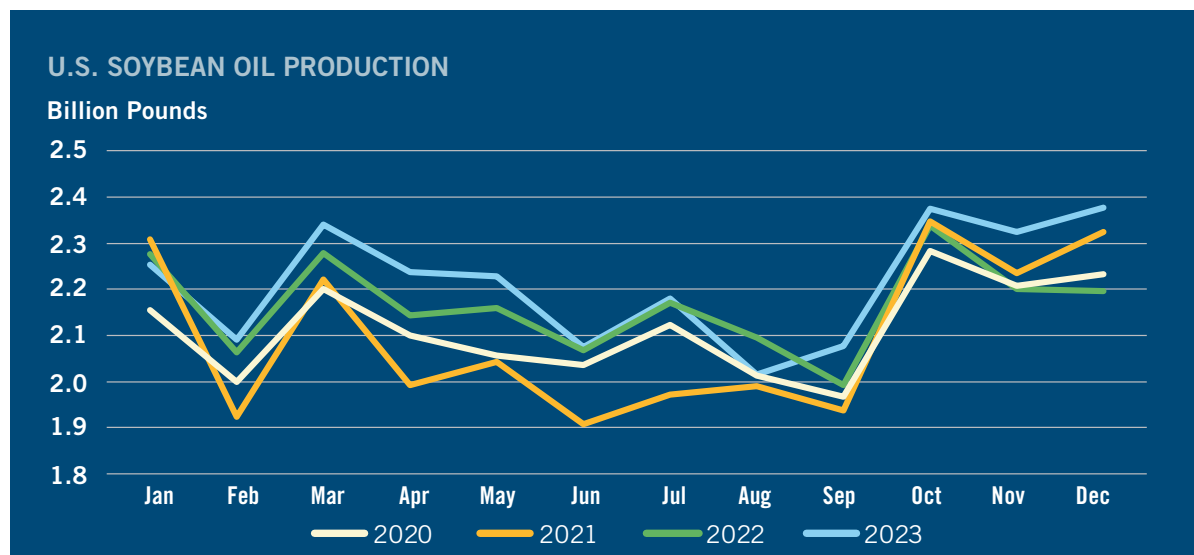
## CAPACITY AND RISK

### Soybean oil production is at record high, but stocks are tight

Soybean oil production in the U.S. has risen to record levels as crush capacity expands. Soybean oil stocks, though, have fallen to historically low levels due to rising demand for renewable diesel feedstocks. Tight stocks of soybean oil in the U.S. have put a stronger floor under prices, raising the importance of soybean oil's role in the crush margin. In a reversal of roles, soybean oil's contribution to the soybean crush revenue\* has risen to about 40%, up from its pre-2021 historical average of 34%, while soybean meal's contribution to the crush revenue has fallen to 60%. Soybean meal typically accounted for 66% of the value of the crush prior to the renewable diesel expansion. ■

#### \*calculation:

soybean oil price/lb.  
x 11 lbs./bu.  
+ soybean meal price/ton/2000 lbs./ton  
x 48 lbs./bu.  
= soybean crush revenue



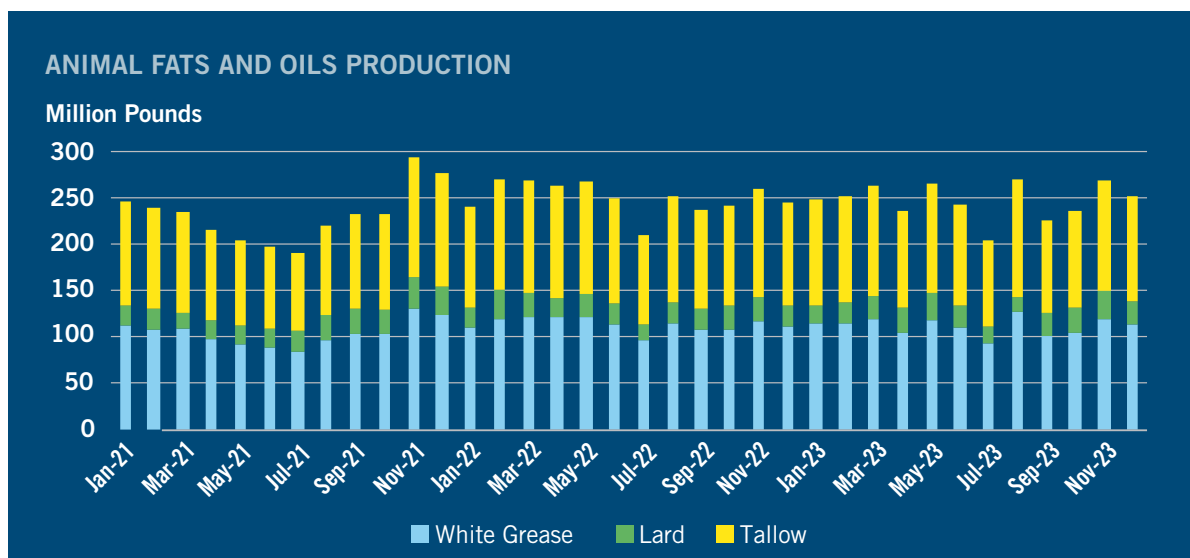
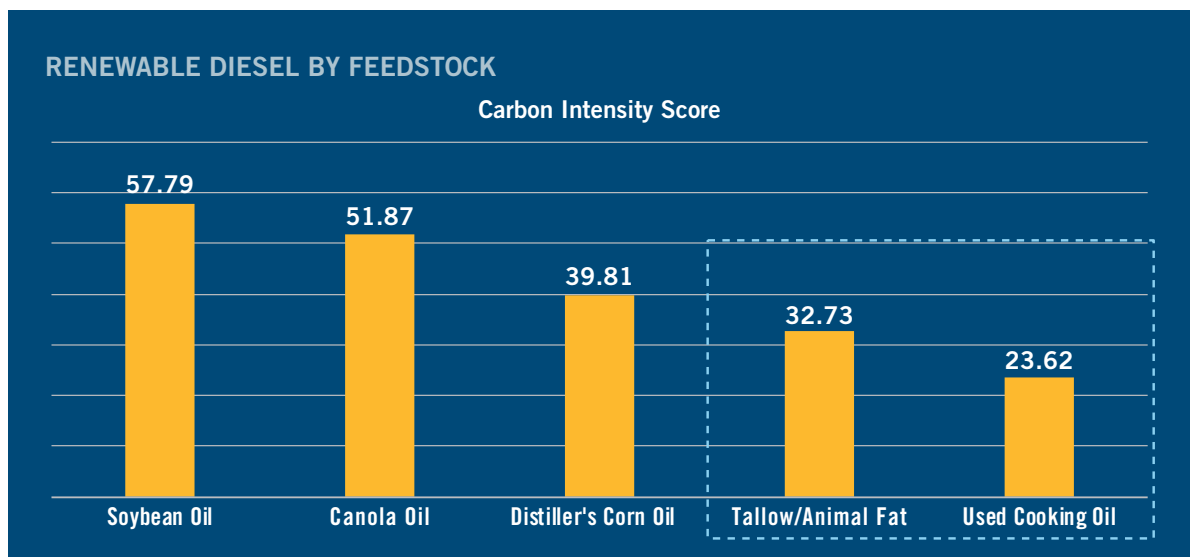
Source: USDA-NASS Fats & Oils: Oilseed Crushings, Production, Consumption and Stocks

## ALTERNATIVE/COMPETITIVE RD FEEDSTOCKS

### Animal fats and oils have a low CI score, but domestic supply is nearly tapped out

With an exceptional CI score compared to other oil substitutes, tallow and other animal fats and oils are an attractive feedstock. The lower CI scores offer higher premiums in carbon markets, pressuring prices of available byproducts that have traditionally garnered a modest value in feed or other markets.

However, growth prospects for animal fats and tallow as feedstocks are limited. Available domestic supply appears to have reached capacity at about 3 billion pounds annually and prices have been rising over the last decade. Despite the market signals creating a strong incentive for refineries to utilize animal fat and oil feedstocks in the biofuels space, the U.S. production outlook is flat. ■



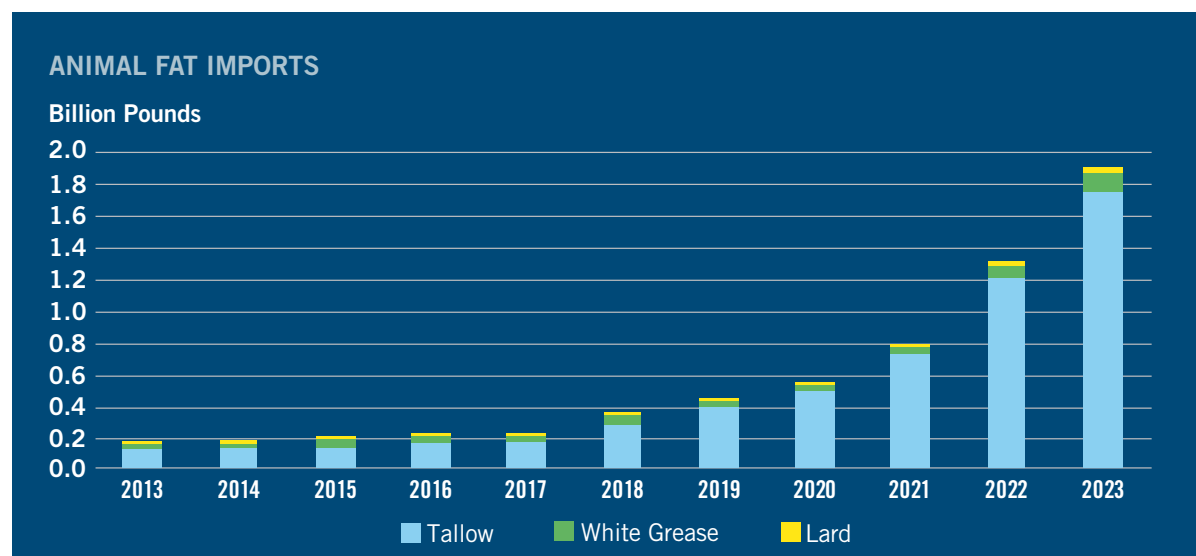
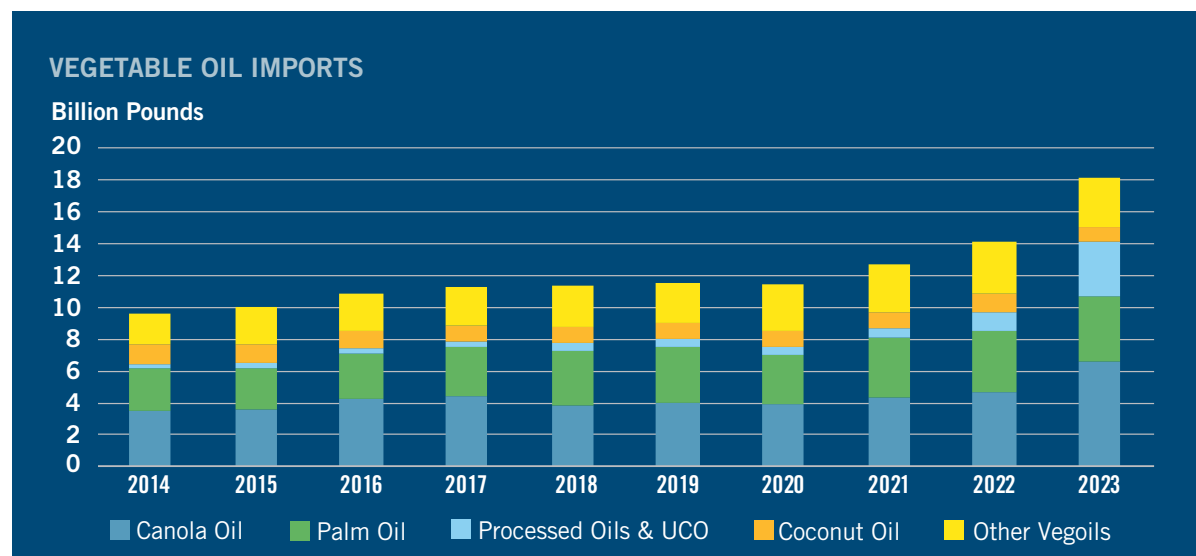
Source: The ProExporter Network and California Air Resource Board, April 19, 2022, USDA-AMS, CoBank Calculations



## ALTERNATIVE/COMPETITIVE RD FEEDSTOCKS

### Imports of fats, oils and greases are at record highs

To help meet rising demand for renewable diesel feedstocks, imports of fats and oils have climbed to record highs while exports have fallen sharply. This increased availability of alternative feedstocks and record flow of vegetable oil imports has created competition for soybean oil and capped soybean oil prices. After EPA's approval in December 2022, imports of canola oil for RD production sharply increased. And in December 2023, California's Air Resources Board approved soybean oil imports from Argentina into its LCFS program after the CI score for Argentine soybean oil was deemed similar to the CI score of U.S. soybean oil. Processed oils, which include used cooking oil (UCO), also surged in 2023. Scrutiny of UCO imports from China is growing. Processors are accused of fraudulently selling palm oil, which is prohibited due to tropical deforestation. Legal restrictions and growing demand abroad could limit the future availability of global feedstock and potentially slow imports of fats and oils into the U.S. The result could support soybean oil prices and crush margins. ■

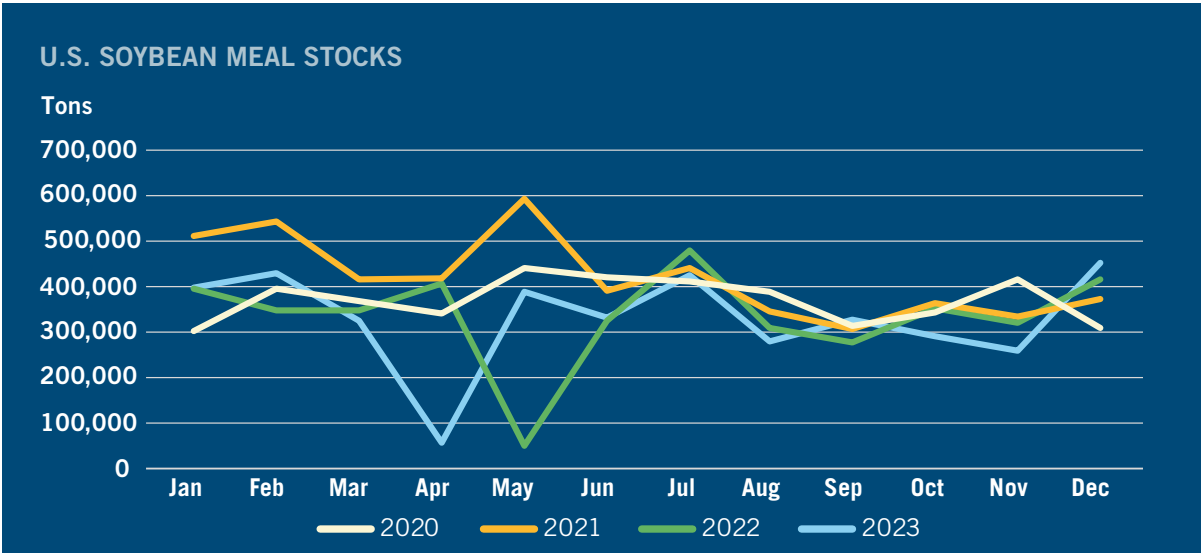
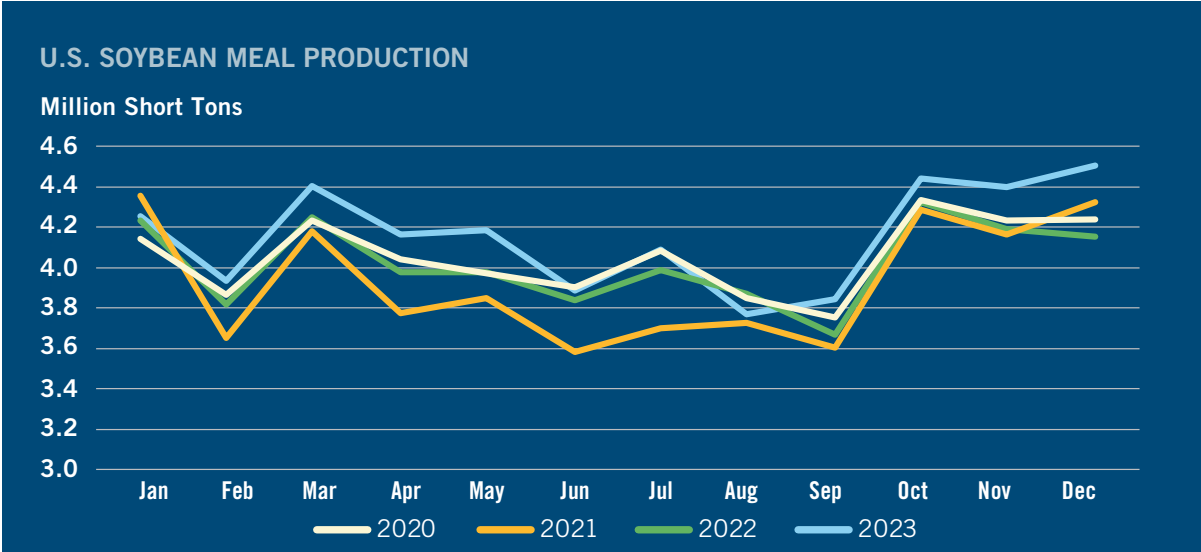


Source: USDA-FAS

### THE SOYBEAN MEAL QUESTION

## U.S. soybean meal stocks are rising

Crushing soybeans produces not just soybean oil but also soybean flakes, which are processed into meal used in food and animal feeds, principally as a protein supplement. Although soybean meal production has climbed to record highs, stocks have held within historical norms due to strong exports to Southeast Asia in the absence of export competition from Argentina – historically the world’s largest exporter for soybean meal and oil. End users of soybean meal in the U.S. hope to benefit from an abundance of soybean meal supplies in the years ahead as crush capacity grows and soybean meal production climbs. ■



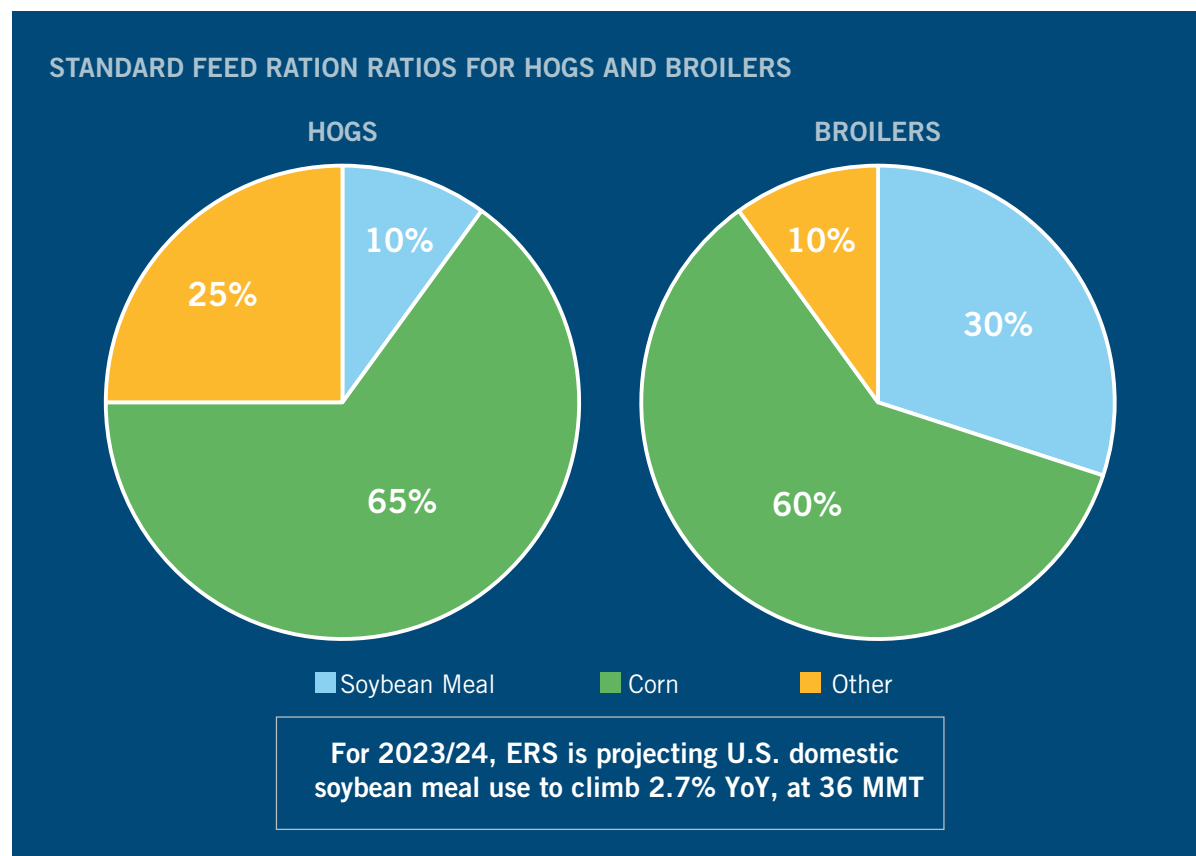
Source: USDA-NASS Fats & Oils: Oilseed Crushings, Production, Consumption and Stocks

## THE SOYBEAN MEAL QUESTION

### Swine and poultry are top feeders of soybean meal, but ratios are small and set

With cattle less tolerant of soybean meal's high protein content, swine and poultry are meal's primary feed segments. Iowa State University dietitians say bringing a hog to market weight takes roughly 8 bushels of corn (65% of the ration), with the remainder of the diet typically a mix of 10-12% soybean meal, and a mix of roughly 25% corn substitute (DDGs or other).

Given their better long-term growth outlook, we expect broiler integrators will be best positioned to leverage growing soybean meal supplies. But like hogs, poultry's rations do not have much flexibility. ■



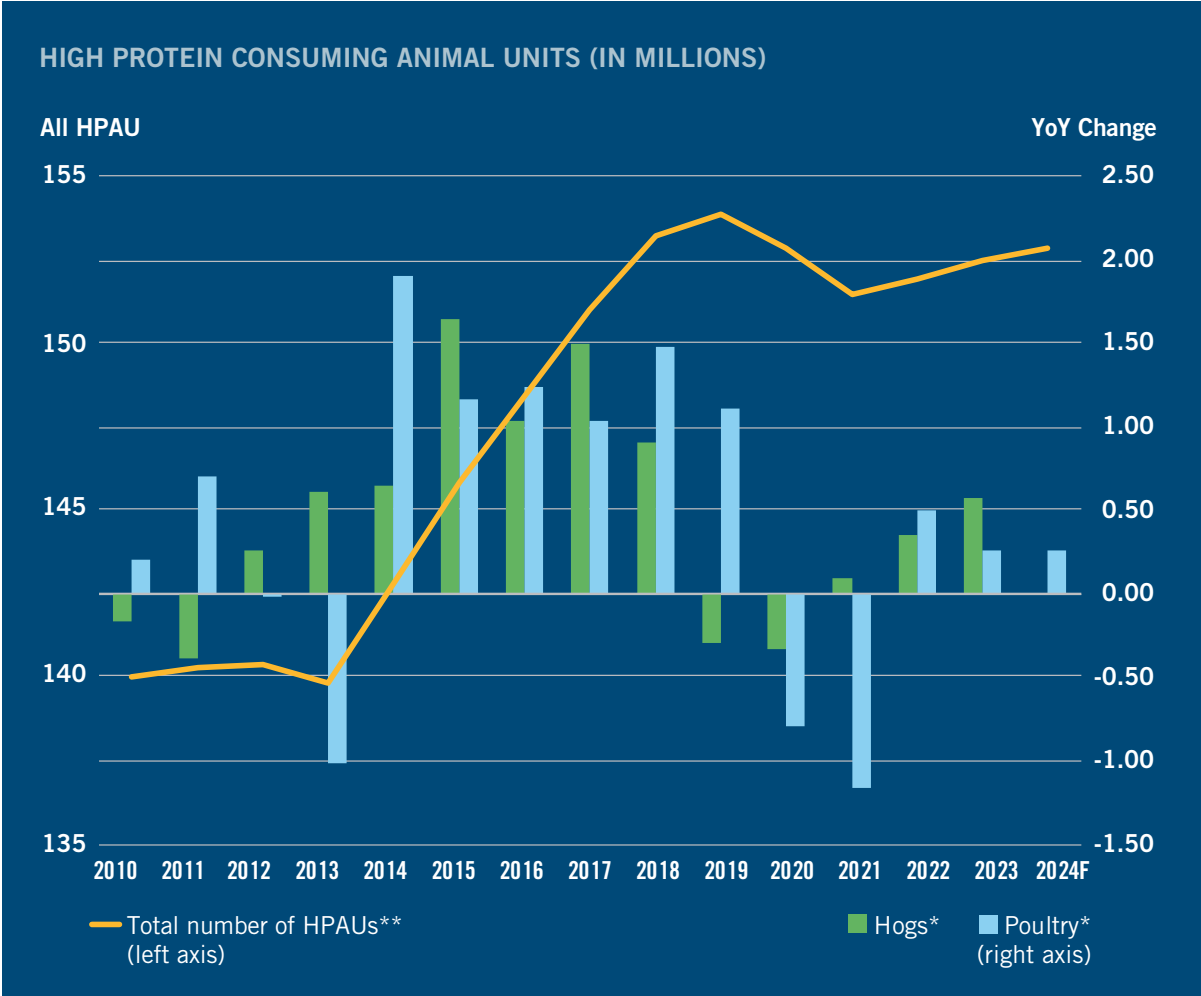
Source: Iowa State, USDA, CoBank Estimates

### THE SOYBEAN MEAL QUESTION

## Animal protein production is flattening and still not back to 2019 levels

Do we have enough livestock to absorb additional soybean meal? Plentiful feed inputs and steady demand have historically encouraged animal protein production to expand. The last occurrence of this phenomena was when the ethanol boom catapulted corn acreage. At first, corn prices rose. But eventually as corn surplus and stocks grew, integrated broiler producers in particular took advantage of low feed costs to boost production. More recently, however, higher input costs and uncertain consumer demand has stalled growth expectations for animal protein.

Total high protein (grain consuming) animal units (HPAUs) – which represents the head count and assumable consumption rates in each category – stood at 153 million in 2023. That’s up 0.4% YoY, but down nearly 1% from the peak in 2018. For 2024, we forecast a modest increase in HPAUs of just 0.2% with moderate increased broiler production leading the charge. ■



Source: USDA, CoBank Estimates

\*Only hogs and poultry are called out as they represent the majority of soybean meal feed use

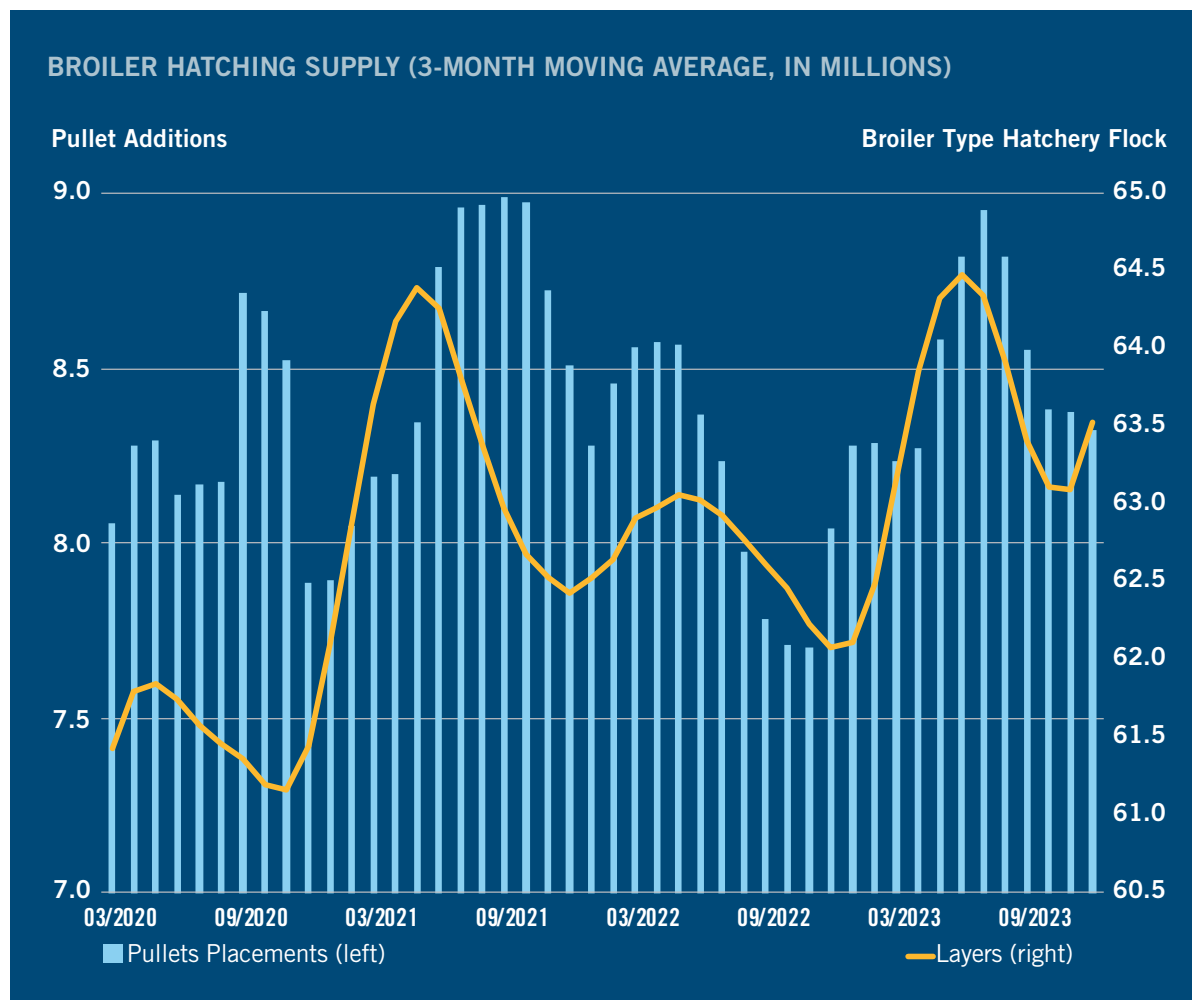
\*\* Includes dairy and beef cattle, hogs, poultry and other

## THE SOYBEAN MEAL QUESTION

### Layer flock size and output curbs growth of broiler numbers

During its impressive growth stretch over the last decade, annual U.S. broiler production increased 3.9 billion pounds while harvest increased just 900 million head, to 9.4 billion head per year. Feed conversion rates have generally improved over time, but broilers appear to have the most potential for domestic meal disappearance.

The potential for expanding the broiler segment lies in part in the capacity of hatcheries to produce chicks and fill barns. While the broiler hatching-type egg layer flock advanced moderately since 2022, productivity rates have hampered chick placements into the broiler flock. Through the first eight weeks of 2024, cumulative U.S. broiler harvest is down 3%, suggesting muted opportunity for growth in HPAU in the U.S. broiler sector for the foreseeable future. Ultimately, with a fixed feed ratios and stagnant animal protein population, the opportunity to increase feed use is rather limited. ■

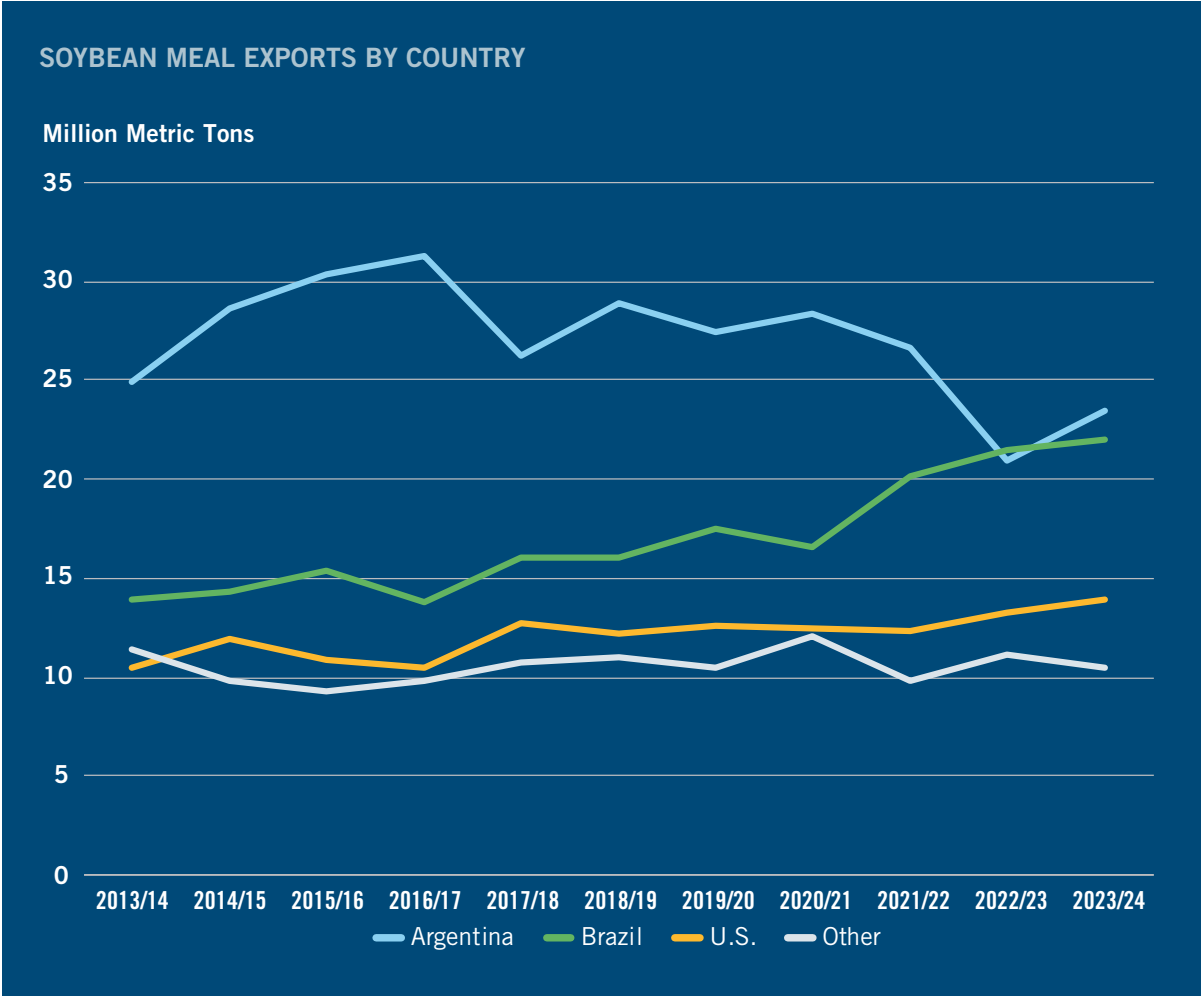


Source: USDA, CoBank Estimates

## THE SOYBEAN MEAL QUESTION

### Competition for soybean meal export market share is growing

The record pace of U.S. soybean meal production and the moderate growth in domestic demand requires a robust export program to clear inventories in the U.S. While U.S. soybean meal exports grew in 2023 following the historic drought that greatly reduced Argentina’s soybean crop and exportable soybean meal supplies, exports from Brazil substantially increased. Barring similar crop failures in South America, competition for soybean meal export market share will grow in the years ahead – requiring the U.S. to compete on price into key markets like Southeast Asia. Argentina’s soybean crushers carry the greatest risk of declining asset utilization in a global price war due to export taxes. Argentina’s export tax is currently 33% for soybeans, and 31% for soybean meal and oil. The new Argentine government has proposed raising the export tax on soybean meal and oil to 33%. ■

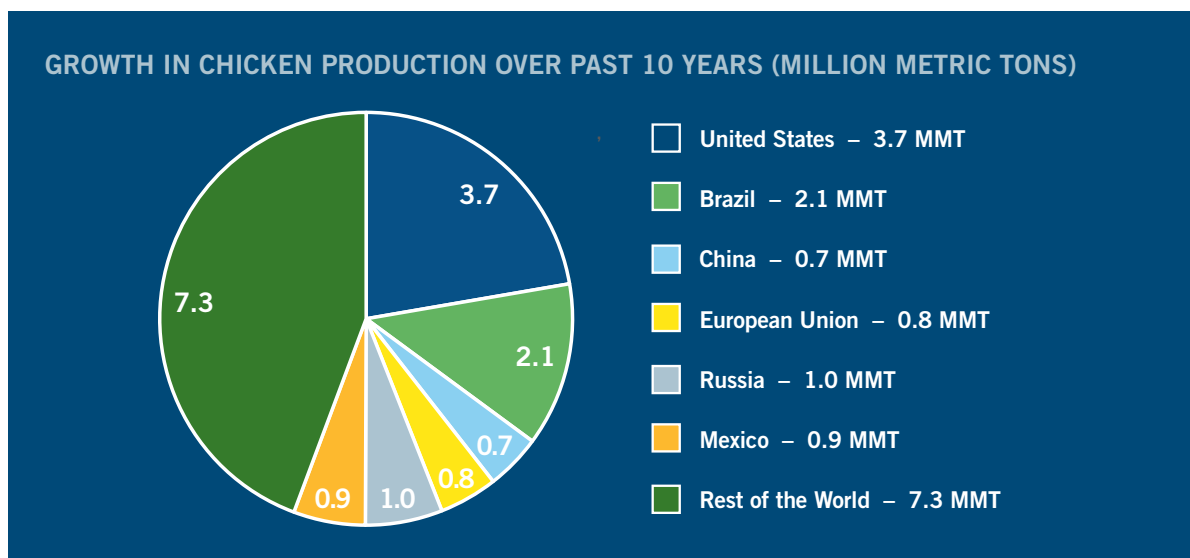
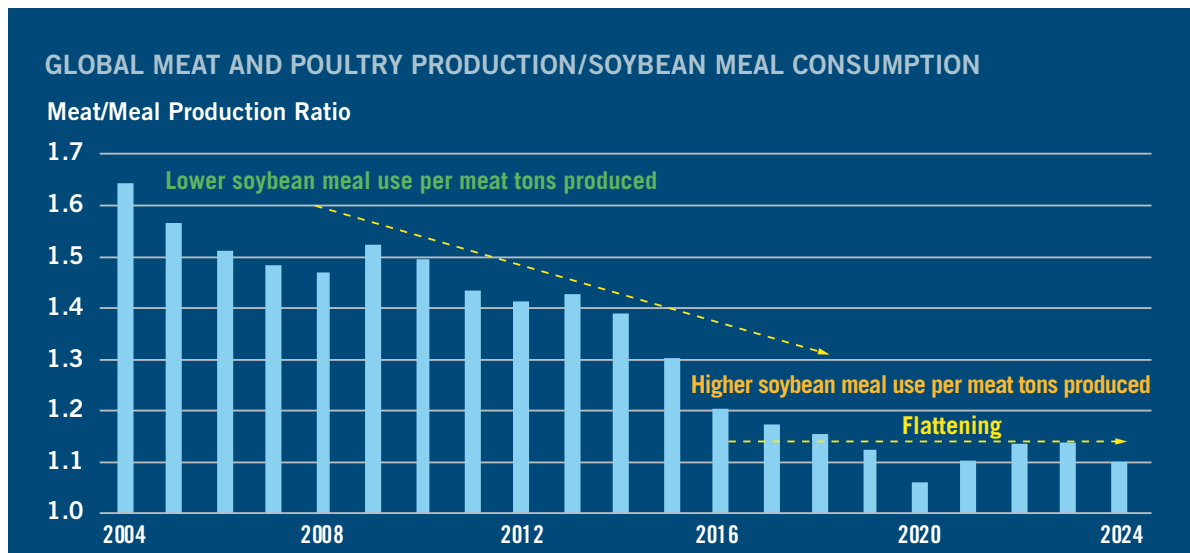


Source: USDA-FAS

## THE SOYBEAN MEAL QUESTION

### Global soybean meal use is plateauing, and feed export opportunities are limited

The opportunity for soybean meal disappearance in global markets is murky. China, the world's leading swine producer and consumer, is significantly rebalancing production and imports after African swine fever led to a 23% decrease in China's swine population during 2019, and then rebounded by 34% over the next two years. China has built out an extensive network of soybean crushing capacity, suggesting an import preference for soybeans vs. meal. Global soybean meal disappearance has grown in tandem with animal protein production, favoring poultry because of higher meal inclusion rates. We are now seeing meal use per ton flattening at 243 MMT. For poultry, roughly half of all broiler production growth over the last 10 years has come from the top six producing nations – and two, U.S and Brazil, are major soybean producers. This suggests that excess soybean meal will struggle in U.S. markets but also abroad. ■

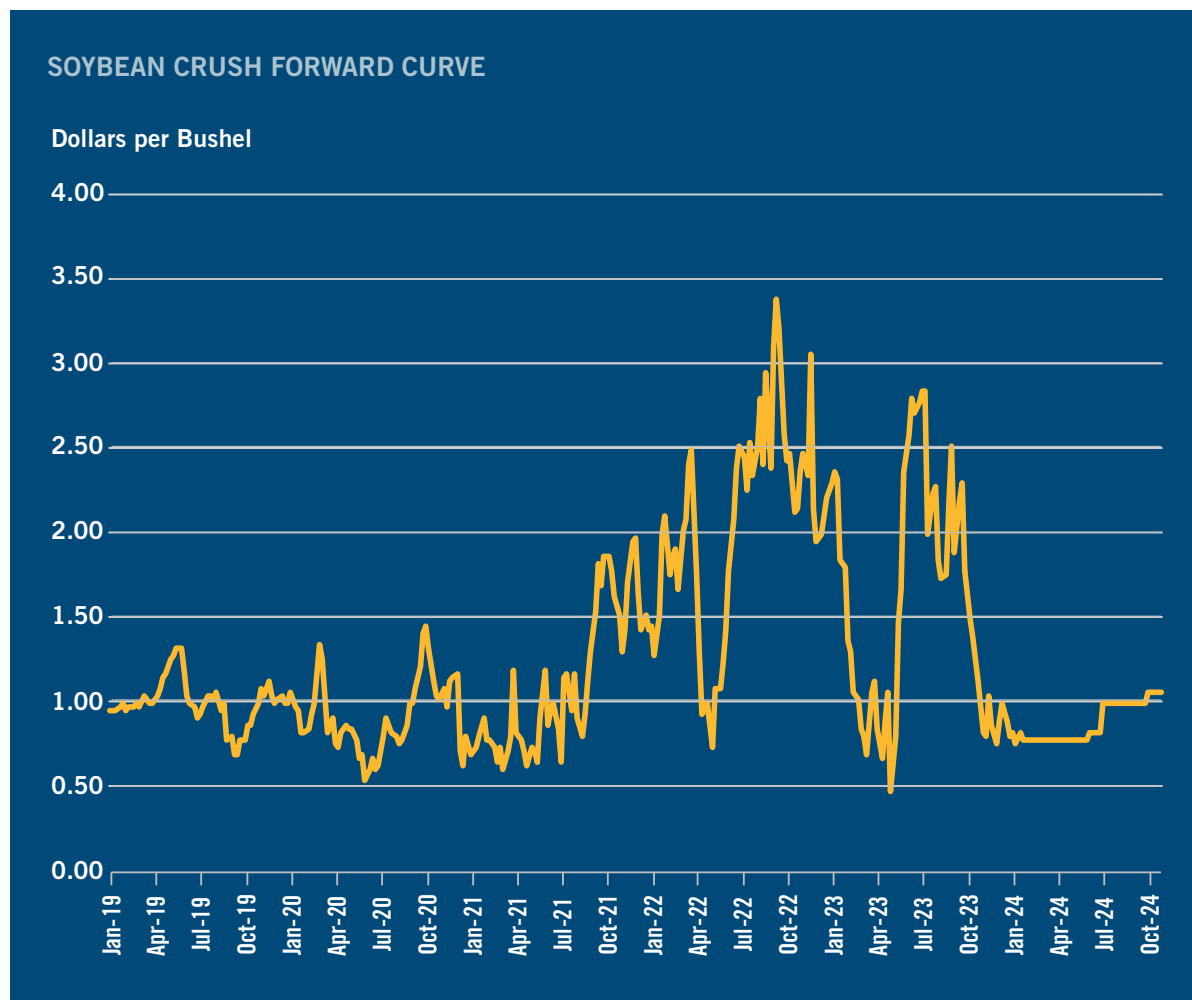


Source: USDA-FAS, CoBank Calculations

## OUTLOOK

### Soybean crush margins have returned to historical norms

In recent years, U.S. soybean crushers bolstered their balance sheets from record-high crush margins, which has left them well-prepared for the inevitable downturn in crush margins. The board crush depicted in the chart indicates a sharply lower crush margin for the year ahead, which is still profitable for legacy plants with little to no debt. New crush plants that were built at substantially higher costs due to higher costs of materials, labor and interest rates, though, will have higher breakeven costs of production with higher debt service. High soybean oil prices will be needed to counter the expected persistent weakness in soybean meal prices. In some local areas of tight soybean supplies, high soybean cash prices will erode margins. Sustained levels of low crush margins would threaten the viability of new high-cost crush plants in the years ahead. ■



Source: Barchart.com



## Conclusions

- Balance sheets of U.S. crushers are strong following multiple years of record crush margins.
- The current downturn in crush margins will not result in rationalization of assets in the near term.
- Rising demand for soybean oil to meet renewable diesel demand will support soybean oil prices long-term.
- U.S. feed demand for soybean meal will increase marginally, requiring the U.S. to compete in the export market.
- Soybean basis will tighten in local areas, compressing crush margins for some plants.
- Risk of prolonged stress on soybean meal prices will pressure margins, potentially resulting in loss of crush capacity in Argentina, where the new Argentine government has proposed higher export taxes on soybean meal.
- In the long term, the risk of overbuilding U.S. soybean crush capacity by undisciplined capital could result in declining margins and the eventual consolidation of weaker players.

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