STATE OF THE CORN ECONOMY

QUARTERLY ECONOMIC REPORT | END OF 3Q 2023

Prepared by Krista Swanson, NCGA Lead Economist

REPORT PREVIEW

In the third quarter of 2023, the corn sector wrapped up the 2022/23 marketing year and entered the 2023/24 marketing year. Geopolitical tensions and international dynamics continue to be factors in the market. Looking ahead, war in Israel could have greater implications for corn if it spreads throughout the Middle East, along with the ongoing war in the Black Sea Region. On the macroeconomic side, interest rates continue to rise while the economy remains strong, a challenge for forecasting economic landing, especially considering geopolitical factors. Despite widespread drought across the corn belt during the growing season, the U.S. is positioned to produce one of the three largest corn crops on record. The positions the U.S. with grain needed to fulfill demand. Even with strong competition in the world market, the outlook for demand from ethanol, feed, and exports is more positive than last year. This report summarizes the State of the Corn Economy with a short perspective on aspects of the corn balance sheet, macroeconomics and related markets, international dynamics, and farm-level factors.

CONTENTS

CORN BALANCE SHEET

Supply: In the October 2023 World Agriculture Supply & Demand Estimates (WASDE) report, the United States Department of Agriculture (USDA) reduced the national average projected corn yield for the 2023/24 marketing year from 173.8 to 173.0 bushels per acre, 4.7% lower than the initial trend yield projection at 181.5 bushels per acre. The projection for area planted remains at 94.9 million planted acres, with harvested area at 87.1 million acres. This translates to a harvested-to-planted-acres ratio of 91.8%, compared to the previous decade average of 91.3%. An adjustment to harvested acres is possible if warranted. In 2022, harvested acres were reduced by 2% between the November and January report. With the yield adjustment and no change to acres in the October report, the estimated production for 2023/24 declined to 15,064 million bushels, a drop of 70 million from the September estimate, and 201 million bushels off the initial production forecast. Even with the reductions, the 2023 crop is on track to be the third-highest production on record. Even if there are further downward adjustments to yield and/or harvested acres, it’s unlikely changes will be large enough for production to fall below the current third-high ranking. ***Summary: Despite drought concerns across the corn belt, USDA forecasts a 15,064-million-bushel corn crop that would be the third-highest production level in history, as the impact of increased corn acres largely offset reduced yields since the initial projection.***

Demand: Total use for the now closed 2022/23 marketing year is estimated at 13,769 million bushels, a net 225-million-bushel decline from the initial projection for the marketing year and the lowest total usage level since 2015/16. Notably, the reduced production in 2022 contributed to lower use, but also driving the decline in demand is the estimated 375-million-bushel decline in exports and a 75-million-bushel decline in ethanol use (100 million for total Food, Seed, Industrial) partially offset by a 250 million bushel increase in feed and residual. Among other factors, exports were challenged by strong competition in the world market, while motor gasoline use trailing pre-COVID levels kept ethanol tempered. USDA has made downward adjustments to demand since the initial projection for the 2023/24 marketing year, but notably the outlook for all use categories is stronger than 2022/23. For 2024, the broiler and turkey production forecasts were lowered, but the raised forecast for beef and pork production helps drive higher feed demand for the 2023/24 year. The forecast for 2023/24 ethanol use is unchanged at the same level as 2022/23. For the next year, the Energy Information Administration’s outlook indicates a slight decline in the use of fuel ethanol in motor gasoline, but strong ethanol margins are currently providing sustained interest in production. Although corn exports started the 2023/24 marketing year on track with the previous five-year average (2017/18 to 2021/22), it has been well behind Brazil’s corn export pace. ***Summary: Coming off the relatively weak demand of 2022/23, current forecasts indicate stronger demand in 2023/24 across feed, ethanol, and exports.***

Ending Stocks: The USDA October estimate for 2022/23 ending stocks at 1,361 million bushels, a 90-million-bushel adjustment from the previous month’s estimate, falling below the ending-stocks level of the previous year. The change also resulted in an adjustment to 2023/24 beginning stocks which, along with changes to supply and demand, resulted in a 109-million-bushel reduction to current year-ending stocks. However, the estimate for 2023/24 endings stocks at 2,110 million bushels is still above the 2-billion-bushel reference point for tight supply. ***Summary: Estimated ending stocks for 2023/24 remain at comfortable levels despite a 109 million bushel drop to 2.1 billion bushels driven by a big adjustment in 2022/23 ending stocks paired with changes on both the supply and demand side.***

Price Trends: USDA projects the 2023/24 marketing year average (MYA) farm price at $4.95, a considerable $1.59 drop from the $6.54 estimated MYA price for 2022/23. For the months of August through October 2023, the December 2023 corn futures contract traded in a narrow range between $4.60 and $5.10. The price at the farm level depends on relative basis which varies greatly across the corn-growing regions. Low water levels on the Mississippi River have increased the cost of river transportation since mid-August resulting in higher corn prices at the gulf. At the same time, basis levels for corn have reduced the price of corn at the farm level. This means farmers are getting relatively lower prices for their corn while the price of U.S. corn at Gulf ports is relatively more expensive to prospective world buyers. ***Summary: Comfortable stocks levels are contributing to a below $5 MYA price projection for 2023/24, while spreads between the lower farm level price and premium on the Gulf port price widened as low water levels raise the cost of river transport.***

Global Corn Balance Sheet: Coming into the 2023/24 marketing year, world corn stocks, at 298.1 million metric tons (MMT), are 4% lower than last year. World production is expected to be 5.1% higher, with increases in the U.S. and Argentina largely contributing to the world increase. Argentina has faced dry conditions the last two years, with 2022/23 severely impacted by drought. For 2023/24, the nation is expected to return to a more normal production level. After record corn production in 2022/23, Brazil is expected to produce less corn in 2023/24. USDA currently has the nation projected to produce 129 MMT, compared to 137 MMT. World corn exports are expected to increase, but overall greater production results in higher ending stocks at the end of 2023/24. It is still very early in the 2023/24 marketing year. Although the U.S. harvest season is progressing and production estimates are gaining clarity, other major producers still have an entire growing season (or two) ahead and potential weather impacts will be a factor to watch. ***Summary: World corn production is expected to rise 5.1% in 2023/24, providing the supply needed for greater corn exports but also leading to higher corn ending stocks on the world balance sheet.***

MACROECONOMICS & OUTSIDE MARKETS

Inflation: From the time most of the world began emerging from the COVID-19 pandemic in late 2021, inflation has been a top macroeconomic policy concern. The annual rate for Consumer Price Index (CPI), one measure of inflation, hit a peak at 9.1% year-over-year rate in June 2022 and then decelerated to 3.0% in June 2023. Then CPI reversed, rising to a 3.7% annualized rate in September 2023. The inflation percentage rates are a year-over-year change in the price index. This means the September 2023 price index value is 3.7% higher than the September 2022 value. The price index value was virtually the same from June 2022 through September 2022, so when the index value rose during the same months of 2023 there was a relative increase in the CPI year-over-year rate. Considering the known price index values for October through December 2022, CPI will continue to rise through the end of the year if the price index continues to grow at the same pace as the change from August to September. However, several factors, such as war in other regions, monetary policy, and market reactions, could influence prices in that time. War expanded in the Middle East could have a heavier influence on energy prices. But energy, along with food, is not included in the core inflation rate that the Federal Reserve has prioritized. The Core CPI is 4.1% for September. The Producer Price Index (PPI) and Personal Consumption Expenditures Index (PCE) are two other measures of inflation, both have trended similar to CPI. ***Summary: General inflation has improved from summer 2022, but reversed course in recent months. If the price index rises at the same rate as last month, inflation will continue to climb in the next three months, but depending on what geopolitical and policy factors materialize, prices may move more strongly in either direction.***

Interest Rates: Aside from inflation, labor and employment statistics are an important consideration in the actions of the Federal Reserve. The labor market shows signs of cooling but remains strong, like the pattern of inflation. Although the current 3.8% unemployment rate is a high point of the past year, it's a historically low level. For reference, the average rates since 2000 and 1948 are 5.8% and 5.7%, respectively. Prior to the Federal Open Market Committee (FOMC) meeting in March 2022, the target range for the federal funds rate was 0% to 0.25%. Currently, the target range is 5.25% to 5.50%. The next FOMC meeting ends on November 1, 2023, and another meeting will occur in December. The summary of FOMC economic projections from the September meeting indicates another 25-basis-point increase is possible in 2023, with 12 of the 19 members marking a 5.50% to 5.75% target range for 2023. The remaining members all indicated staying in the current range. Treasury yields are another market-driven factor that influences the interest rates that consumers and businesses pay on loans. The change in yields reflects how investors assess the economy. The market yield on 10-year treasury securities has risen about 1% since the July FOMC meeting, the highest level since July 2007, indicating investor confidence in an optimistic outlook and higher inflation expectations. If investor concern for recession grows, yields should come down as the expectation for slower inflation and a lower federal funds rate is priced in. Lenders tie their interest rates offered to loans made, so the increasing treasury yields are also contributing to higher rates on consumer and business loans. ***Summary: Providing the economy continues to show signs of strength and inflation, both the Federal Reserve and the market are signaling a period of higher-for-longer interest rates will persist.***

Exchange Rates: In 2022, the U.S. dollar strengthened against nearly every other major currency to levels not seen in decades. The nominal broad dollar index, used to measure dollar value against a set of widely used international currencies, appreciated over 12% in 2022 partly due to aggressive interest rate increases that improved return on investment for the U.S. dollar. The index dropped about 6% from November 2022 to January 2023 and was at a similar level in mid-July 2023. In the three-month period from mid-July to mid-October, the nominal broad dollar index increased more than 5% and is stronger than both the five-year and ten-year averages. If everything else is constant, an increase in interest rates fuels demand for U.S. dollars and causes the real trade-weighted exchange rate to rise, meaning it takes more units of a foreign currency to purchase U.S. agricultural commodities. From 2021 to 2022, the real trade-weighted exchange rate for corn reported by USDA increased 9.9%, meaning it took 9.9% more units of a foreign currency to purchase U.S. corn. The latest update with a projection was published in August, it shows a -1.8% change from 2022 to 2023, but the notable increase in nominal broad dollar index value in recent months would not yet be reflected in that. Higher interest rates have been a catalyst for the dollar strength in the past few months. ***Summary: Neutral to declining interest rates and dollar value would help to reduce the exchange rate effect of higher price for U.S. corn in the world market, but both remain strong in the short-term.***

Recession Indicators: Several economic indicators point toward impending recession. The Conference Board's index of leading indicators is a widely followed gauge of future economic activity. The index declined in September 2023, for the eighteenth consecutive month. An individual economic indicator that has received added attention amid bank failures earlier this year is the relationship between the 2-year and 10-year treasury yields. This inversion in yields challenges banks who rely on the normal positioning of lower short-term rates and higher long-term rates. This normal relationship makes sense, a greater risk would be expected when committing money for a longer period. An inversion means the opposite is true, with higher short-term rates and relatively lower long-term rates. "Relatively" is a keyword in the current situation – although the 10-year yield is still below the 2-year yield, both are currently at their highest level since 2007. When an inversion has happened in the past, a recession within two years has occurred 98% of the time. This indicator has accurately predicted the last eight recessions. The two treasury yields inverted last summer, but in early July 2023, the inversion was at the widest position since 1981. ***Summary: Despite the indicators that point toward likely recession, the economy continues to show resilience thus far and predictions for recession versus soft landing remain mixed.***

Crude Oil: The coalition of oil producers known as OPEC+ and individual nations have made cuts to oil production, with some production cuts extended into 2024. Price of the nearest-term Brent crude futures, an international benchmark for oil price, has been reactive to the production changes. The contract price rose nearly 25% in the third quarter of 2023. Prices dropped in early October as supply fears gave way to deteriorating macro indicators and signs of U.S. demand loss, but the trend hit a sharp reversal after the initial Hamas attack on Israel. If war expands throughout the Middle East, in particular involvement of Iran, that could have even greater implications for crude oil. Like the trend of crude oil, retail motor diesel prices increased nearly 21% in the third quarter of 2023. Aside from 2022, retail diesel prices are at the highest level since 2008. Despite the rising crude oil prices, gasoline prices have continued a downward trend, due to lower seasonal demand, higher inventory levels, and the changes in the economics of oil refining resulting from Russia and Saudi Arabia cutting production. ***Summary: So far, other economic factors have kept gasoline following a different price trajectory than diesel and crude oil, but war spreading to include major oil producer Iran could threaten crude oil supply and have a ripple effect in energy prices.***

Fertilizer Prices: Farm prices for nitrogen fertilizer set new record highs in 2022, while potash and phosphorus fertilizers came very close to the 2008 record highs but did not quite surpass those levels. Farm prices for fertilizers have dropped from the 2022 high points but remain elevated compared to the 2009 to 2020 average and compared to Fall 2020. There is considerable variation in different forms of nitrogen farm prices relative to the historical average farm price: 28% nitrogen solution and anhydrous ammonia are both 22% above their respective historical averages, and urea is 13% above. Farm prices for phosphorus fertilizers DAP and MAP are 31% and 36% higher than the historical average, respectively. Potash is 5% above the historical average. USDA forecasts the average cost of fertilizer for the 2024 corn crop will be 17% lower than the average cost for the 2023 corn crop, following an estimated 14% drop from 2022 to 2023. Even with the relative declines in the last two years, the estimated 2024 fertilizer cost for corn at $157 per acre is 19% higher than $132 per acre cost in 2021. In recent weeks, farm-level fertilizer prices have trended upward, a change from the downward trend of the past sixteen to seventeen months. There were large swings in fertilizer prices from the fall to spring buying season for both the 2022 crop and the 2023 crop, which makes the changes in fertilizer prices of high interest in the coming months. ***Summary: Current farm prices for fertilizers are much lower than the 2022 high points, but prices are still elevated compared to Fall 2020 and the longer term 2009 to 2020 average.***

INTERNATIONAL DYNAMICS

Mexico GMO Corn Ban: Mexico has become an increasingly important trade partner over the past two decades. Since the 2011/12 marketing year, at least 20% of U.S. corn exports have gone to Mexico annually. In February 2023, Mexico issued a decree calling for the immediate ban on genetically modified (GM) corn in the masa or tortilla flour food sector. In response to the decree, the U.S. initiated technical consultations in early March. In June, the Office of the U.S. Trade Representative requested consultations under the U.S.-Mexico-Canada Agreement dispute settlement procedures and that process continues. From an economic standpoint, buyers of white corn in Mexico could demand non-GMO white corn, if that was their preference, without a decree to control normal market flows. Although this decree wasn't in effect until mid-February and it only applies to GMO white corn, the U.S. market share for corn in Mexico has declined. For the 2021/22 marketing year, the U.S. was the source of 97% of the corn Mexico imported, close to the decade average of 95%. The sum of monthly corn exports from reporter nations to Mexico indicates the U.S. accounted for 84% of Mexico's corn imports for 2022/23. The U.S. exported an estimated 4.2% less corn to Mexico in 2022/23 than the prior year, but the relative market share is 13% lower because Mexico increased their total corn imports by 10% relative to last year, increasing imports from other nations. There was a large impact on white corn, which normally makes up 3.5% to 7% of total U.S. corn exports to Mexico. White corn exports to Mexico in 2022/23 made up only 0.5% of total U.S. corn exports to Mexico, with quantity dropping 87% from 2021/22. ***Summary: Mexico is an important export destination of U.S. corn, and it is important to reach a resolution on the GMO issue.***

Chinese Corn Demand: China's demand for corn more than doubled over the past decade leading up to 2021/22, largely for livestock feed. A trade deal with China spurred a big increase in Chinese corn purchases from the U.S. beginning in the 2020/21 marketing year. The U.S. exported 21.5 MMT of corn to China that year, more than ten times the 2.1 MMT of corn the prior year. Corn exports to China dropped a third lower in 2021/22 and dipped further to 7.8 MMT in 2022/23. China's current market-year purchases of U.S. corn are lagging recent years for a few reasons. China gained Brazil as a corn source, importing corn from Brazil for the first time in November 2022. In the 2022/23 marketing year, an estimated 14% of China's total corn imports are from Brazil, compared to 0% in the previous marketing year. Another contributing factor is that China is importing less total corn this year. China reports their total corn purchases for the 2022/23 marketing year at 18.6 MMT, only 78% of the 23.8 MMT of corn China imported in 2021/22. Not only are China's imports of corn down this year, but China's total imports of all commodities and products in the first three quarters of 2023 are down 7.5% compared to last year, and exports are down 5.7%. The economy has struggled to gain traction since the nation reopened from COVID last year and is showing signs of moving into recession which could be bearish for global commodity prices. ***Summary: U.S. exports of corn to China have been lower this year, not only attributable to competition in the world corn market, but also their weak post-COVID economy.***

Brazil Corn Exports: Brazil surpassed the U.S. as the largest corn exporter for 2022/23 after fifteen years of major growth in production and exports. Brazil supplied just 7.9% of world corn exports in the 2008/09 marketing year and supplied an estimated 31.5% of world corn exports for the 2022/23 marketing year. The U.S. is estimated to have supplied 23.3% this marketing year, down from 62.8% in 2008/09. Notably, Brazil experienced a record production year while the U.S. suffered a drought-reduced 2022 crop. The higher-than-normal river transportation costs in fall 2022 and strong dollar value during the 2022/23 year were also unfavorable for U.S. corn exports. Production has increased in Brazil, but exports have grown at a faster pace than production. Most corn in Brazil is grown as a second crop to soybeans, although corn is grown as a first crop and a third crop in some regions of the nation. For 2022/23, corn prices have been low, resulting in tight margins for Brazilian farmers and seemingly decreasing the appetite for corn, particularly as a second or third crop. USDA is projecting Brazil to produce 129 MMT of corn for 2023/24, compared to 137 MMT in 2022/23. Brazil's reporting agency is projecting an even lower number at 119.4 MMT. Infrastructure and transportation issues are another factor that may deter farmers in Brazil from planting more corn acres in the short-term. ***Summary: Brazil has grown to become a major competitor in the world market for corn and will likely remain a competitive exporter, but several factors may keep further corn expansion at lower levels than experienced over the last fifteen years.***

War in Ukraine: In the three marketing years prior to the Russian invasion, Ukraine supplied 15% of world corn and ranked as the world's fourth largest corn exporting nation. Aside from damages to ports and grain storage facilities, estimates indicate about one-third of Ukraine farmland is contaminated with land mines. In 2022, Ukraine harvested 27 MMT of corn and is estimated to produce 28 MMT in 2023, coming in 36% lower than their pre-war record of 42.1 MMT in 2021. Similar declines are expected for wheat and other grains. When the war began, Ukraine's vital food and fertilizer exports halted. As part of the Black Sea Grain Initiative brokered in July 2022, Russia permitted Ukrainian exports from certain ports. Russia did not agree to extend the agreement when it came up for renewal in July 2023. Ukraine has been able to export through other routes, including some progression through the Black Sea. The nation was able to maintain a pre-war level of exports again in 2022/23, but USDA is projecting a 28% decrease in corn exports from Ukraine for 2023/24. ***Summary: Ukraine continues to be a significant corn producer and exporter despite the war and Russia's refusal to renew the Black Sea Grain Initiative but impacts on exports could be more significant in 2023/24 without that renewal.***

FARM FACTORS

Harvest Progress & Climate Outlook: The U.S. harvest has progressed ahead of normal pace for corn. As of October 22, 2023, an estimated 59% of corn has been harvested, compared to the 54% average of the last five years. Most states are ahead of or near their five-year average, but harvest pace has been delayed in some of the larger corn-producing states. Indiana, Ohio, and Pennsylvania each are at least 10% behind their five-year average pace. Looking ahead to winter and what could materialize for the next growing season, the El Niño climate pattern continues to develop following three consecutive years of La Niña. El Niño and La Niña are climate patterns in the Pacific Ocean that can affect weather around the world. During an El Niño, much of the corn belt normally experiences warm and dry conditions, but wetter than normal conditions in the southern corn-growing areas. There are trends in crop impacts, but strength of the climate pattern and other dynamics mean each year is different and the general expectation doesn't always materialize everywhere. Dating back to 1990, in all four years that corn yielded more than one deviation above trend yield, El Niño has dominated the growing season. However, two of the six largest downside deviations have also been El Niño growing seasons. The impact in South America is varied. Argentina would be expected to have wetter than normal conditions, but currently the nation is still suffering under drought conditions. El Niño would be expected to bring wet conditions to southern Brazil and dry conditions to the central and northern parts of the nation. If and how these conditions materialize could impact not only crop production but also influence planting of the second corn crop. ***Summary: Harvest is progressing ahead of pace across much of the U.S., but a few major corn-producing states are behind normal pace. Progression of the El Niño climate pattern could bring a change to weather for the winter and the 2024 crop.***

Income Outlook: The USDA projects average cost of production for corn at $856 per acre for 2024. Although lower than the $888 average in 2023 and the $911 average in 2022, it's still 16% higher than the $739 average in 2021. At the same time, the projected $4.47 MYA price for 2024/25 from the FAPRI Baseline Update in September is more than 25% lower than the $6.00 MYA price in 2021/22. Depending on which yield projection figure is used, the $856 per acre average cost estimate for 2024 translates to a per unit cost near $4.69. In other words, costs are estimated at $0.22 more per bushel than the most recent projected 2024/25 MYA price. The projection for cost above price is not desirable, but it's also not uncommon. The projected average costs were higher than the expected MYA price for the 2023 crop, and also in seven of the ten years from 2013 to 2022. ***Summary: Returns on corn sales are expected to be similarly tight for 2024, as in 2023 and much of the last decade.***

Safety Net: Federal spending on farm-related programs has been high in recent years, largely due to short-term, ad hoc programs, not assumed for 2023 crop year. High costs of production relative to returns from grain sales over the last decade demonstrate the importance of the safety net and ad hoc payments in that time. The 2023 projected price for crop insurance is $5.91. The harvest price is on track to be near $4.90 as the end of the month approaches. At that price level, producers with harvest price option and higher coverage levels on revenue-based policies could have price-loss-based claims depending. Given the outlook for $4.95 MYA price, farmers in counties with yield losses could trigger Title 1 farm program payments from ARC-CO for the 2023 crop, payable in fall 2024. ***Summary: The large drop in corn price and lower outlook for 2023/24 MYA price increases payment likelihood in revenue-based programs, especially when yields are lower than normal.***