



IHS Markit™

# Economic Forecasting & Industry Report

## THE STATE OF NORTH DAKOTA

**October 7, 2022**

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## I. Project Overview

### North Dakota Legislative Assembly goals:

- > The North Dakota Legislative Assembly sought the support of a professional services firm with the capabilities to support the state's revenue estimating and economic forecasting efforts.
- > The Legislative Assembly required that a consultant either have or develop the economic modeling framework that can address how the economy impacts its revenue streams.
- > The end-product required of the Legislative Assembly's consultant will be used for updating the 2021-23 biennium revenue forecast and developing the 2023-25 biennium revenue forecast.
- > The information must be provided in context of both short- and long-term economic behavior (out to 2023 and 2027, respectively) with forecast expectations of the national economy as well as detailed economic forecasts specific to North Dakota's economy.
- > All forecasted values will be provided in terms of a baseline, optimistic, and pessimistic scenarios with probability assignments to each outcome. And finally, in addition to their quantitative requests, the North Dakota Legislative Assembly requires the qualitative assessment of both national and local economic conditions and demographic trends that are driving these projections.

### About IHS Markit

- > IHS Markit is now a part of S&P Global.
- > IHS Markit is a leading source of information, insight and advisory services in the pivotal areas that shape today's business and policy landscape: economics, financial markets, energy, chemicals, technology, logistics and transportation, healthcare, geopolitical risk, sustainability and supply chain management.
- > IHS was founded in 1959 and became a publicly traded company on the New York Stock Exchange in 2005.
- > In July 2016, IHS Inc. and Markit Ltd. merged to form IHS Markit Ltd. (NASDAQ: INFO), a world leader in critical information, analytics and solutions for the major industries and markets that drive economies worldwide.
- > IHS Markit has more than 50,000 key business and government customers, including 80% of the Fortune Global 500 and the world's leading financial institutions.
- > By providing in-depth analysis and forecasts down to the local level, IHS Economics team of over 300 of economists and analysts serve as valuable extensions to our client organizations' staff and provide the data and analysis they need to make high impact business and policy decisions.
- > As much as possible, IHS Markit has utilized our existing US Macroeconomic and Regional modeling infrastructure to meet the Legislative Management's economic forecasting requirements. This allowed IHS Markit to immediately begin the more

detailed work on behalf of the State tax revenue models and minimized the development cost associated with building new models.

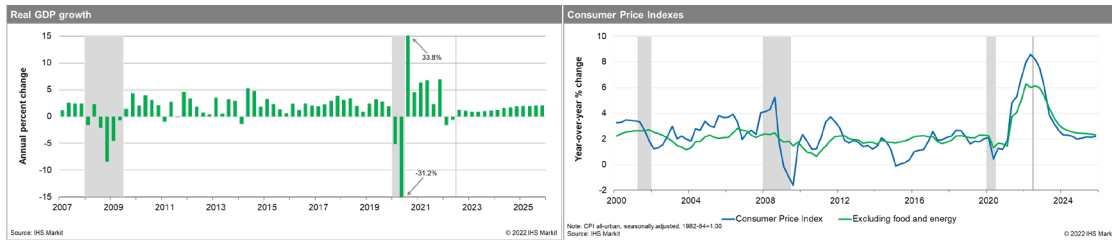
## II. Major Economic and Demographic Drivers in the North Dakota Economy

### US Macroeconomy

#### OVERVIEW

##### **Improving supplies, growth recession quell inflation; limited impact of IRA and student debt forgiveness**

- > After growing 1.8% in Q1, real gross domestic income grew 1.4% in Q2 as profits boomed. Gross domestic output—the average of GDP and GDI—grew modestly in both quarters. This, and other recent data—including further monthly expansions in industrial production, employment, and income—clarify that the economy is not (yet) in recession.
- > We revised up our forecast of real GDP growth for 2022 from 1.5% to 1.7%, and for 2023 down from 1.0% to 0.9%, leaving the projected level of GDP practically unchanged in 2023. However, these small revisions in growth measured year-over-year, which arise mainly from upward revisions in GDP in Q2 and Q3 of this year, conceal a 0.4 percentage point downward revision in growth in 2023, measured Q4 to Q4, that is followed by lesser though still notable downward revisions through early 2025. These revisions reflect our re-assessment of the potential for much further rise in the labor force participation rate, which has recovered nearly to the declining demographic trend, but are re-enforced by an induced decline in investment and hence capital inputs.
- > The forecast shows the unemployment rate rising to 4.7% by early 2025—a growth recession—before then declining to 4.3% by late 2028. Sequential core PCE inflation drops to 2.5% by mid-2023 as supplies of certain commodities increase and their prices ease, but then declines more slowly towards 2% as labor markets gradually soften in response to tightening monetary policy.
- > At the Fed’s annual meeting in Jackson Hole, Chair Powell delivered blunt remarks that underscored the FOMC’s determination to contain inflation, warned of coming pain in labor markets, and undermined market expectations of a mid-2023 reversal of monetary policy. While his message was consistent with our forecast, term yields promptly rose, and stock prices slumped. We assume the Fed raises its policy rate to the range of 3.50% – 3.75% by December and doesn’t reverse course until December of 2023. Strong inflation readings in coming months would encourage us to assume a higher peak in the policy rate and a later reversal.
- > This month’s forecast includes the Inflation Reduction Act. The incentives in the IRA should encourage use of renewable energy and limit increases in the cost of prescription drugs, but we estimate the impacts on headline growth and inflation to be modest.



**Slower growth in actual and potential GDP; little change in the output gap**

- > Real GDP is expected to be 1.7% in 2022 and 0.9% in 2023. The projected level of GDP essentially unchanged in 2023 from last month’s forecast. However, these small and apparently offsetting revisions in growth measured year-over year, which arise mainly from upward revisions in GDP growth in Q2 and Q3 of this year, conceal a 0.4 percentage point downward revision in growth in 2023, measured Q4 to Q4, and lesser though still notable downward revisions through the first half of 2025.
- > The downward revision to GDP growth in 2023 reflects mainly a downward revision to growth of PCE by 0.9 percentage point over the four quarters of next year. That revision is attributable to two factors. First, the downward revision in the level of the participation rate implies slower near-term growth of the labor force, employment and hence, labor income—a key driver of PCE.
- > Second, equity prices open this month’s forecast lower than in last month’s forecast, and the shortfall persists because we revised down the dividend payout ratio to remain closer to its historical average. The resulting reduction in the ratio of equity wealth to personal income contributed to weaker near-term growth of consumption. The downward revision in our forecast for PCE growth in 2023 brings it closer to, but still above, the consensus forecast.
- > One implication of a downward revision to GDP growth originating from the supply side of the economy is that there is relatively little change in the output gap. Hence, we continue to show the unemployment rate rising to between 4.5% and 5% by late 2024, with little change in our inflation forecast, and therefore no cause to re-assess our assumptions regarding monetary policy.
- > However, there is an eventual permanent reduction in the level of actual (and potential) GDP that, by 2032, reaches approximately 1%, implying a reduction in potential growth over the decade of about 0.1 percentage point per year. The eventual reduction in the level of GDP produced in the nonfarm business sector is even larger, reaching 1.4% by 2032.
- > The downward revision in the level of potential GDP is attributable partly to the downward revision in the labor force, which nears 1% by 2025. However, a slower growing economy requires less investment to equip its workers adequately, and this implies a slower-growing capital stock. Therefore, relative to last month’s forecast, the level of investment has been revised down, and with it the level of capital services by an amount that grows to approximately 1.6% by 2032. The downward revision in capital services was reinforced by the downward revision in stock prices that raised the equity cost of capital.

**A rise in unemployment will reinforce disinflation from easing commodity prices**

- > The CPI was unchanged in July; the 12-month change fell to 8.5% from 9.1% in June, suggesting headline inflation has peaked. The core CPI increased 0.3%. Its 12-month change held steady at 5.9%, but was down from 6.5% in March.
- > In the second quarter, the employment cost index for civilian workers rose 5.4% (annualized rate) and is up 5.0% over the last year. Hourly compensation grew 4.7% during the quarter, but productivity plunged 5.2%, driving unit labor costs up 10.5% in the quarter and 9.4% over the last year.
- > Inflation surged as demand recovered faster than could be accommodated by supplies of commodities and labor disrupted first by COVID, then by war in Ukraine. In addition, rents have accelerated in lagged response to soaring house prices. We expect these pressures to moderate in the second half of 2022, as supplies improve and workers return to the labor force.
- > An important feature of our inflation forecast remains the partial reversal in several key prices driving the recent spike in inflation. For example, the recent surge in the PCE price for motor vehicles and parts added 0.6 percentage point to core PCE inflation over the last four quarters. However, as the supply of semiconductors improves, and vehicle production rebounds, we expect this price to decline 7% by the end of 2024 enough to subtract 0.2 percentage point from core PCE inflation over 2023 and another 0.1 point over 2024.
- > We also expect that as commodity markets adjust to disruptions caused by the war in Ukraine, and a slowing in global growth, an eventual reversal of the recent spike in energy costs and a deceleration in food prices will push headline inflation below core inflation over 2023 and 2024.
- > The forecast assumes waning commodity price shocks and a rise in unemployment to 4.8% will reduce core PCE inflation towards long-run expectations anchored at the Fed's 2% objective. A risk is that the history of the 1970s and 1980s repeats itself. Then, large inflation shocks, accommodated by monetary policy, led to a sharp, persistent increase in inflation expectations.

**Growth of business fixed investment reduced in this month's forecast, mirroring a markdown to near-term potential GDP growth**

- > After rising 7.4% last year, real BFI is projected to slow to growth of 4.2% this year and 0.4% next year followed by a 0.5% decline in 2024. The slowdown in growth of overall BFI reflects deceleration in equipment spending and intellectual property products partially offset by acceleration in structures. Growth of BFI averaged over 2022, 2023, and 2024 in this month's forecast is 0.6 percentage point below last month's forecast.
- > The markdown to growth of BFI in the forecast owes largely to a markdown in our near-term forecast of potential GDP growth. In response to a recent flattening out of the path of the labor-force participation rate, and in light of demographic and economic trends that are weighing on participation, we

lowered our projection for the labor-force participation rate, a key input into potential GDP. Slower growth of potential GDP growth fed back into slower growth of business fixed investment — less potential GDP growth implies less of a need to expand productivity capacity to keep pace with sales.

- > In the very near term (second half of this year), recovering business spending on light vehicles and ongoing investment in mining structures are expected to prop up BFI. Other areas of investment spending are expected to weaken.
- > Over a longer horizon, tightening financial conditions—rising borrowing costs and tightening bank lending standards—are expected to slow the economy broadly and investment spending specifically.
- > Posing challenges to growth of BFI in this month’s forecast are slow growth of output, elevated borrowing costs (relative to recent years), tightening bank lending conditions, and depressed levels of business confidence.

### **A stronger dollar; slowing imports**

- > The dollar is soaring. The Federal Reserve’s Broad Dollar Index stood 8.6% higher than a year earlier in June; the real index was 10.8% higher; the real index soared to levels last seen in 1986.
- > We expect the broad dollar index (nominal), which stood 7.9% higher in August than a year earlier, to peak in the fourth quarter and then gently decline over the next four years. Compared to last month, this forecast is 7% higher at the end of 2023 and 10% higher by the end of 2025. Higher long-term interest rates and a forecast for higher inflation abroad account for the revision.
- > The US monthly international trade deficit contracted by a unprecedented \$35 billion in the four months ending in July to \$70.6 billion. Fewer imports account for slightly more than half of the shrinkage and more exports for slightly less than half.
- > Import prices are expected to swing from double-digit annualized growth in the first and second quarters to eight subsequent quarters of negative growth as an easing of bottlenecks and other disruptions eliminate trade as a source of inflation.
- > Growth of real imports of goods and services slowed to 2.8% in the second quarter. In the forecast, real imports drop in Q3 and subsequently grow at low-single-digit rates over the next three years.
- > Real exports, which bounced halfway back from the pandemic in 2020 and then sputtered, attain pre-pandemic levels in the second quarter of 2023.

### **Payroll gains were solid once again in August but a slowdown lies ahead**

- > Nonfarm payroll employment rose 315 thousand in August, a solid reading that was broadly in line with the consensus expectation, even as the unemployment rate rose 0.2 percentage point to 3.7%.
- > The rise in unemployment, though, was not as bad as it may have seemed. Civilian employment (from the Household Survey) rose 442 thousand in August. The unemployment rate rose because this gain was outpaced by a robust, 786 thousand increase in the civilian labor force.

- > The gain in the labor force is good news, as declining labor-force participation has been a key factor restraining the US economy from the supply side.
- > Rebounding from its pandemic low, the participation rate has fallen short of our earlier projected recovery, and while we expect the rate to continue to drift upwards this year, the changing composition of the working-age population implies the rate may be near its peak. On balance, this month's forecast includes a sustained downward revision in the participation rate going forward.
- > The recovery in payrolls has been quicker and more robust following the COVID-19 downturn than the recovery following the Great Recession, however the hole was deeper this time around. Over the balance of this year, we expect payroll gains to slow to roughly 201 thousand per month averaged over the last four months of the year.
- > Beyond 2022 monthly payroll gains slow down dramatically. Monthly payroll gains turn negative over the majority of 2023 and 2024, averaging -46 thousand over that time period. Payrolls resume rising in 2025 and 2026, averaging 31 thousand over 2025-2026.
- > We project the unemployment rate will rise 1.1 percentage points to a peak of 4.7% by mid-2025, as labor markets soften in response to tightening monetary policy.

### **Real household wealth expected to decline amid weakness in equity values and elevated prices**

- > According to BEA's second estimate, real disposable personal income (DPI) fell at a 0.6% annual rate in the second quarter of 2022, following a 7.8% decline in the prior quarter.
- > Personal income rose 0.2% in July following a hefty 1.0% increase in June. Real DPI increased 0.3% in July, following a decline in consumer prices.
- > The personal saving rate was unchanged at 5.0% in July but has drifted down this year. In our forecast, the roughly \$2.4 trillion of "excess savings" added to household wealth during the pandemic allows consumers to maintain a moderately higher level of spending in the face of rising prices.
- > Real household net worth surged 7.8% in 2021 (Q4 to Q4), thanks to large gains in home prices and surging equity markets. Sharply higher consumer prices and weak stock prices resulted in a 22.0% (annualized) decline in real household net worth in the second quarter of 2022.
- > Real DPI rose 2.3% in 2021 after a 6.2% stimulus-boosted jump in 2020. As fiscal stimulus (direct payments and emergency unemployment aid) has ended and inflation has taken off, our forecast shows a 5.4% decline in real DPI in 2022. Real DPI is expected to begin rising again in the third quarter of 2022 and increase 3.8% in 2023 as inflation moderates.
- > Going forward, a development worth watching is the race between wage increases and the persistence of recently elevated inflation. While wage gains have recently been growing, they have not, on the whole, outpaced inflation. Over the past 12 months, the annualized rate of inflation was 6.3%, compared to average hourly wage gains of just 5.2% on the same basis. We expect both measures to drift lower over the next couple of years, with wage gains

eventually outpacing inflation.

### **White House plans student debt forgiveness**

- > The White House unveiled a controversial plan to cancel approximately one third of federally held student debt. However, the program likely faces legal and political challenges that might delay or prevent its implementation. Therefore, while we have included in our September forecast the extension of forbearance, we have not yet included other elements of the plan. Though the plan is not yet reflected in our forecast we estimate the macro impacts—stronger GDP growth and higher inflation—to be small.
- > In the second quarter, a second tranche of payments, totaling approximately \$348 billion at an annual rate, was made to state and local governments under the American Rescue Plan. Because the funds are earmarked for investment projects, the BEA recorded them as capital transfers, not—as with the first tranche a year ago—Grant-in-Aids. Consequently, in the National Accounts, the payments appear not in state and local net saving, but in the broader concept of net lending and borrowing.
- > California is large enough that occasionally fiscal developments there move the national needle. From Q3 2021 to Q1 2022, state and local corporate taxes jumped 84%, driven by California’s new pass-through entity tax. Those receipts dropped sharply in Q2, boosting growth in national corporate profits after tax to 48.8%. In addition, California recently announced plans to use its burgeoning budget surplus to distribute \$1000 cash payment to 23 million persons. We assume these payments are made this fall, generating a sharp jump in state and local payments of social benefits in the fourth quarter that is reversed in early 2023.

### **Global economy faces a period of subdued growth**

- > In our latest forecast, growth of real, trade-weighted foreign GDP slows from 5.8% in 2021 to 3.0% in 2022 and 2.0% in 2023. Russia’s invasion of Ukraine and COVID-19 lockdowns in mainland China contributed to a sharp slowdown in growth in the second quarter of 2022 and tightening financial conditions will lead to subdued global growth in late 2022 and 2023.
- > We project that the value of the real trade-weighted broad dollar appreciates through the first quarter of 2023 before declining through 2027.
- > The J.P. Morgan Global Composite Output Index (compiled by S&P Global) fell to a 26-month low of 49.3 in August from 50.8 in July. Output contracted in both the manufacturing and service sectors, the first concurrent downturn since June 2020.
- > With global demand cooling and supply disruptions easing, global inflation is expected to moderate in 2023 and 2024. The global economy is expected to achieve a soft landing, with average real GDP growth of 2.5% in 2022 and 2023. This will be a multi-speed economy, however, with Western Europe likely to experience a mild recession in late 2022 and early 2023. Other major countries will avert recessions but perform below potential.

- > With perseverance, monetary policy can be effective in subduing inflation. Recent declines in industrial and agricultural commodity prices are helpful. The IHS Markit Materials Price Index has fallen 23% from its early March peak. The retreat in commodity prices is filtering downstream to intermediate and finished products and should bring some relief to consumers in most parts of the world. Our forecast calls for global consumer price inflation to ease from 7.6% in 2022 to 4.5% in 2023 and 2.6% in 2024. New supply shocks could darken the near-term outlook, however, since inventories are low in energy and metals markets.

### Bottom line for the US economy

- > Real GDP is forecast to grow 1.7% in 2022 and 0.9% in 2023.
- > The unemployment rate rises to 4.7% by 2025, then declines to about 4.3% in late 2028.
- > Core PCE inflation drops to 2.5% by mid-2023 then declines more slowly towards 2% as labor markets respond to monetary tightening.
- > We assume the Federal Reserve will raise its policy rate to the range of 3.50%-3.75% by December.
- > The forecast includes the Inflation Reduction Act, but we estimate impacts to headline growth and inflation to be modest.

#### Real GDP and its components

Percent change, annual rate	2022Q2	2022Q3	2022Q4	2023Q1	2023Q2
Real GDP	-0.6	1.3	1.0	0.9	0.9
Consumption	1.5	1.6	2.1	1.0	1.3
Residential investment	-16.4	-31.4	-19.4	-3.6	2.4
Business fixed investment	0.0	2.7	2.6	-0.5	-0.8
Federal government	-3.9	-1.5	2.9	6.1	0.7
State & local government	-0.6	-0.2	1.1	1.8	1.9
Exports	17.6	11.5	2.0	1.3	0.8
Imports	2.8	-4.7	3.0	1.7	-0.7

Source: IHS Markit

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#### Key indicators

Percent change	2021	2022	2023	2024
Industrial production	4.9	4.1	0.0	0.2
Payroll employment	2.8	4.0	0.9	-0.5
Consumer Price Index	4.7	8.1	3.9	2.2
Core CPI	3.6	6.1	4.1	2.6
Brent crude oil price (USD/barrel)	70.7	106.3	98.4	91.7
Federal funds rate (%)	0.1	1.6	3.6	3.1
10-year Treasury yield (%)	1.4	2.8	3.1	3.1

Source: IHS Markit

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## North Dakota State Economy

### **Recovery has been slow in North Dakota but will be aided by improving oil market conditions**

- > North Dakota's recovery from the 2020 downturn has been slow. Through April 2022, employment is still down 3.5% relative to February 2020, ranking 45th among states. North Dakota was insulated during the initial 2020 downturn due to its rural landscape, which helped mitigate the spread of the virus, but the recovery to-date has been hampered by the deep downturn in oil markets.
- > Mining employment remains 26.0% below its February 2020 level and alone accounts for 36.0% of the current jobs deficit through April, despite accounting for just under 5.0% of overall employment pre-pandemic. The impact of mining is clear when looking at the performance across metros. Through April, employment is down a modest 0.8% in Bismarck and 1.0% year over year (y/y) in Fargo but down a steep 3.5% across the nonmetro portion of the state relative to the pre-pandemic peak. The bulk of oil-related jobs and production are concentrated outside of the metro areas.
- > The good news is that conditions in the oil market are improving, which will set the stage for further recovery. Following a low of just \$28/barrel during the second quarter of 2020, West Texas Intermediate (WTI) prices have more than tripled since, averaging \$95/barrel during the first quarter of 2022.
- > The disruption to energy markets following the Russian invasion of Ukraine put further upward pressure on prices. US producers have been measured in ramping up production due to decreased re-investment strategies mandated by their stockholders, but continued price growth will further incentivize increased drilling. Momentum should pick up over 2022 with growth continuing in the years ahead as the oil industry becomes a notable tailwind again over the near term.

### **State of the US oil industry will be a dominant force behind the performance of North Dakota's economy**

- > Just when the oil industry started to see sustained growth following the 2015/16 correction, the global pandemic threw oil markets into a tailspin. The impact has been sudden, with North Dakota rig counts plunging to 9–11 rigs over the latter part of 2020. This is half the amount as the worst week during the 2015/16 correction.
- > Fortunately, rig counts have been trending higher in 2021 and 2022 in tandem with higher prices. Rigs averaged 27 in late 2021 and further accelerated in 2022 with rigs now up to 36 in May. This is a notable improvement from the 2020 lows but still depressed with more room to grow. Rig counts were in the low 50s right before the pandemic hit. Nevertheless, thanks to the large DUC inventory, new wells coming on line are nearing 80 and are expected to increase to around 100 by 2024
- > The recovery will press forward over 2022 and 2023. This recession was a short one but it was deep, and a full recovery hinges on a reliable way to

control the virus threat and continued growth in the US oil market. There is light at the end of the tunnel, and with recovery underway, oil production is expected to increase from current levels of 1.1 MMbbls/d to about 1.3 MMbbls/d by 2025.

- > Looking further ahead North Dakota's economy will grow roughly on par with the US on the whole. Employment in the state will climb an average 1.1% annually through 2026, matching the 1.1% forecast for the United States.
- > North Dakota's economy has been a roller coaster, with high-flying growth during 2010–14, then a steep plunge in 2015–16, followed by a gradual climb back up until the economy hit another wall in 2020. While North Dakota will match US growth coming out of the last downturn, the composition will be much different, with the energy sector providing a big boost for the Peace Garden State over the medium term.

### **The energy industry is a double-edged sword for North Dakota's economy**

- > Since the pandemic, oil prices have recovered, and drilling and oil production is increasing. WTI in 2022 and 2023 is expected to average between \$90-\$96/bbl in the short term and above \$70/bbl through the latter half of the 2020 decade, which will incentivize production increases; however, certain risks to this outlook include a faster than expected energy transition, the possible closure of the Dakota Access Pipeline and severe global economic recession.
- > The western part of the state remains heavily dependent on the Bakken formation and the oil industry. However, the metros in the eastern part of the state do not have huge dependence on the oil industry and have made strides in diversifying their economies over the years.
- > Besides the in-migration related to the energy boom, the state has had trouble attracting new residents. This limits population growth and dampens overall economic potential.
- > The state is quite vulnerable to boom and bust cycles now that it is such a large energy producer. Employment in the state was the second-fastest growing in the country during 2014 but fell to dead last in 2015 and remained among the bottom in 2016 and 2017. The economic growth spurred by the energy industry can be dramatic but so can the declines.

### **Labor force and demographics**

- > In 2018, North Dakota was the 47th-largest state by population. The state's total population increased by 0.6%, to 760,000. This is well below the 2.0%-plus average seen during 2011–15 when the state was one of the fastest growing in the nation. The mass immigration sparked by the oil industry was the main driver behind the outsized population growth, and there was payback as oil field workers left the state. Population growth will pick up in the coming years along with upstream energy activity, but it will not get back to the 2011–15 boom years.
- > One trend that has not changed is the declining share of the state's population living in rural areas. North Dakota had been losing rural population steadily since 1984, with rural residents' share of the total population decreasing from 66% in 1975 to 56% in 2000. Most of this decline was during the 1980s farm crisis, when both rural and metropolitan areas saw residents relocate to other states.

More recent data from the decennial census show that in 2010 this share fell further, to 52%. Although this population decline has recently decelerated, due largely to the influx of people to rural northwestern North Dakota for the Bakken shale play, it is still under way because of ongoing migration from rural areas to the state's metropolitan areas such as Fargo and Bismarck.

- > North Dakota boasts a well-educated work force: its educational system has one of the nation's highest percentage (93%) of ninth-graders who go on to graduate from high school; the national average is 88%. In addition, the state has a significantly higher proportion of population possessing at least an associate's degree, which stood at 44% in 2017, in comparison to the national average of 41%.

### **Economic structure**

- > North Dakota has one of the smallest concentrations of industrial jobs in the country. In all, manufacturing firms make up just 6% of nonfarm employment, versus the national average of 9%. Industrial activity is driven by a few segments: agricultural and construction machinery; food products; printing and publishing; transportation equipment; fabricated metals; and stone, clay, and glass.
- > Agriculture has a large influence on the state's manufacturing economy, affecting local agricultural machinery manufacturers, as well as transportation providers. Major local manufacturers include Melroe/Ingersoll Rand, Imation, Marvin Windows, and American Crystal Sugar.
- > The most notable economic change is the recent explosion of growth in the energy sector due to the Bakken shale. While the mining and natural resources sector still accounts for only 5.0% of North Dakota's total nonfarm employment, this is up from just 1% 10 years ago. Although the Bakken shale region has experienced quite a boom since the mid-2000s, the low-oil-price environment that emerged in late 2014 and has continued through 2015 and 2016 has led to a dramatic decline in upstream energy activity although the longer-term prospects remain relatively bright for the Bakken play.
- > Fargo generates almost one-third of both jobs and gross state product. The metro area serves as a center for farm-related trade, distribution, and manufacturing, and has a large service sector that is highly concentrated in the healthcare and other knowledge-based industries. Fargo's low-cost structure makes it ideal for the back-office operations of many financial services firms, including Wells Fargo.

## III. Special Industries

### Oil

#### A. Global and North American Fundamentals

**Global Markets:** Currently there is high uncertainty in the short-term price outlook (see figure 3-1) with several competing possibilities driving this outlook:

- > Our base-case crude oil price outlook, assumes demand remains below production capacity, but uncertainty about Russian oil flows and thin spare capacity generally keeps Dated Brent oil prices around \$95–105/bbl for the rest of 2022 and in 2023, based on September 2022 forecast
  - Brent/US spread to average about -\$6/bbl for the remainder of 2022
- > In 2023, demand growth is concentrated in mainland China and supply growth in the United States. If one falters, there could be disproportionate price impacts.
- > Recession fears – 2022 Global oil demand increase drops from 4.0 MMbbls/day to 2.7 MMbbls day – helping to keep prices down
  - Mainland China’s oil demand has fallen below year-earlier levels for five consecutive months – **only 3<sup>rd</sup> time since 1990**. A sustained oil price recovery to \$100/bbl and higher is difficult to envision if Chinese monthly oil demand for the rest of this year remains less than a year ago.
  - Although weaker demand growth has eased supply concerns, limited spare oil production capacity is a concern for the rest of 2022 and 2023. Two years ago, there was 7–8 MMb/d of global spare capacity, but today there is only around 1 MMbbls/d or less that could be immediately utilized to increase production
  - Russia is using gas supply as a weapon—it could also use oil. Russia has cut off gas supplies to several countries and stopped and restarted gas and oil flows to others. Russia crude oil exports have remained at or above prewar levels owing to success at shifting sales away from Europe.

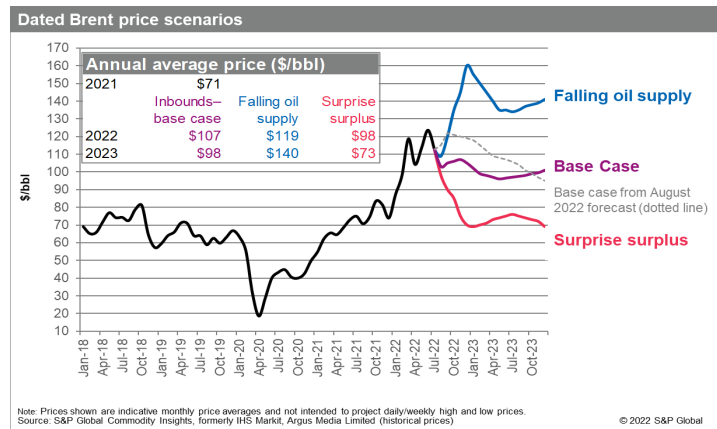


Figure 3-1: Range of global oil price forecasts

**US Markets:** Despite current high prices, US production growth will be modest. Operators’ business model continues to shun production growth in favor of a returns-driven model

- > Based on our price outlook the industry will still generate a free cash flow margin of 35% - 40% and raise US output to 12.3 MMbbls/day by the end of 2022 (figure 3-2), (up about 0.9 MMbbls/day from

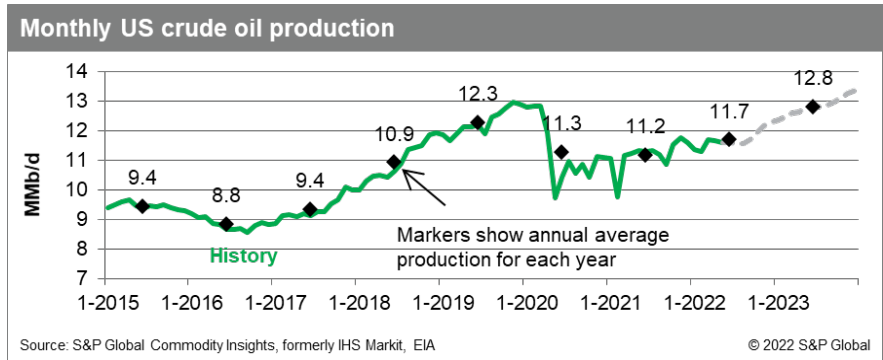


Figure 3-2: US oil production history and short-term forecast

Dec. 2021) with the Permian Basin output expected to be the biggest contributor. However, production increases are stalling as service sector and bottlenecks constrain growth.

- > While operators are still declaring reinvestment discipline to investors, production growth is coming mainly from private operators. Public companies, are forecasted to grow volumes 3-4% in 2022, while privately operated production is likely to grow 10%. We note that this strategy of using cashflow for other priorities, rather than reinvesting it in new production has paid off for operators as stock prices have risen and more dividends are being paid to shareholders.
- > Consolidation is likely to continue as larger companies reposition themselves for long-term sustainability and portfolios become more concentrated.

Challenges to US oil markets are evident and could impact future production and price outlooks. These include:

- > Release of an unprecedented amount from the strategic petroleum reserves (SPR) has been ordered by the Biden administration in an attempt to hold down gas prices. With current releases approaching nearly 1 MMbbls/d reserves have dropped to a new low of just under 400 MMbbls (figure 3.3). This rate is

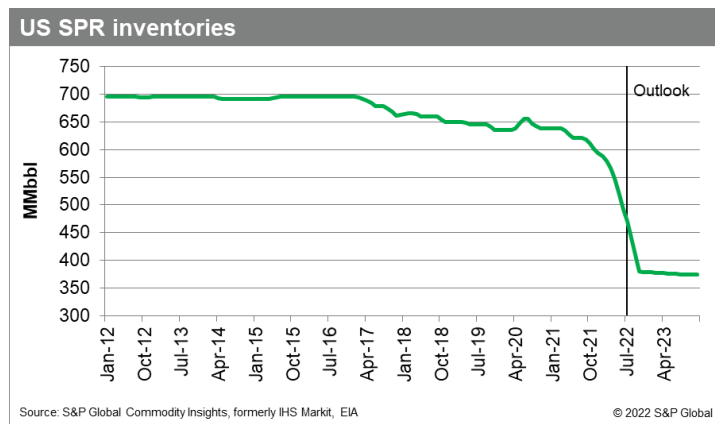


Figure 3-3: US SPR inventory history

likely unsustainable and will have to be eventually curtailed which may result in tighter supplies and a price increase. Although plans have been announced to begin refilling the SPR, with higher price outlooks for the foreseeable future, it may be difficult to refill the SPR any time soon.

> Cost inflation is limiting re-investment as prices for oil and gas services have risen 15-16% from 2021 to 2022. Of the total \$109.7 Billion in US upstream investment in 2022, \$20.9 Billion is due to cost inflation. This means that nearly one-half of the \$42.9 Billion investment increase was eaten up by cost inflation. While we expect cost inflation to subside somewhat in the years ahead, it will nevertheless be a drag on future production increases.

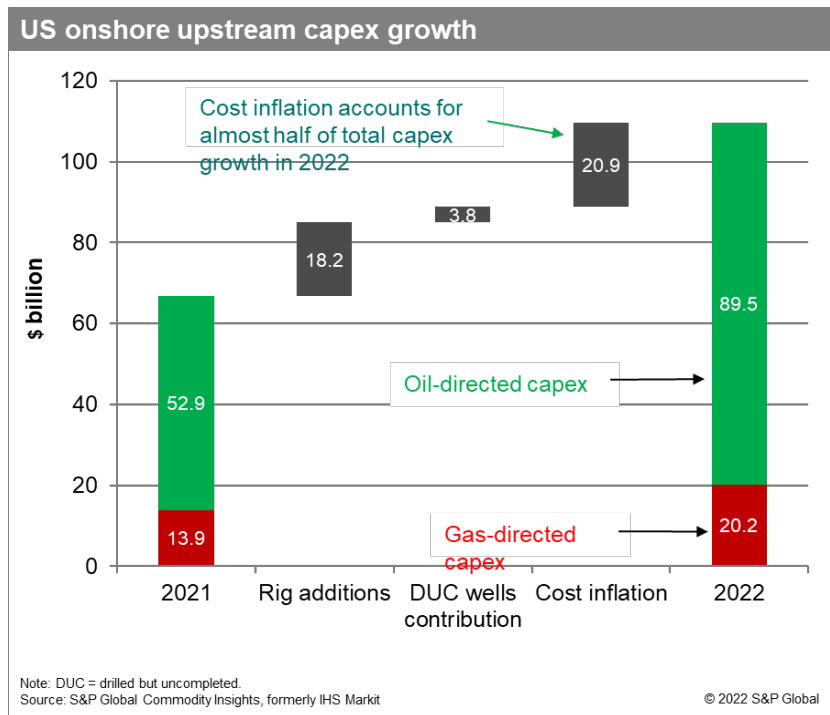


Figure 3-4: US upstream investment growth from 2021 to 2022

- > ESG and regulations will become increasingly important
  - Most international oil companies are committed to some form of net zero emission which is likely to divert investments and resources away from traditional oil and gas projects over the longer term, but are unlikely to affect the short-term outlook
  - Private companies are lower performers in terms of environmental, social, and governance (ESG) metrics—privates flared 3.4% of their associated gas production in 2021 while global and large independents flared less than 1%.
  - Previous and possible leasing and drilling moratoria on federal lands and Native American lands are unlikely to affect the outlook in the short term.

**Long term oil price forecast:** A key objective of this scope is to create longer-term base case production and drilling forecasts as well as a high case and low case. Fundamental to these projects is a long-term price forecast. Since the 2021 report, much has changed as noted in the previous section, including the long-term price outlook (see figure 3.5). The short-term outlook of 2022 and 2023 is expected to gradually level out to the low \$70/bbl range by 2025.

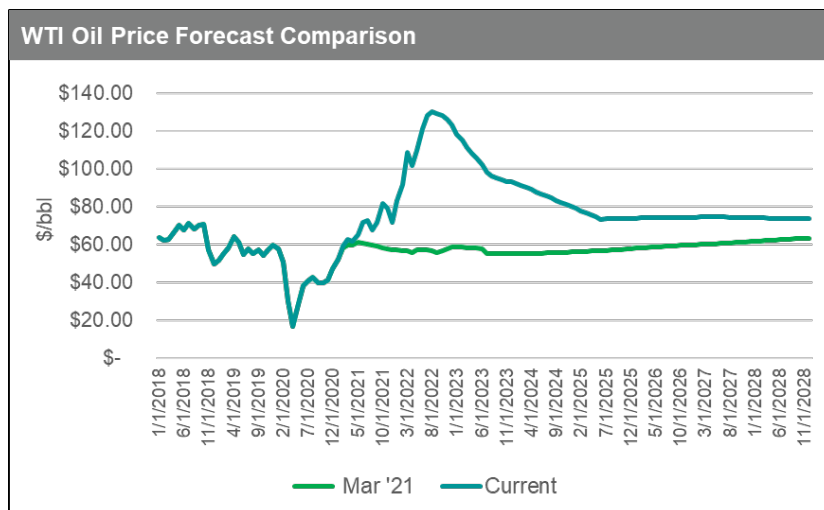


Figure 3-5: Long-term price forecast

The projected higher price projections (in real terms) are due mainly to anticipated

lower future investments in oil and gas projects. Historically, the oil industry has been able to achieve about a 10% rate of return on investments; however, in the future we believe that investments will be required to achieve a 20% rate of return. Furthermore, funding is likely to be harder to obtain due to the emphasis on energy transition and away from conventional hydrocarbon energy sources.

## B. Outlook for North Dakota and the Bakken/Three Forks

While we expect to see modest production increases, much if this will be in the Permian Basin, although we can expect increases to also occur in the Bakken and Eagle Ford plays. These, however, are somewhat smaller than the Permian and will not contribute as much as the Permian Basin.

**Remaining resource base and acreage quality:** Although the Bakken/Three Forks play has been producing for nearly a decade and a half and is considered a mature play, IHS Markit has determined that there are still about 17 billion barrels of remaining technical resources left undeveloped. About 11 billion barrels (64%) can be produced for under \$60/bbl which further enhances the long-term economic potential of the play. In addition, there are about 34 TCF of remaining associated natural gas resources. A large portion of these, nevertheless, is likely to be produced from outside the initial core or sweet spot areas centered in Mountrail County (see figure 3.6a).

IHS Markit has designated five acreage classes for the play, with class 1 being the best. Classes 1 and 2 are about 60% exhausted, and class 3 is about 45% drilled up. This signifies that indeed the core areas are beginning to reach exhaustion and that more production will likely come from class 3 and 4 acreage. Much of the class 5 acreage has breakeven prices which are higher than the long-term price forecast and a large portion is not likely to be produced. Our forecast calls for class 1 acreage to be exhausted by 2025 and class 2 acreage to be exhausted by 2030 (Figure 3-6b).

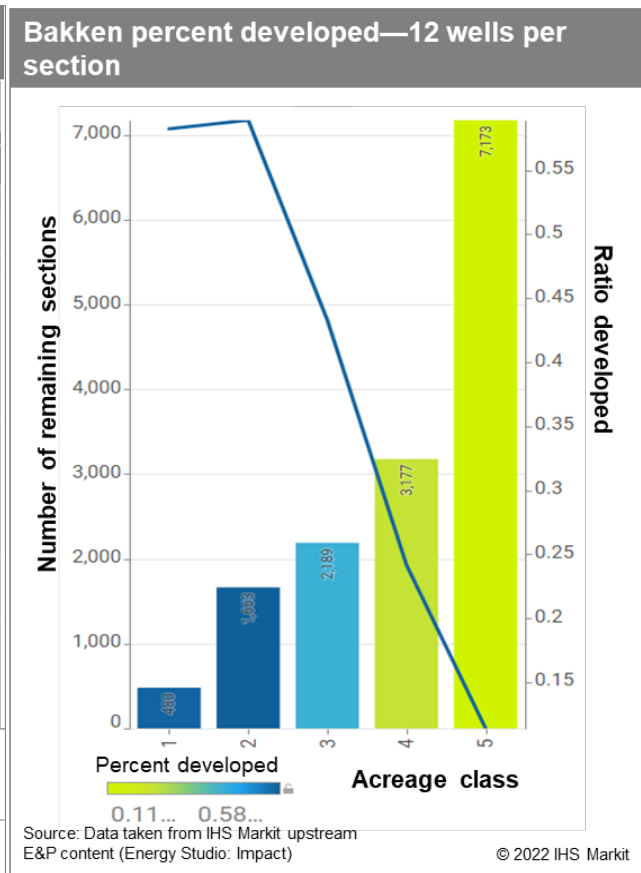
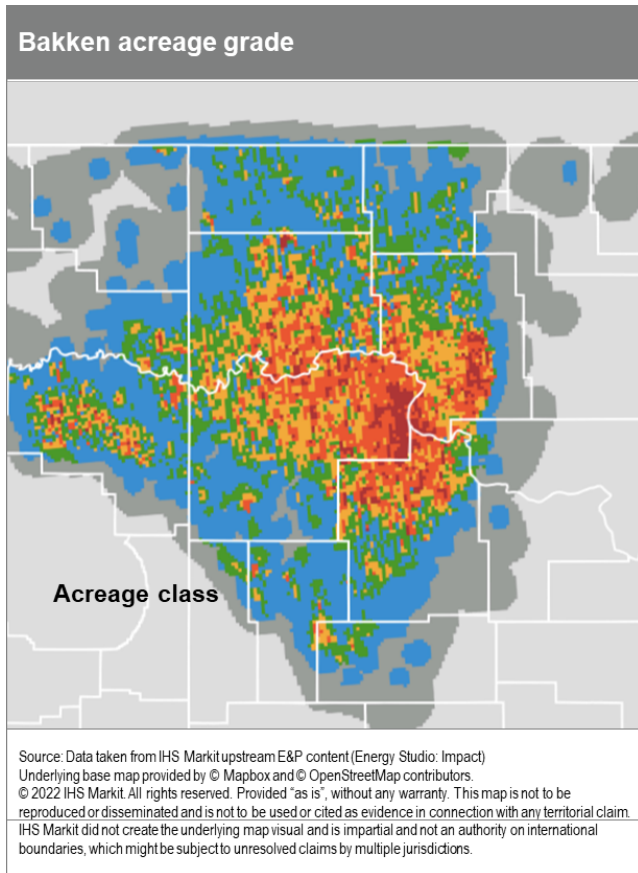


Figure 3-6a: Bakken play and acreage classes

Figure 3-6b: Acreage class depletion – Bakken play

**Short-term Drilling Forecast:**

Producers are activity drilling in the play with 2022 rig counts in the mid 30 range. While this is lower than the mid-50 pre-pandemic counts, it nevertheless is a significant improvement over 2020 and 2021 (see figure 3.7). IHS Markit projects that about 80-plus wells will come on stream each month; however, over the next four years, the (drilled uncompleted wells) DUC inventory of around 600 wells will contribute significantly to this total.

The DUC contribution is significant in that (1) not as many rigs are needed to maintain new well and production levels, and (2) A DUC well costs about 65% of a new drilled and

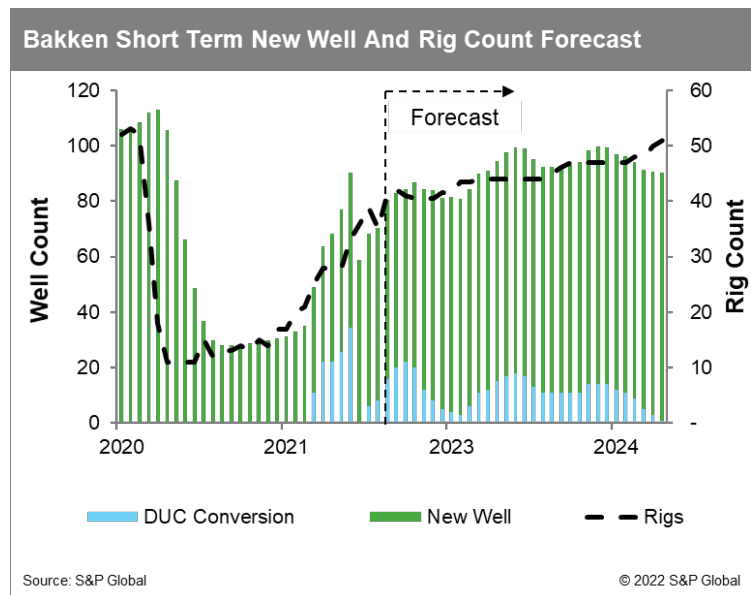


Figure 3-7: New wells including DUCs – Bakken play

completed well. This means that revenues for taxation purposes will not be as great as it would be in a new well, given that the rig expense for drilling a new well has already occurred.

**Long-term low, base and high cases:**

Seven-year outlooks have been developed for both new wells and oil and gas production. The new well base case projects the activity presented above through 2029 where we project that about 90-95 new well additions will continue at roughly the same rate, although by 2025, the current DUC inventory is projected to be exhausted and new drills will contribute 100% to these totals. (see figure 3-8).

Low and high new well additions generally track the base case. In creating these cases, we assumed for the low case that the oil price would be 10% lower than the base case outlook and that reinvestment rates would also be about 5% lower. Conversely, for the high case we assumed that oil prices would be 10% higher than the base case outlook and reinvestment rates would also be 5% higher. Results of the high case project that new well additions will reach about 110 new wells each month, which is comparable to pre-pandemic levels.

It is important to note that the base case includes reinvestment rates that are lower than pre-pandemic levels, and that by reining in the reinvestment rates slightly, helps bring the new-well high case in alignment with pre-pandemic levels.

New well contributions to the production forecast cases are displayed in figure 3-9. Long-term production is expected to ramp up over the next three years, aided by the DUC contribution. Despite capital spending restraints, higher commodity prices and DUCs are likely to keep pushing

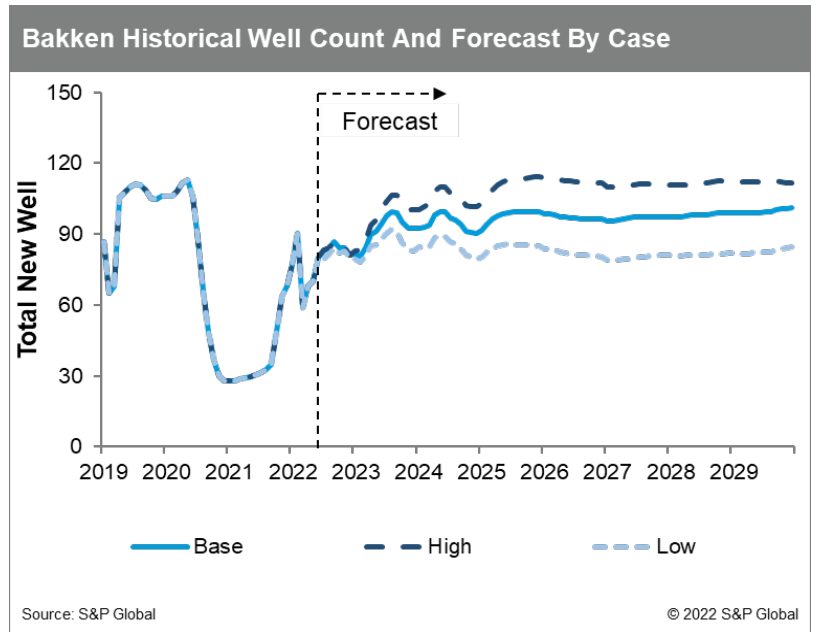


Figure 3-8: Low-Base-High drilling forecasts – Bakken play

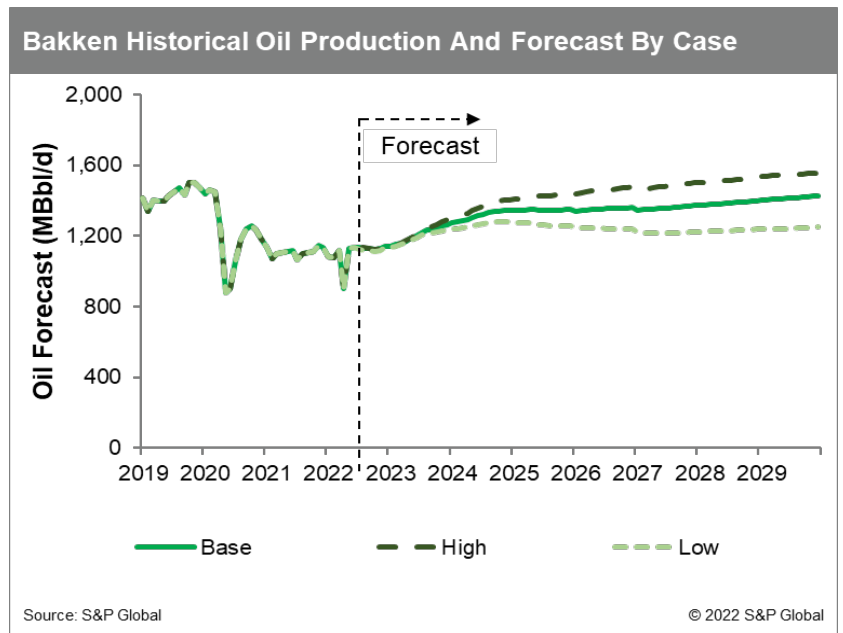
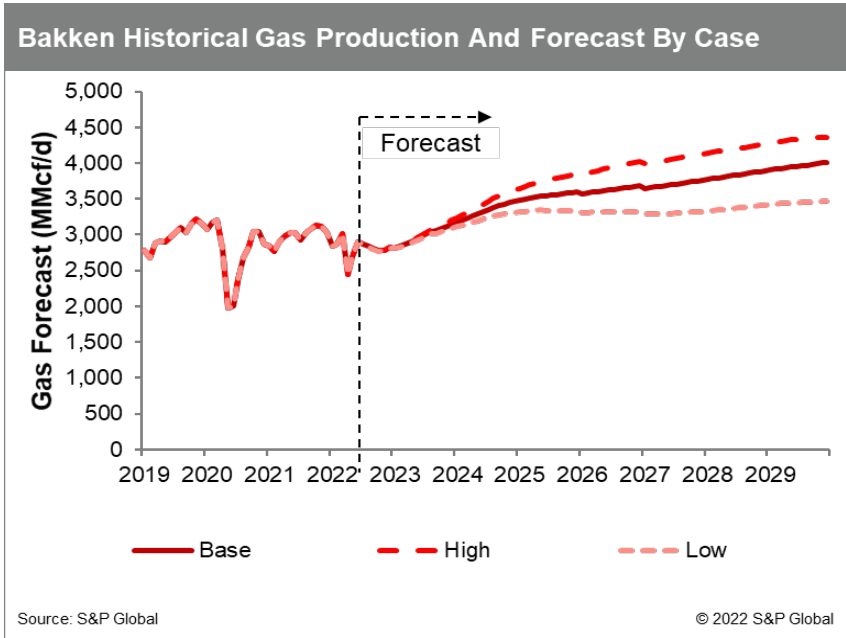


Figure 3-9: Low-Base-High oil production forecasts – Bakken play

Bakken production levels higher to about 1.4 MMbbls by the latter half of the decade, despite the lower quality of acreage that will be developed. As noted earlier, the base case forecast includes class 1 acreage exhaustion by 2025 and class 2 acreage exhaustion by 2030.

Associated gas production is also projected to increase at a slightly faster rate, increasing from the current level of 2.8 bcf/day to 4.0 bcf/day by the end of the forecast period. Over the life of a well, gas production raises relative to oil and given the ever-increasing

number of mature wells in the play, we would expect that the gas forecast for all three cases would rise relative to oil production.



**Risks to the forecast:** The Dakota Access Pipeline (DAPL) is key to the Bakken remaining competitive. Over the past year, there have been court challenges to the DAPL easement crossing the Missouri River. While IHS Markit believes that ultimately the DAPL will remain open and has based its forecast on the pipeline remaining open, there is a risk that the opposition could prevail. If the pipeline were to be permanently shut down, about 570,000 bbls of oil would have to be transported by rail (see figure 3-11). Since rail transport is more expensive than pipeline transport an additional \$8-9 cost would be added to the price making the Bakken less competitive with other US

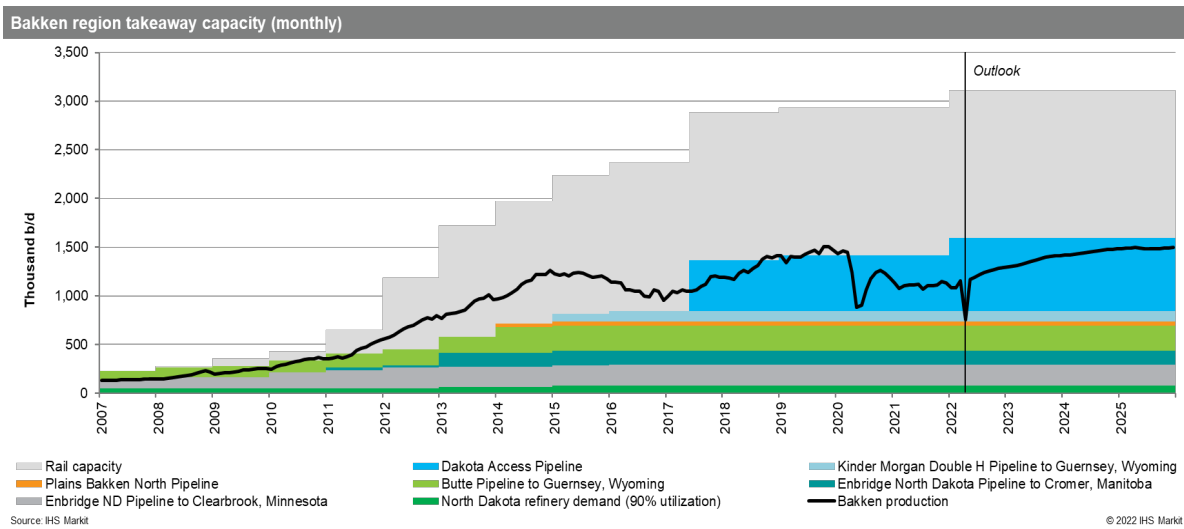
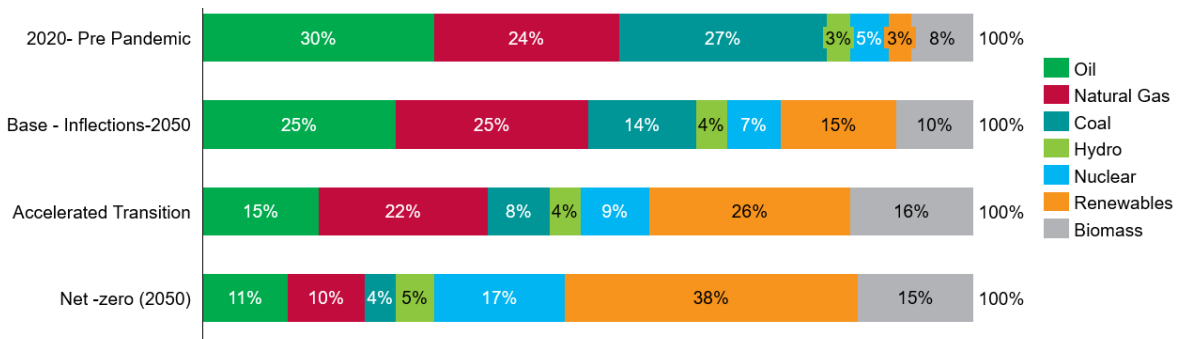


Figure 3-11: North Dakota take-away and production forecast

basins. This additional price addition would have roughly the same effect as lowering the price by about 10%, which in effect would likely produce a forecast outcome similar to the low production case.

Another possible risk to the forecast would be a faster than expected energy transition to renewable energy sources such as wind and solar. IHS Markit has built into its forecast a degree of energy transition in the base case which projects that oil will account for 25% of the global energy mix by 2050. The net-zero goal proposed by compliance with the Paris treaty accord would lower the global oil contribution to the energy mix to just 11%. This would in turn reduce the oil-price outlook to below \$30/bbl which in effect would shut down future drilling in the Bakken as only about 26% of the play breaks even for under \$40/bbl (figure 3-12).



- As a result of the oil-price crash due to the pandemic new emphasis by industry and government on clean energy has shifted. The current projected mix of energy sources has reduced reliance on oil and coal (which are more carbon intensive than natural gas) and increased reliance on renewables, mainly wind and solar
- Projected increases in average global temperature by 2100 for each scenario
  - Pre-pandemic 3.1° C
  - Accelerated Transition 1.9° C

Figure 3-12: Energy scenarios projection

## Agriculture

IHS Markit has aligned its 2022 plantings estimate to the NASS August US crop production report, which is aligned to the June Acreage Report. This year's weather has once again turned out less than ideal with cotton and grain sorghum taking the brunt of the growing season poorly owing to the Great Plains drought. Spring wheat yields bounced back after last year's drought coming in at 47.8 bushels per acre versus last season's level of 32.6 bushels per acre. Corn yields have been reduced as key areas missed needed precipitation and temperatures have been on the warmer side. Conversely, the Northern Plains has seen much better conditions than last year although not perfect. Like last year, summer weather has slowly whittled away at corn yields falling from their starting point of 179 bushels per acre and falling to 175.4 bushels per acre. Soybean yields still hover in the grey area of estimates as weather at the time of this forecast development was still undecided. Since that time conditions have remained dry leading to speculation that top-end yields have been reduced. For now, our forecast assumes a yield of 51.9 bushels per acre.

Grain and oilseed prices have been revised higher in the medium term as our costs of production outlook ingest higher PPIs for major cost components. Livestock and meat prices maintain elevated levels as significant production hurdles remain in place, spanning familiar issues of high input costs and labor shortage disruptions in processing, transportation, and other areas of the supply chain. Dairy prices sustain notable elevation under seasonal demand support from schools reopening and exports boosted by resurging international interest, while supply issues such as depleted inventories are facing only recent and limited recover in milk output.

The 2021 net farm income has been revised higher to \$140.4 billion and remains historically large in 2022 at \$133.0 billion. The stronger US dollar has added risk to our export forecast given our average yield outlook for Brazil's 2022/23 crop, which will be planted starting in October.

Total principal crop acres for 2023 will reach 320.7 million acres, which is a sizable jump from 2022 level. We believe the risk lies with larger winter wheat acres, larger cotton acres, and lower hay acres. The net effect however would still be a year-on-year gain from 2022. The recent FSA data may point to a revision higher in 2022 plantings.

Costs of production have been shifted higher pushing inflation longer through the forecast horizon. In May, the USDA updated its 2021 per acre cost components, which have been incorporated into our historical data. Cotton variable costs will fall by 2% in 2023, soybeans by 1%, wheat rise by 1%, corn rise by 1%, and rice fall by 2%. Although fuel and fertilizer look to back off in 2023, they are still much higher than levels farmers have seen for the last five years. However, grain and oilseed prices are elevated enough to provide returns over variable costs in 2023, hence the strength in US crop plantings. Keep in mind our key cost drivers are not factoring in either a large recession, which would have a high likely hood of driving energy lower or escalating geo-political event that push fuel and fertilizer prices to new highs. The greatest risk will be if a farmer elects to lock in input prices but waits for the spring insurance price guarantee to set their floor. If South America finally sees an average crop and US dollar

gains curtail exports, farmers will be staring negative returns over variable expenses in the eye.

US total cash receipts were at \$375.7 billion in 2021, up from 2020 as higher crop receipts offset a decline in livestock receipts. Higher crop receipts for soybeans and fruit and nuts in 2020 more than offset lower receipts for corn and cotton. However, from 2021 to 2025 total marketing receipts are expected to increase primarily because of likely stronger growth in livestock receipts. Crop receipts are forecast at \$508.8 billion in 2022 and forecast to drop off slightly in following years.

On the challenging side, farm cash expenses are also expected to increase in 2022 and remain relatively high through 2027.

US Cash Receipts, Government Payments, Net Cash & Farm Income and Cash Expenses(Billion \$)													
Item	2015	2016	2017	2018	2019	2020	2021	2022F	2023F	2024F	2025F	2026F	2027F
Total Cash Receipts	377.4	358.5	370.4	371.2	367.3	363.5	433.6	508.8	472.6	447.8	461.1	471.3	479.0
Livestock Cash Receipts	189.5	162.7	175.6	176.3	175.6	164.4	195.8	245.5	224.2	214.8	220.7	225.4	230.7
Crop Cash Receipts	187.9	195.8	194.9	194.9	191.7	199.1	237.8	263.4	248.4	233.0	240.4	245.9	248.3
Government Payments	10.8	13.0	11.5	13.7	22.4	45.5	25.8	12.6	6.0	6.3	6.3	6.5	6.5
Total Cash Income	422.6	399.4	413.2	414.0	424.4	443.3	491.7	556.6	513.1	488.3	501.7	512.2	519.9
Cash Expenses	315.8	303.8	311.9	311.4	317.3	326.5	345.3	408.1	410.1	385.0	385.8	388.5	392.9
Net Cash Income	106.8	95.6	101.3	102.6	107.1	116.8	146.4	148.6	102.9	103.3	115.9	123.6	127.0
Net Farm Income	81.7	62.3	75.1	81.1	79.2	94.5	140.4	133.0	94.6	86.7	100.4	107.4	109.5

Source: IHS Markit

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## US farm balance sheet

The US farm balance sheet is expected to stay relatively strong through the forecast period. Farm assets and equity are forecast to increase somewhat through 2027.

US Farm Balance Sheet													
Item	2015	2016	2017	2018	2019	2020	2021	2022F	2023F	2024F	2025F	2026F	2027F
Farm Assets (bil \$)	2,880	2,914	3,006	3,027	3,075	3,175	3,498	3,861	3,919	3,853	3,800	3,844	3,904
Farm Liabilities (bil \$)	357	374	390	403	420	441	474	517	520	512	510	516	522
Farm Equity (bil \$)	2,523	2,540	2,616	2,624	2,655	2,733	3,024	3,344	3,400	3,340	3,289	3,329	3,381

Source: IHS Markit

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The third-quarter forecast of 2022 highlights elevated prices for the year, with a combination of supply disruptions continuing to keep livestock and dairy values in an elevated range. Harsh drought conditions have persisted with no sign of major relief yet, negatively impacting cattle producers across the west, Midwest, and south regions of the country. Also among producers is the fact that feed prices have remained considerably elevated and are expected to remain as such. Additionally, the processing and transportation networks across the various have had to still contend with labor shortages. Regarding pork supply, declines beyond prior expectations have occurred among the breeding herd, market hog, and pig crop numbers, which are creating further delays in production recovery efforts. As for poultry, bird flu infections were firmly thought to be fully finish after a period of no new outbreaks, but now commercial flock infections have been once again reported in chicken, turkey, and egg operations alike now. With the timing and intensity of avian flu once again being thrown into question, this can certainly contribute toward another span of volatile poultry pricing. Among dairy, though milk production has started to see recovery from both milk cow numbers and milk output per cow, the ultimate intensity of this upturn remains in question. Despite instances of price retreats, the next year is expected to see livestock and dairy values remain within notably elevated ranges. However, considering some of the downward price movements that have happened, and with some uncertain production dynamics, there is firm downward price risk associated with these most recent forecasts.

## US Crop Balance Sheets

### Soybeans

US soybean stocks are forecast to decrease in subsequent years because of increasing demand. The lower stocks will help boost soybean farm prices in 2021/22 and 2022/23. Prices though are expected to drop in ensuing forecast years as stocks begin to build again as expected larger soybean acres will increase production.

**Supply:** During the time of this forecast's conception at the end of August, soybean yields still looked promising as weather conditions still offered opportunity for moisture. Soybean yields are forecast at 51.9 bushels per acre with production increasing from 4.44 billion bushels last year to 4.53 billion bushels. Since that time though, IHS Markit has lowered its yield outlook, released 6 September, to 51.3 bushels per acre pulling the crop slightly lower to 4.47 billion bushels. In 2023, US farmers are expected to plant 89 million acres, which is a 1.0 million acre increase over 2022. With yields of 52.7 bushels per acre, production will increase to 4.65 billion bushels.

**Demand:** The 2022/23 soybean crush is expected to increase to 2.27 billion bushels in 2022/23 and given our renewable diesel outlook, crush will quickly make its way to 3.0 billion bushels owing to expanding crush capacity. Our forecast is contingent on those plantings being built. Current crush margins point to a very profitable opportunity here in the short term. Our soybean export outlook has not changed greatly throughout the forecast period. We have revised our outlook for both 2021/22 and 2022/23 to 2.15 and 2.13 billion bushels, respectively. The strong US dollar has added risk for exports in the short term. With continued expansion of Brazilian acres, US exports will weaken long term. The 2022/23 ending stocks are forecast at 258 million bushels and jump to 391 million bushels next season. Our 2022/23 ending stock estimate does not seem to support current price levels, but that points to the market's expectation that yield estimates are too high.

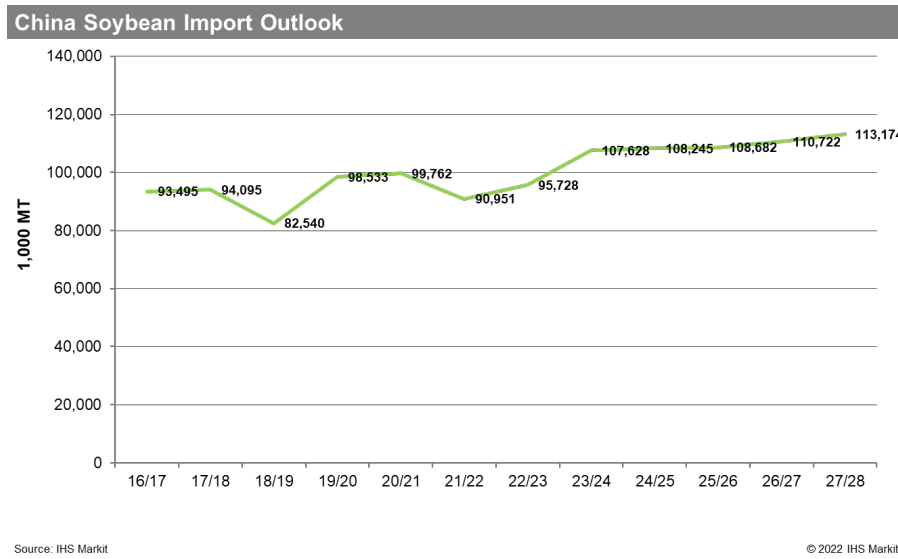
**Price risk:** This season's farm-level price has been revised to \$13.6 per bushel but collapses to \$10.12 per bushel in 2023/24 as stocks rise.

US Soybean Fundamentals												
Marketing Year Beginning September 1	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28
<b>Prices (Dollars Per Bushel)</b>												
Marketing Year Average Price	9.47	9.33	8.48	8.57	10.80	13.40	13.60	10.12	10.42	11.08	11.02	11.02
Central IL Processor Price	9.77	9.53	8.53	8.90	13.41	15.09	13.99	10.45	10.75	11.39	11.32	11.33
<b>Soybean to Corn Price Ratio</b>												
	2.82	2.78	2.35	2.41	2.38	2.27	2.27	2.29	2.16	2.25	2.29	2.27
<b>Acreage (Million Acres)</b>												
Planted Area	83.5	90.2	89.2	76.1	83.4	87.2	88.0	89.0	89.0	89.4	90.4	90.1
Harvested Area	82.7	89.5	87.6	74.9	82.6	86.3	87.2	88.2	88.2	88.6	89.6	89.3
Harvested Area % of Planted	99%	99%	98%	98%	99%	99%	99%	99%	99%	99%	99%	99%
<b>Yield (Bushels Per Acre)</b>												
	52	49	51	47	51	51	52	53	53	54	54	55
<b>Supply (Million Bushels)</b>												
Beginning Stocks	197	302	438	909	525	257	234	258	391	384	363	367
Production	4,296	4,412	4,428	3,552	4,216	4,435	4,531	4,645	4,702	4,767	4,864	4,900
Imports	22	22	14	15	20	15	15	15	15	15	15	15
Total Supply	4,515	4,735	4,880	4,476	4,761	4,707	4,780	4,918	5,108	5,167	5,242	5,282
<b>Domestic Disappearance</b>												
Crush	1,901	2,055	2,092	2,165	2,141	2,205	2,270	2,341	2,507	2,668	2,843	2,935
Seed & Residual	146	108	203	108	97	118	122	136	137	140	144	146
Total Domestic Disappearance	2,047	2,163	2,295	2,272	2,238	2,323	2,392	2,477	2,644	2,808	2,987	3,081
<b>Exports</b>												
	2,167	2,134	1,676	1,679	2,266	2,150	2,130	2,051	2,079	1,996	1,887	1,826
<b>Total Disappearance</b>												
	4,214	4,297	3,971	3,952	4,504	4,473	4,522	4,527	4,723	4,803	4,875	4,907
<b>Ending Stocks</b>												
	302	438	909	525	257	234	258	391	384	363	367	375

Source: IHS Markit

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China is the world’s largest importer of soybeans and China’s imports of soybeans during the forecast period are expected to continue to grow. But export competition from Brazil is also expected to grow as Brazil’s exports are forecast to continue to increase.



Source: IHS Markit

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## Corn

**Supply:** This summer’s weather was either feast or famine with the Western Corn Belt witnessing hot dry temperatures that neared other major yield loss events to areas in the Eastern Belt where conditions will produce at just below a record crop. The net

effect however has been a yield level below 2021/22. More recently and following the release of this forecast, IHS Markit has even more bearish yields with the condition implied yield of 171.6 bushels per acre. For this forecast, our production total is seen at 14.4 billion bushels. For next year, we anticipate corn plantings to rise to 90.8 million acres and with yields of 180.7 bushels per acre, production will near 15.0 billion bushels.

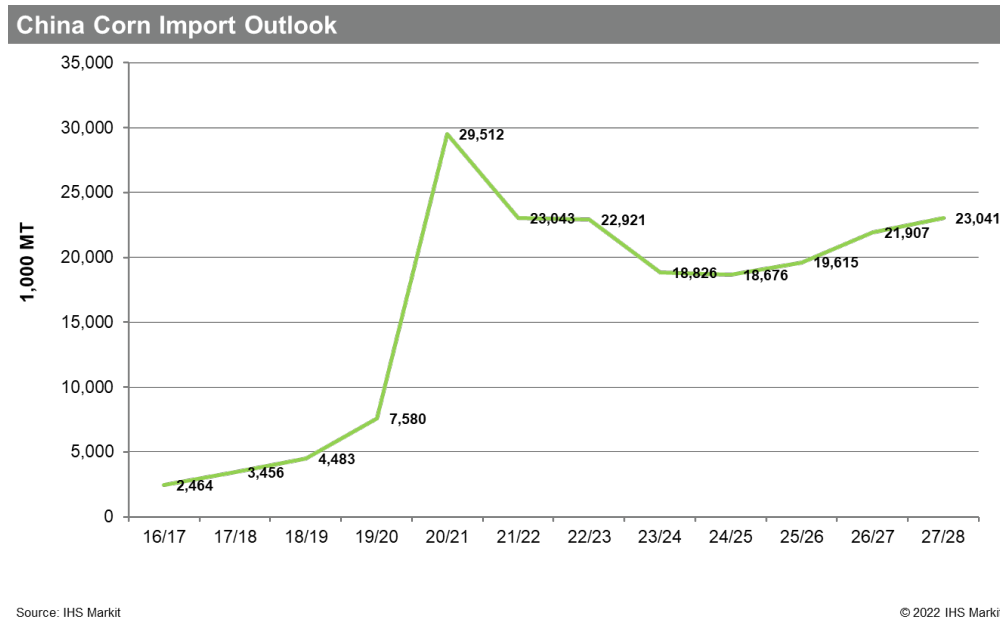
**Demand:** The 2022/23 feed and residual use will fall to 5.5 billion bushels owing to a smaller crop size. Higher feed costs will also be a bearish factor for livestock producers. Corn for ethanol use contracts from 5.34 billion bushels to 5.25 billion bushels but climbs higher the following season. HFCS use for this season will remain flat, but we do expect a slight push higher as corn prices fall for 2023/24. Exports are seen flat season over season at 2.4 billion bushels, but with the drop in corn prices jump to 2.58 billion bushels in 2023/24. Our forecast assumes a return of Ukrainian corn to the export market around 2024/25, expanding second crop corn acres in Brazil, along with a slowdown in Chinese import demand in the short term. Toward the end of the decade, US corn exports will rise as global demand inflates. Ending stocks will contract in 2022/23 after expanding in 2021/22. With the larger crop size in 2023/24, stocks will press higher, stabilize before moving back above 2.0 billion bushels in 2026/27. There remains a large risk associated with our ending stock estimate. With the surging US dollar, our export estimate may become too bullish, which would directly translate into higher stocks and compound that change in the short term.

**Price risk:** The average farm level corn price for 2022/23 has been revised to \$6.0 per bushel and falls to \$4.42 per bushel in 2023/24. In the previous forecast, our corn farm price falls aggressively in the short term as global supplies rise. However, this forecast shows a much higher bottom as costs of production have risen. In the very short term, production costs are not the determining factor for corn price but in the medium to long term, they are very important as corn price must be high enough to guarantee returns over variable expenses. This fact is extremely important because in the short term, the market will reduce prices below costs of production to reduce supplies.

## Economic Forecasting Report

	US Corn Fundamentals											
Marketing Year Beginning September 1	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28
<b>Prices (Dollars Per Bushel)</b>												
Season Average Farm Price	3.36	3.36	3.61	3.56	4.53	5.90	6.00	4.42	4.82	4.92	4.81	4.85
Central IL Spot Market Price	3.37	3.34	3.60	3.46	5.47	6.17	5.99	4.45	4.83	4.93	4.83	4.87
FOB, U.S. Gulf	3.95	4.07	4.29	4.01	6.07	6.50	6.51	4.78	5.21	5.32	5.21	5.25
<b>Acreage (Million Acres)</b>												
Planted Area	94.0	90.2	88.9	89.7	90.7	93.4	89.8	90.8	88.6	89.2	88.9	86.5
Harvested Area	86.7	82.7	81.3	81.3	82.3	85.4	81.8	82.8	80.7	81.3	81.1	78.9
Harvested Area % of Planted	92%	92%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%
<b>Yield (Bushels Per Acre)</b>												
	175	177	176	167	171	177	175	181	183	184	186	188
<b>Supply (Million Bushels)</b>												
Beginning Stocks	1,737	2,293	2,140	2,221	1,919	1,235	1,615	1,425	1,718	1,662	1,916	2,017
Production	15,148	14,609	14,340	13,620	14,111	15,115	14,359	14,964	14,737	15,000	15,098	14,866
Imports	57	36	28	42	24	25	25	25	25	25	25	25
Total Supply	16,942	16,939	16,509	15,883	16,055	16,375	15,998	16,414	16,480	16,687	17,039	16,908
<b>Domestic Disappearance (Million Bushels)</b>												
Feed & Residual	5,468	5,304	5,427	5,899	5,603	5,600	5,500	5,341	5,528	5,692	5,753	5,701
Fuel Alcohol (Ethanol)	5,432	5,605	5,378	4,857	5,033	5,335	5,250	5,316	5,388	5,379	5,539	5,545
HFCS	467	459	441	418	421	415	415	423	426	426	429	429
Seed	29	30	29	30	31	31	31	30	30	30	30	31
Food, Other	957	963	944	981	987	979	978	1,010	1,010	1,016	1,024	1,031
Total Domestic Disappearance	12,353	12,361	12,220	12,185	12,074	12,360	12,174	12,120	12,382	12,543	12,774	12,737
Exports (Million Bushels)	2,296	2,437	2,068	1,778	2,747	2,400	2,400	2,577	2,436	2,227	2,247	2,257
Total Disappearance (Million Bushels)	14,649	14,798	14,288	13,963	14,821	14,760	14,574	14,697	14,818	14,771	15,022	14,994
Ending Stocks (Million Bushels)	2,293	2,140	2,221	1,919	1,235	1,615	1,425	1,718	1,662	1,916	2,017	1,915
Source: IHS Markit											© 2022 IHS Markit	

US share of world exports is expected to hold steady in the forecast period partly due to potential increase in exports to China. China in recent years removed its support prices for corn production and that combined with growing feed demand in China is expected to increase China's imports of soybeans increased from 7.6 million tonnes in 2020/21 to 29.5 million tonnes in 2021/22. But exports are expected to drop after 2021/22 and begin rising again in 2025/26. Brazil is expected to increase its corn exports during the forecast period so export competition for the US will be strong.



## Wheat

**Supply:** The 2023 all wheat plantings are forecast to be down slightly with the loss coming from other spring and durum. Winter wheat acres are forecast to be flat. However, our risk assessment is more heavily tilted to winter as wheat acres coming in higher than expected. Moisture levels across the Great Plains will also play a pivotal role in seeing if that wheat makes it to the spring. We believe farmers will be watching if winter wheat futures can hold their August lows but without a drop in corn futures wheat should be supported.

**Demand:** The 2022/23 wheat food use will fall to 958 million bushels while feed and residual use drops to 80 million bushels. With tight corn supplies in the western Corn Belt, wheat feedings have the potential to increase. Our US wheat export forecast in 2022/23 is not overly bullish, only increasing to 812 million bushels. Our longer-term wheat export forecast is unchanged with the overall outlook trending lower throughout the forecast horizon. Ending stocks will fall from 660 million bushels to 627 million bushels in 2022/23.

**Price risk:** Farm-level wheat price for 2022/23 has been revised higher to \$8.90 per bushel.

US Wheat Fundamentals												
Marketing Year Beginning June 1	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28
<b>Prices (Dollars Per Bushel)</b>												
Marketing Year Average Price	3.89	4.72	5.16	4.58	5.05	7.63	8.90	7.00	7.60	7.49	7.48	7.41
<b>Acreage (Million Acres)</b>												
Planted Area	50.1	46.0	47.8	45.5	44.5	46.7	47.0	46.8	46.8	47.1	46.9	47.1
Harvested Area	43.9	37.5	39.6	37.4	36.8	37.2	37.5	37.5	37.3	37.5	37.3	37.5
Harvested Area % of Planted	87%	82%	83%	82%	83%	80%	80%	80%	80%	80%	79%	80%
<b>Yield (Bushels Per Acre)</b>												
	53	46	48	52	50	44	48	50	51	51	52	52
<b>Supply (Million Bushels)</b>												
Beginning Stocks	976	1,181	1,099	1,080	1,028	845	660	627	659	756	785	789
Production	2,309	1,740	1,885	1,932	1,828	1,646	1,783	1,878	1,886	1,916	1,923	1,955
Imports	118	158	135	104	100	95	98	76	81	80	79	78
Total Supply	3,402	3,078	3,119	3,116	2,956	2,586	2,541	2,581	2,626	2,752	2,786	2,821
<b>Domestic Disappearance</b>												
Food and Industrial	949	964	954	962	961	972	958	954	951	954	958	963
Seed	61	63	59	62	64	60	64	64	67	66	67	64
Feed & Residual	161	47	88	95	93	94	80	65	36	35	39	53
Total Domestic Disappearance	1,171	1,075	1,102	1,118	1,117	1,126	1,102	1,083	1,054	1,056	1,064	1,080
<b>Exports</b>												
	1,051	906	937	969	994	800	812	840	816	911	934	938
<b>Total Disappearance</b>												
	2,222	1,981	2,039	2,087	2,111	1,926	1,914	1,922	1,869	1,967	1,998	2,018
<b>Ending Stocks</b>												
	1,181	1,099	1,080	1,028	845	660	627	659	756	785	789	803

Source: IHS Markit

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World wheat exports are expected to decrease during forecast period. However, the US will face greater competition from EU exports.

## Cattle and Beef Sector Supply

Total cattle and calves in the United States at the start of 2022 fell by 2.0% year on year (y/y) to 91.9 million head. Inventory liquidation has persisted under a number of factors, spanning high feed costs, intense drought across key production areas, and efforts to add beef supply to the market under tight availability. With various supply chain issues still in effect, including limited labor counts and transportation delays, the industry continues to struggle with managing and upholding healthier supply conditions. Given the heightened rates of clearing out cattle and heifer slaughter, this has placed increasing downward pressure on future supply circumstances. This is in terms of both falling cattle weights in the short term, as well as slowing rebuilding and recovery endeavors further out. Ultimately, long-term dynamics for cattle numbers are further moderate decline and then overall flatness, owing to retreating per-capita consumption rates of beef, as well as the shrinking rate in population growth for the United States. At the beginning of 2023, the total inventory of cattle and calves are to measure at 90.6 million head, a reduction of 1.4% y/y. These reduced cattle figures are accompanied by a total cattle slaughter count of 32.6 million head in 2023, down 4.2% y/y, following a drop of 0.5% y/y to 34.0 million head for 2022. Given softening cattle weight figures occurring throughout 2022, weights are expected to show some increases and stability in the short term, with overall growth prevailing in the long term, as supported by continued genetic and technological developments. With these impacts altogether, US beef production in 2022 is forecast to effectively hold flat y/y at 27.8 million metric tons (MMt), under overall light declines that are fueled by the

various negative supply impacts. In 2023, US beef production is projected to fall by 2.0% y/y, as recent supply chain dynamics and producer hurdles have not allowed for the market to stabilize and rise from ongoing losses. Over the next several years beyond 2023, US beef production is anticipated to see further reductions with eventual light growth, as the industry tries to balance delays in production systems mixed with softening consumption gains.

## **Demand**

Beef consumption for the United States in 2022 is expected to hold firm at 27.7 billion pounds, as consumers have faced significant price inflation, which has clashed with surprising resilience in consumers and their preference for including beef in their diets. However, as 2022 has gone on, price inflation has spread to other forms of protein, which has continued to pressure overall demand lower beyond prior understanding. With further supply issues expected in 2023, the market is to see beef prices shift even higher, when beef products were already typically the more expensive protein option. In light of this, domestic beef consumption is estimated to retreat by 3.9% y/y to 26.7 billion pounds in 2023. Further out in the longer term, beef consumption is to stabilize and then trend lightly higher once again, fueled by light population growth in the United States offsetting an ultimate pullback in per-capita consumption rates of beef. Although there have been periods of strengthening domestic beef demand, these have not been able to put a stop to the firm downward trend in beef consumption that has prevailed across the past several decades. Beef consumption has had to contend with consumers moving away from beef owing to health concerns, morality from perceived animal treatment, a higher comparative price, and an expanding selection of substitutes. Ultimately, these past and present trends are to extend out into the future, with the movement away from beef consumption supported by the continued developments of plant-based and cell-cultured alternatives. At the same time, despite the reasons for reduced growth in US beef demand, the established presence of beef in the diets of US consumers is to overall remain large into the future. This is owed to those who prioritize beef's taste, use, and traditional production method over the potential motivations to adjust away. The export market for US beef is anticipated to rise by a soft 0.7% y/y in 2022, reversing higher after a wide range of patterns among major trade partners have more concretely strengthened in recent months. In particular, Japan, South Korea, and mainland China have been leading the growth in US beef imports, supporting lighter gains with Mexico and Canada. Long-term US beef export prospects are to not be overly positive, with mainland China being the primary source of significant consumption and import growth in the future. This is due to mainland China's historically small consumption rates that are now on a strong upward trend, with its domestic production not expected to keep up with the growth rate in demand. Additionally, Brazil and Australia have been aggressively pushing toward their supply and trade expansion of beef, which is to suppress US beef export volumes over the next several years especially.

	US Cattle Sector Fundamentals											
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
<b>Prices (Cents per Pound)</b>												
1100 - 1300 #,												
5-area Direct Steers	120.89	121.90	117.07	117.15	107.73	122.57	142.18	146.58	139.04	147.31	150.85	150.49
Change	-18.6%	0.8%	-4.0%	0.1%	-8.0%	13.8%	16.0%	3.1%	-5.1%	5.9%	2.4%	-0.2%
600 - 650 #, Oklahoma												
City Feeder Steers	153.44	155.82	159.20	153.65	145.83	158.21	181.67	191.36	169.31	190.62	192.09	193.80
Change	-32.3%	1.5%	2.2%	-3.5%	-5.1%	8.5%	14.8%	5.3%	-11.5%	12.6%	0.8%	0.9%
Utility Cows, Sioux Falls	71.61	62.01	55.86	56.66	67.29	86.64	66.48	77.13	84.41	88.54	90.62	88.76
Change	-31.6%	-13.4%	-9.9%	1.4%	18.8%	28.8%	-23.3%	16.0%	9.4%	4.9%	2.4%	-2.1%
Boxed Beef Cutout	206.77	209.90	213.97	222.62	238.93	279.26	264.78	275.40	284.45	292.50	298.64	298.80
Beef Retail (Dollars per pound)	5.96	5.91	5.92	6.04	6.38	7.25	7.61	7.75	8.07	8.00	8.16	8.14
<b>Cattle Inventories as of January 1 (Million Head)</b>												
Beef Cows (Jan. 1)	30.2	31.2	31.5	31.8	31.3	30.8	30.1	29.4	29.7	29.6	29.6	29.8
Dairy Cows (Jan. 1)	9.3	9.3	9.4	9.4	9.3	9.4	9.4	9.4	9.3	9.4	9.4	9.3
Cattle and Calves (Jan. 1)	91.9	93.7	94.3	94.8	93.8	93.8	91.9	90.6	89.8	89.6	89.4	90.1
Calf Crop	35.1	35.8	36.4	36.3	35.1	35.1	34.6	34.0	34.2	34.1	34.4	34.5
Calf Death Loss	2.1	2.1	2.2	2.3	2.1	2.1	2.3	2.1	2.1	2.1	2.1	2.1
Calf Slaughter	0.5	0.5	0.6	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2
Beef Cow Slaughter	2.6	2.8	3.1	3.2	3.3	3.6	3.7	3.1	3.2	3.1	3.1	3.1
Dairy Cow Slaughter	2.9	3.0	3.2	3.3	3.1	3.2	3.0	3.0	3.0	3.0	3.0	3.0
Bull Slaughter	0.5	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5
Steer and Heifer Slaughter	24.6	25.7	26.2	26.5	25.8	26.5	26.3	25.5	25.4	25.3	24.8	25.3
Total Slaughter	31.1	32.7	33.6	34.1	33.2	34.2	34.0	32.6	32.3	32.2	31.7	32.1
Cattle Imports	1.7	1.8	1.9	2.0	2.1	1.8	1.7	1.9	1.9	1.9	1.9	1.9
Cattle Exports	0.1	0.2	0.2	0.3	0.3	0.5	0.3	0.2	0.2	0.2	0.2	0.2
Cattle Death Loss	2.3	2.4	2.4	2.5	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3
Residual	0.0	-0.2	0.0	-0.7	0.2	-0.1	0.8	0.1	0.0	0.0	0.0	0.0
<b>Cattle and Calves (Dec. 31)</b>	<b>93.1</b>	<b>93.7</b>	<b>94.2</b>	<b>93.2</b>	<b>93.2</b>	<b>91.3</b>	<b>90.0</b>	<b>89.3</b>	<b>89.0</b>	<b>88.8</b>	<b>89.5</b>	<b>89.8</b>
Cattle on Feed	13.2	13.1	14.1	14.4	14.7	14.7	14.7	14.5	14.6	14.9	14.5	14.9
<b>Beef Supply (Million Pounds)</b>												
Beginning Stocks	683	757	649	664	609	588	613	636	611	582	587	578
Imports	3,015	2,993	2,999	3,057	3,342	3,311	3,401	3,100	2,956	3,034	3,144	3,177
Production	25,221	26,228	26,867	27,148	27,153	27,938	27,814	27,250	26,846	26,886	26,596	27,094
Total	28,919	29,978	30,515	30,870	31,104	31,837	31,828	30,986	30,414	30,502	30,327	30,849
<b>Beef Disappearance (Million Pounds)</b>												
Domestic Use	25,673	26,371	26,665	27,167	27,484	27,828	27,740	26,666	26,605	26,843	26,780	27,161
Exports	2,556	2,860	3,155	3,022	2,956	3,446	3,472	3,300	3,226	3,073	2,969	3,095
Total	28,229	29,231	29,820	30,189	30,440	31,274	31,212	29,966	29,831	29,916	29,749	30,256
Ending Stocks	757	649	664	609	588	613	636	611	582	587	578	593
<b>Per Capita Consumption (Pounds)</b>												
Carcass Weight	79	81	81	83	83	84	83	80	79	79	79	80
Retail Weight	53	54	54	55	56	56	56	53	53	53	53	53
Change	2.9%	2.0%	0.7%	1.9%	0.8%	0.5%	-0.6%	-4.3%	-0.7%	0.4%	-0.7%	0.9%

Source: IHS Markit

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## Prices

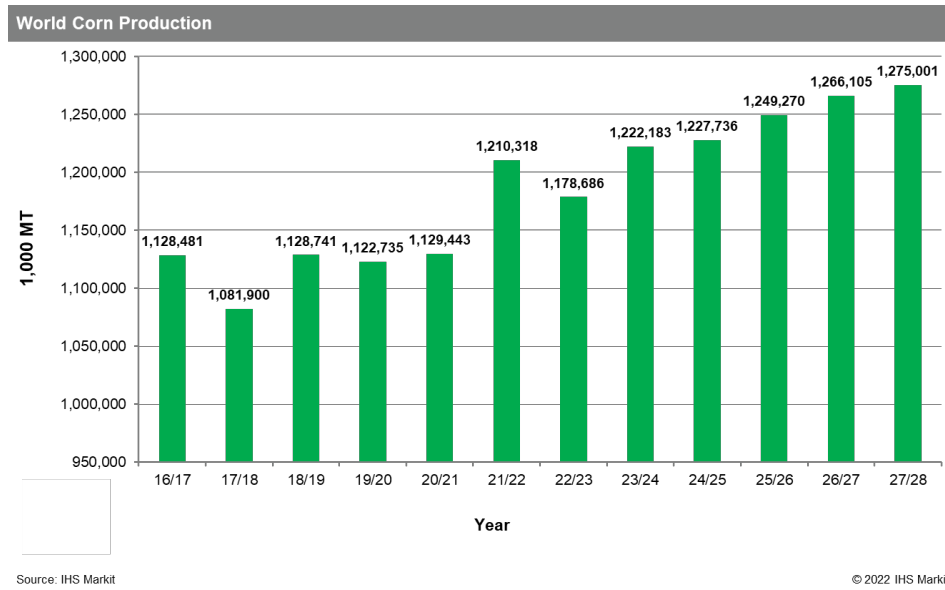
Beef prices in 2022 are forecast to fall by 5.2% y/y to \$264.8 per hundredweight (cwt), although this is following an average annual increase of 6.3% y/y each year from 2017 through 2021. Although production struggles have persisted, the short-term efforts to increase slaughter have assisted in helping prices somewhat soften in 2022. However, it is because of these same supply chain complications that greater price relief is not expected beyond this ultimately marginal decline. In addition, the

slowdown in consumption this year relative to previous years has also been a contributing factor in the modest downward correction in beef prices during 2022. Given that widespread inflation impacts have spread across the protein sectors and general spending, consumers are facing difficulty in balancing their spending habits, beef included. Notable production recovery is expected to be several years out, and eventual demand levels will take some time to rebound as well. However, as the fundamentals balance out at these newer levels of weakness, this means beef prices are to remain concretely elevated over the next several years. US beef prices in 2023 are estimated to increase by 4.0% y/y to \$275.4 per cwt, with steady gains anticipated in the years further out, ultimately exceeding the \$300.0 per cwt mark before 2030.

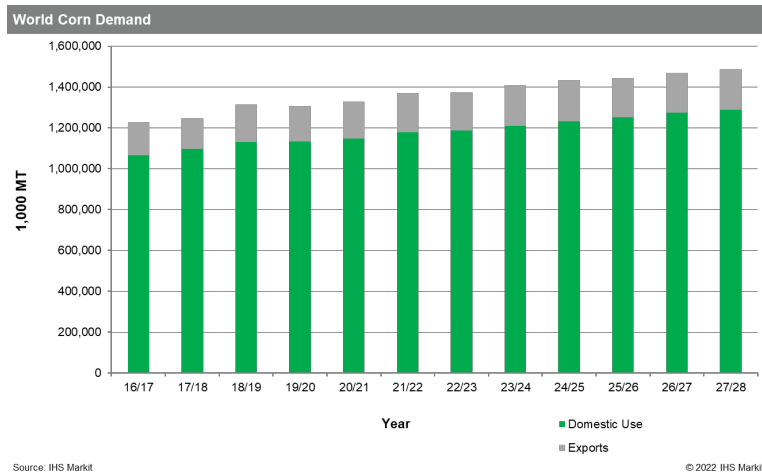
**Global Outlook and Assumptions**

**Corn**

**Supply:** Global corn production is forecast to decrease to 1.18 billion metric tonnes in 2022/23, with the US expected to account for most of the decrease. But then world corn production is projected to continue to grow through 2027/28 reaching a record 1.28 billion MT. The largest production increases are forecast for Brazil (to increase by about 16 MMT) and Ukraine (to increase by about 12 MMT during the forecast period increasing export competition for the US. Ukraine’s exports are forecast to decrease in 2022/23 because of the Russia Ukraine war.

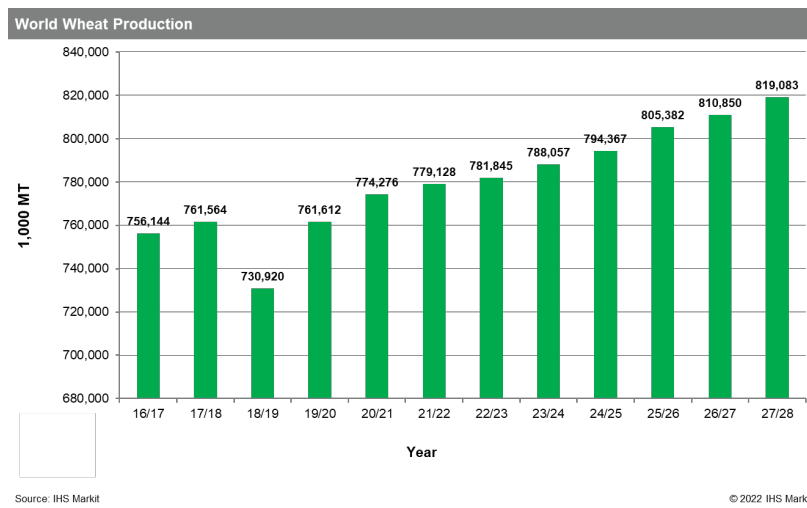


**Demand:** World corn imports are forecast to increase by 11 MMT in 2022/23. World corn imports are forecast to increase about 12 MMT from 2023/24 to 2027/28. China corn imports are expected to remain relatively flat. US corn exports are forecast to decrease from 61 MMT in 2023/24 to 57.3 MMT in 2027/28. Brazil’s exports are expected to increase marginally during that time period. Ukraine’s exports could increase nearly 4 MMT during that time period.

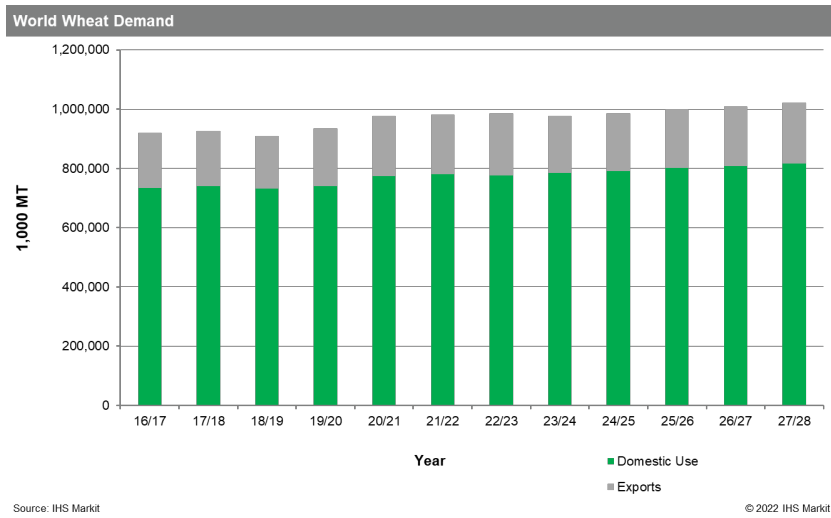


### World Wheat

**Supply:** World wheat production is forecast at 781.8 MMT in 2022/23, up marginally from the previous year. World wheat production is projected to continue to grow through 2027/28 reaching a record 819 MMT. The largest production increases are forecast for the Ukraine with production potentially increasing by 9 MMT and the EU which could increase 6 MMT during the forecast period. US production during the forecast period is forecast to increase by about 4.5 MMT.



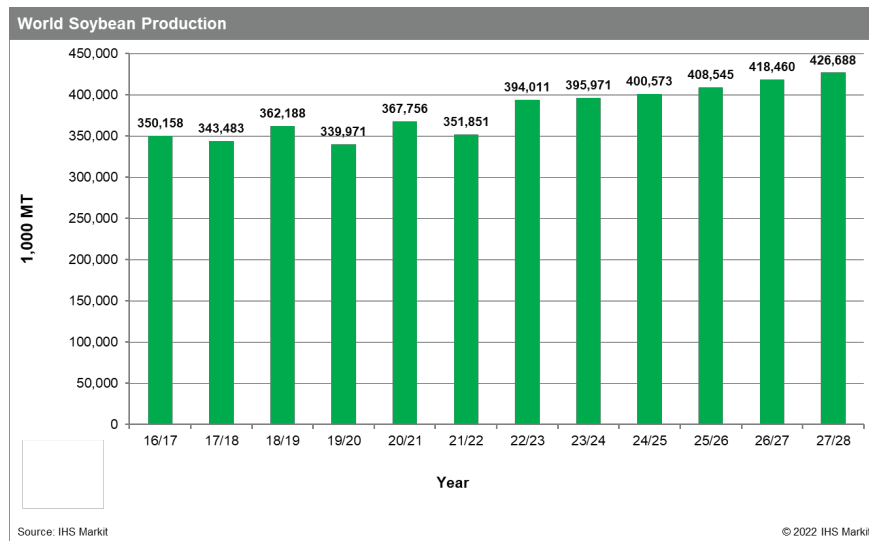
**Demand:** World wheat imports are forecast to increase by about 2 MMT in 2022/23. But world wheat imports are forecast to increase by about 7 MMT from 2022/23 to 2027/28 mainly. Asia is expected to account for most of the increase in world wheat imports during the forecast period. US exports are expected to increase by about 3.0 MMT from 2022/23 to 2027/28.

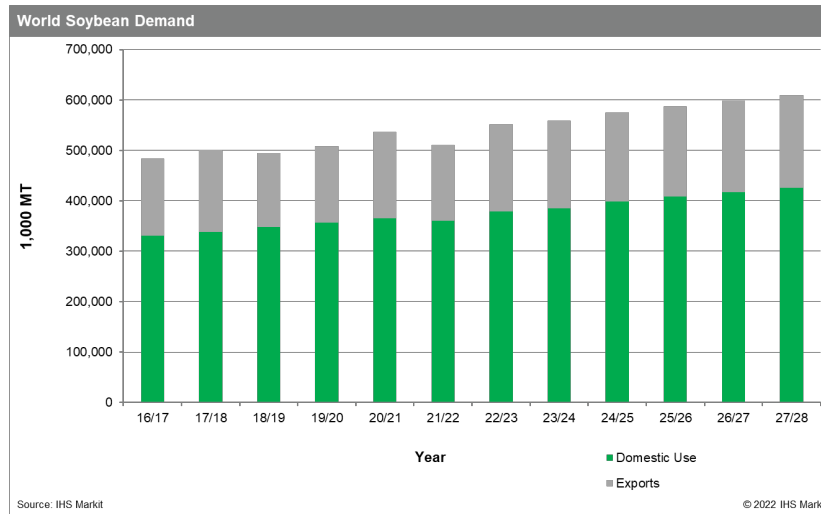


### Soybeans

**Supply:** World soybean production is forecast at 394.0 MMT in 2022/23, up sharply from the previous year. World soybean production is projected to continue to grow through 2027/28 reaching a record 426.7 MMT. The largest production increases are forecast for Brazil and Argentina which combined could increase over 12 MMT during the forecast period. US production is also forecast to increase sharply, rising by almost 10.0 MMT during the forecast period.

**Demand:** World soybean imports are forecast to increase by over 10 MMT in 2022/23 with China accounting for more than half that increase. World soybean imports are forecast to increase by nearly 20 MMT from 2022/23 to 2027/28 mainly because of expected increases by China. This larger increase in imports bodes well for exporting countries such as the US, Brazil and Argentina.





## Farm Policy Issues

### Climate and Conservation Policy

Inflation Reduction Act of 2022 – incentive for farmers to change farm management practices to improve soil health and create carbon credits. USDA conservation programs provided with \$20 billion in funding, with the biggest share going to:

- The Environmental Quality Incentives Program (EQIP) at \$8.45 billion over the Fiscal Year (FY) 2022 through 2026 period.
- The Conservation Stewardship Program (CSP) would see an increase of \$3.25 billion over the FY 2023-2026 period.
- The Conservation Easement Program would receive \$1.4 billion over that period.
- The Regional Conservation Partnership Program would get \$6.7 billion over FY 2023-2026.

### WOTUS

**Latest Supreme Court session on WOTUS yields differing views on potential outcome.** The US Supreme Court heard arguments in its opening session in a case that focused on what constitutes waters of the US (WOTUS) under the Clean Water Act. The case, *Sackett v. EPA*, reached the highest court with a hope they may address the uncertainty that has surrounded this issue since a split ruling by the court in 2006. That was subsequently followed by a regulatory action by the Obama administration to broaden the definition of WOTUS while the Trump administration rejected that rule and replaced it with a more restrictive reading of what constitutes WOTUS. In arguments last Monday, some read the questions and statements from justices as likely siding with EPA on the issue that would give them broader authority or at least not curtail their authority on regulating what is considered WOTUS. But others noted the justices also appeared uneasy with the vagueness of the law as it stands and that could see the court move toward a less-restrictive reading in the case. Still others read the exchanges between attorneys for the Idaho couple bringing the suit and the US government as potentially signaling some change would be coming, but perhaps in a decision that would not be as far-reaching as either side would hope. But the conservative majority on the

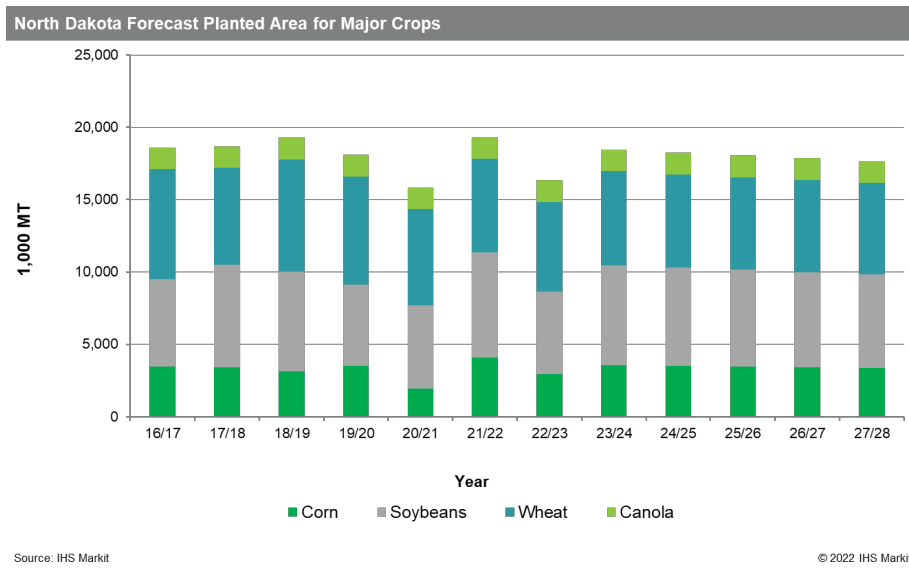
court clearly is troubled by the vague nature of the Clean Water Act relative to the case at hand.

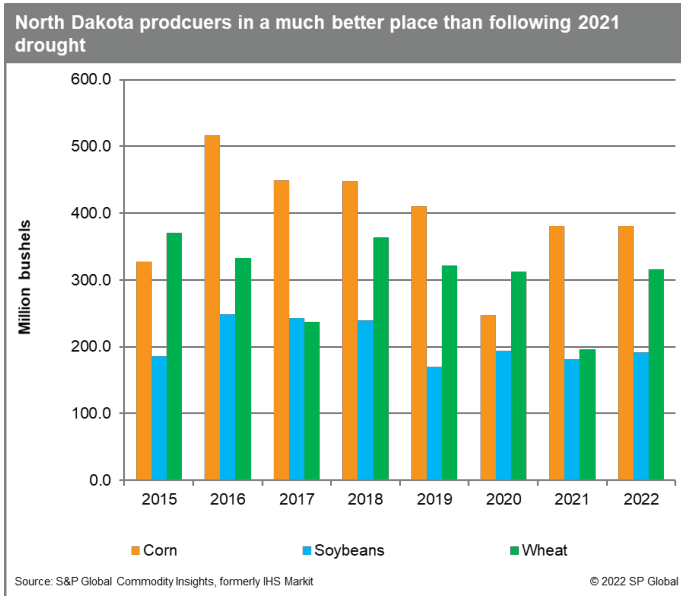
**Farm Bill 2023**

Work on the Farm Bill is gaining steam.

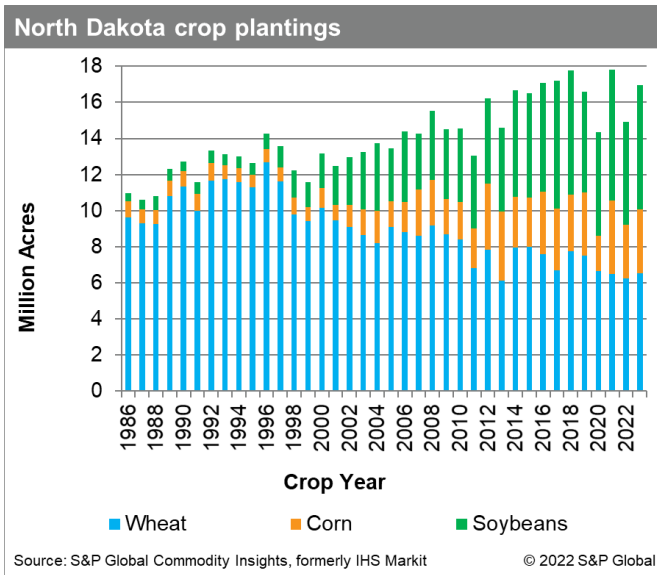
**North Dakota Outlook**

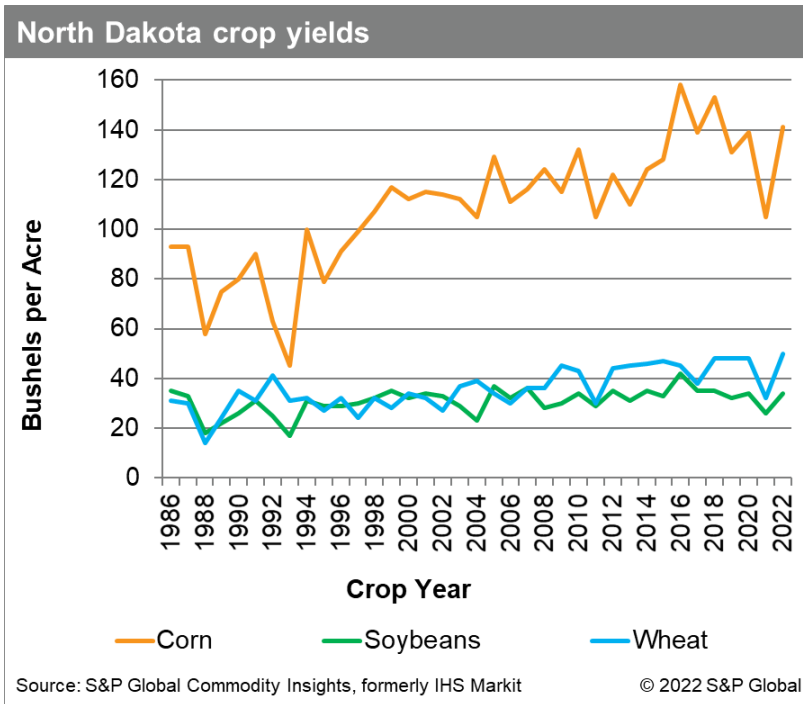
The state bounced back from last year’s drought with a wheat crop size 61% larger year over year. Even with surging input prices North Dakota farmers like others in the US took advantage of this year’s prices and weather. Looking ahead to 2023 North Dakota is forecast to expand plantings for major crops by 7.2% driven mainly by corn. In your home state the greatest risk to plants will be spring weather as how wet you get determines the level of prevented plantings. The drier the year the lower the prevented plantings for North Dakota. Grain and oilseed prices will soften during the 2022/23 crop year as global supplies return but all is contingent on South American weather. Prices remain historically high however softening the blow felt by sustained strong input prices. The risk moving forward surround global macroeconomic risk, Ukrainian export potential, and if Brazil doesn’t have a third crop loss in a row. Their area continues to expand which has been buffered by weaker yields, when that changes supplies will surge



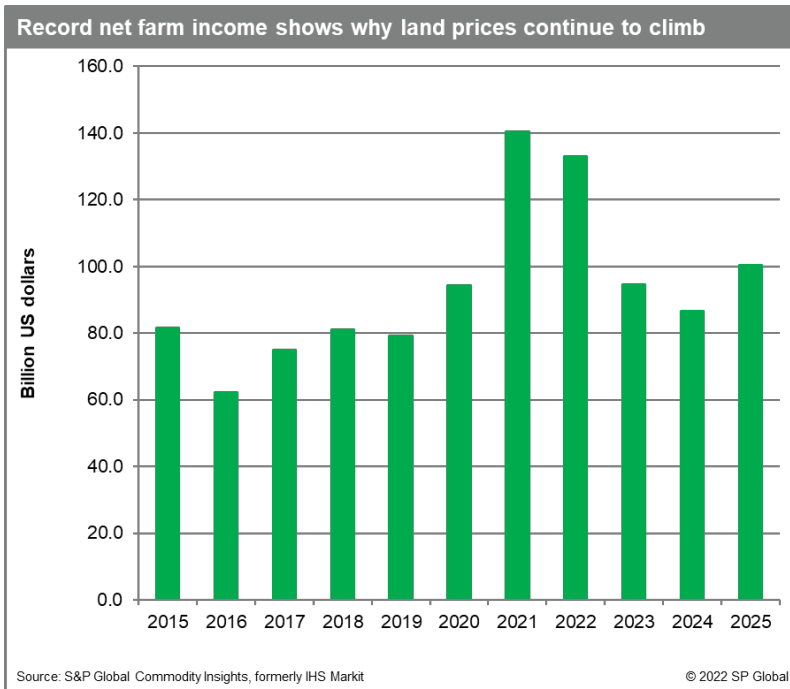


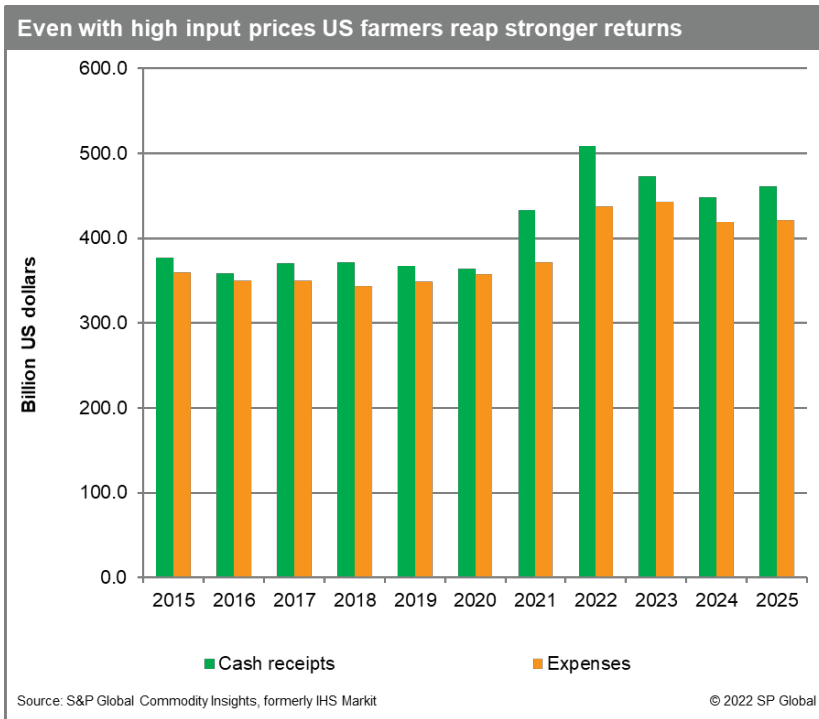
North Dakota wheat plantings gave way to corn and soybeans. Weather will influence yields.





Farmer net income still strong despite higher costs.





## IV. Deep Dive into the Tax Streams

To forecast the tax revenues for North Dakota, IHS has developed custom econometric models for major sources of state tax revenue.

- > The forecasted amounts are based on quarterly data with quarterly economic drivers associated with the underlying economic activity. The economic drivers were carefully selected after reviewing historical data and comparing economic data to the tax collections.
- > Quarterly forecast are aggregated into fiscal year totals and biennial totals.
- > This is the first “run” of the models and the output from the models will continue to be reviewed, and if needed, adjusted to make the forecasts as accurate as possible.
- > The forecast amounts will be updated in January and March to reflect the most current information available for the economic outlook.

### September 2022 Forecasts

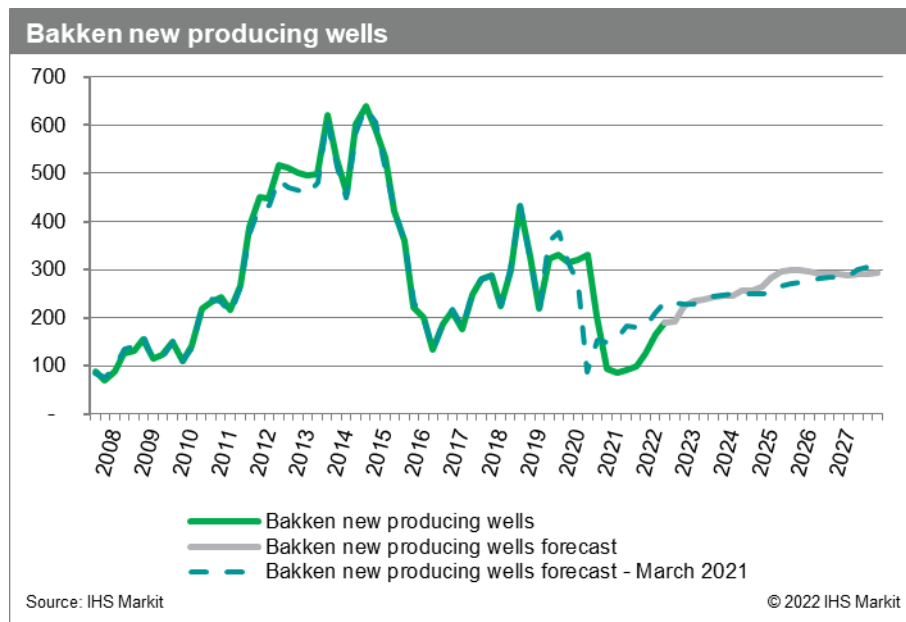
Revenue Source	2019-21 Biennium Actual	2021-23 Biennium Forecast	2023-25 Biennium Forecast
<b>Sales and use tax</b>	<b>1,823,991,775</b>	<b>1,940,581,097</b> 6.4%	<b>2,037,598,143</b> 5.0%
<b>Motor vehicle excise tax</b>	<b>259,690,121</b>	<b>287,940,849</b> 10.9%	<b>338,775,687</b> 17.7%
<b>Individual income tax</b>			
Total individual income tax collections	1,025,353,869	1,349,779,966 31.6%	1,526,901,926 13.1%
Transfer to refund reserve accounts	(207,800,000)	(447,400,000)	(324,000,000)
<b>Net individual income tax collections</b>	<b>817,553,869</b>	<b>902,379,966</b> 10.4%	<b>1,202,901,926</b> 33.3%
<b>Corporate income tax</b>			
Total corporate income tax collections	294,644,398	398,064,008 35.1%	334,575,978 -15.9%
Transfer to refund reserve accounts	(56,234,413)	(53,351,687)	(57,000,000)
<b>Net corporate income tax collections</b>	<b>238,409,985</b>	<b>344,712,321</b> 44.6%	<b>277,575,978</b> -19.5%

Note: The percentages in the table reflect the change from the prior biennium

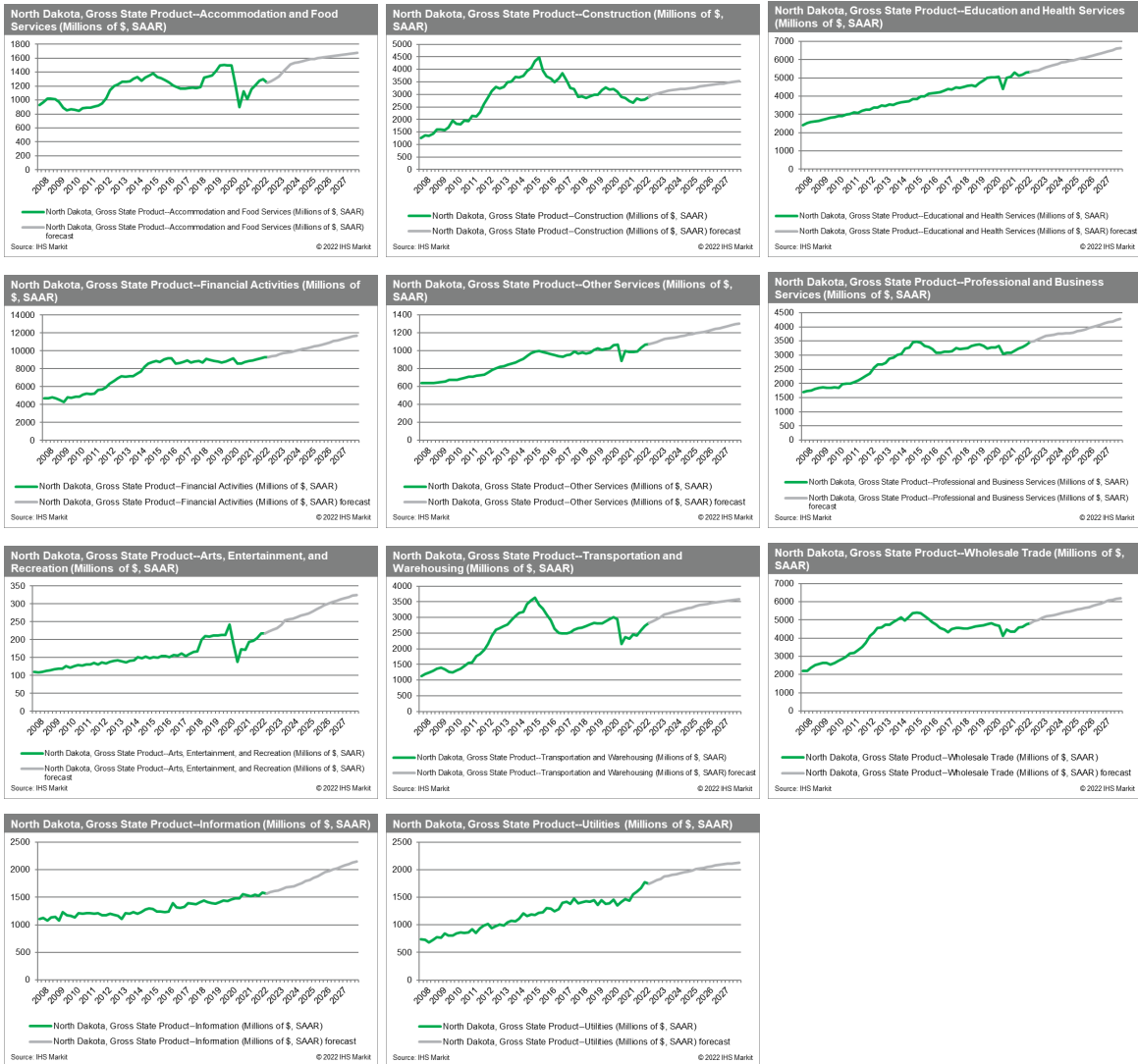
The specific market drivers and concept behind each of the forecasted tax streams are provided in detail below.

### Sales and use tax

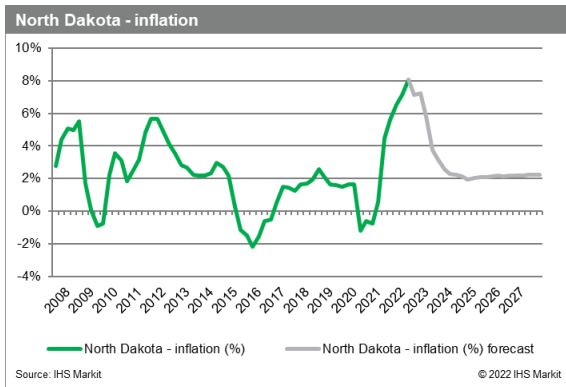
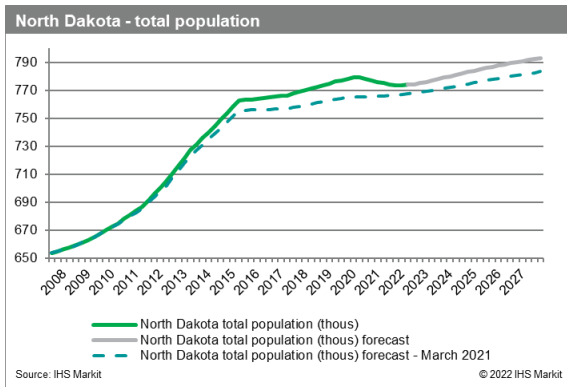
- > To forecast the sales and use tax revenue, each taxable sales sector is modeled and a forecast is produced. The sector forecasts are summed to a total taxable sales forecast. The tax rate is applied to the total taxable sales forecast to calculate sales and use tax revenue.
- > Of the fifteen taxable sales sectors, nine sectors have a strong correlation with energy markets, thus (1) new producing wells is used as the driver in these equations. The nine sectors are accommodation and food services, construction, financial services, manufacturing, mining and oil, miscellaneous, other services, transportation and warehousing, and wholesale trade. The well count in the Bakken play has been gradually recovering after hitting lows in 2020 and 2021 due to the COVID-19 shutdowns and a price war between Russia and Saudi Arabia. The number of new producing wells in the Bakken will continue to increase through the forecast horizon but at a slower pace than seen in recent history.



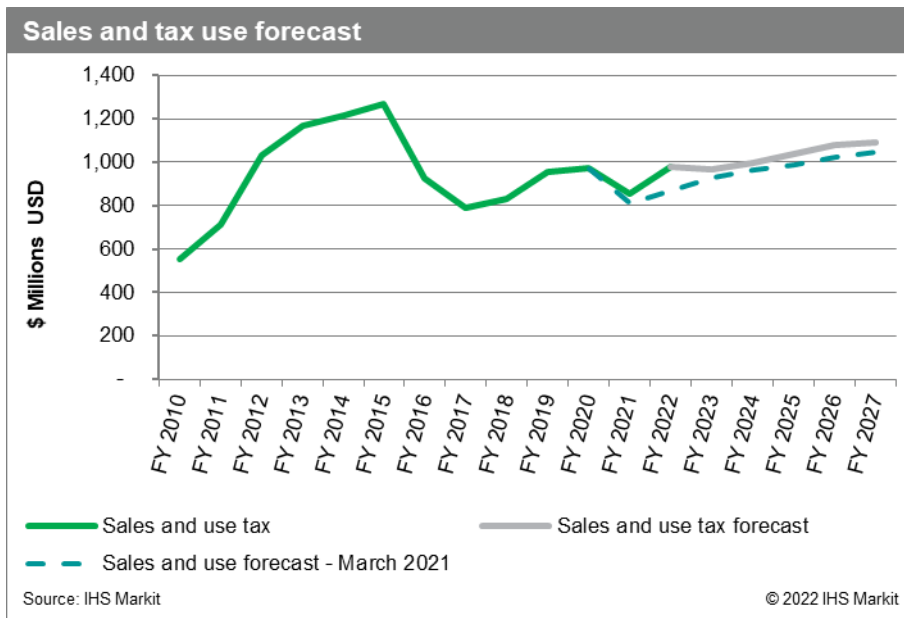
- > Another driver used in some of the sector-level equations is (2) gross state product in North Dakota by sector and can be found in the models for accommodations and food services, construction, education, health care, and social services, financial services, other services, professional services, arts and recreation, transportation and warehousing, wholesale trade, information industries and utilities.
- > Gross state product in all sectors had positive year-over-year growth in the first quarter of 2022. The largest growth was in transportation and warehousing at nearly 14.5% year-over-year. Gross state product in education and health services had the weakest year-over-year growth in 2022Q1 at 0.33%. Growth continues at a steady pace for all sectors throughout the forecast horizon.



- > The taxable sales in retail trade is driven by (4) population and (5) inflation in North Dakota. IHSM assumes per-capita purchases are stable and align with population growth. Inflation is assumed to have peaked in the second quarter of 2022 and will normalize to 2% by the end of 2024.

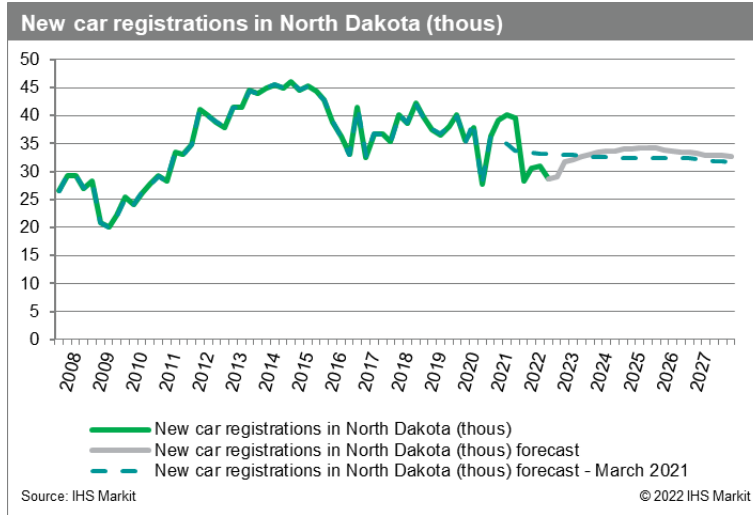


- > After summing the sector-level taxable sales to a total and applying the 5% tax rate and 91.3% for transfer to the general fund, IHSM forecasts a 1.2% decline in sales and use tax in FY 2023, followed by growth of 3.4% in FY 2022 and 4.4% in FY 2023.

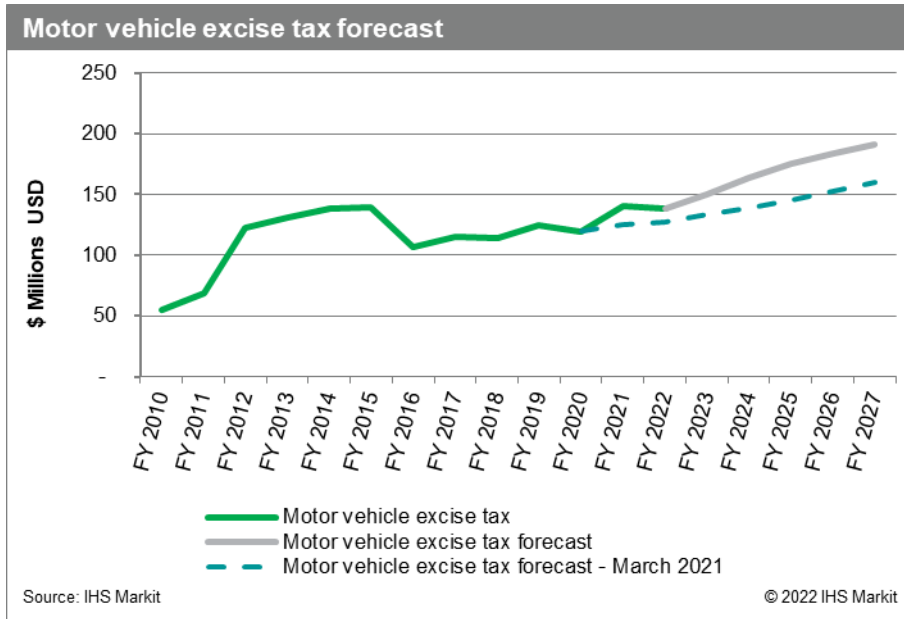


**Motor vehicle excise tax**

- > The main driver of motor vehicle excise tax is (1) new passenger and light truck registrations for the state. Since the peak in 2014, new car registrations have declined through 2020. After a jump in the beginning of 2021 due to pentup demand, registrations fell as a result of supply chain issues. In the forecast, as supply chain issues are solved and demand increases, new car registrations will rise.

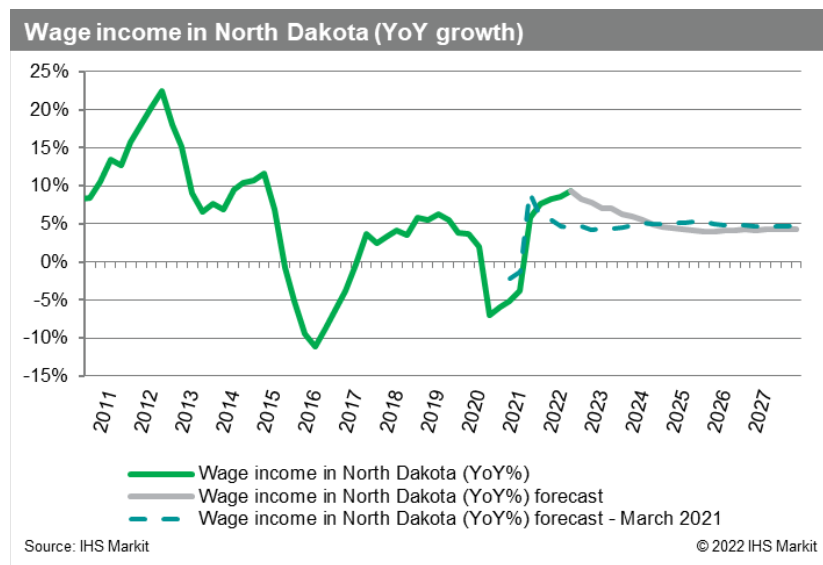


- > Resulting from the more positive new care registrations forecast and anticipated release of pent up demand, IHSM expects motor vehicle tax to grow by 8.8% in FY 2023, 9.3% in FY 2024, and 6.6% in FY 2025.

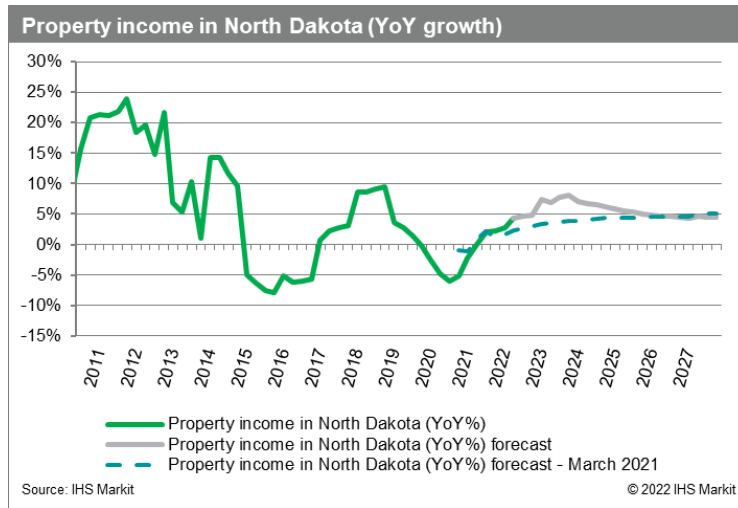


**Individual income tax**

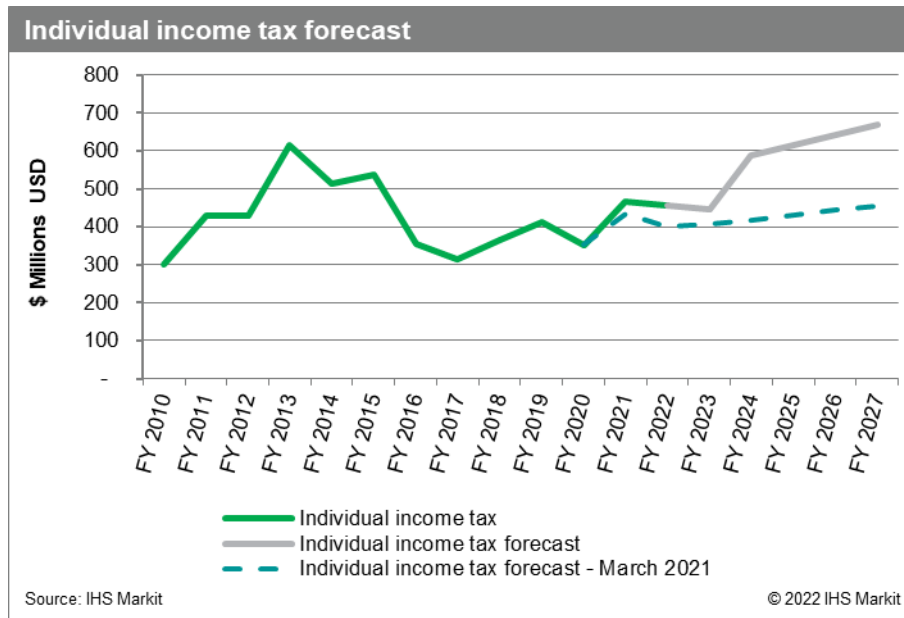
- > To model and forecast individual income tax revenues, IHSM built separate models for individual income tax submitted as withholdings versus as estimated payments.
- > Our model for individual income tax submitted as withholdings has a single driver: (1) total wage income in North Dakota. As income withholding is relatively stable and largely driven by total wage income in the state, the elasticity of income withholding with respect to total income is approximately one. This means that one percent growth of wage income will translate to one percent of withholding. Wage income grew from a dip in 2020 from the pandemic and peaks in 2022. Growth is expected to normalize to slightly below 5% by 2024.



- > The tax base of individual income tax submitted as estimated payments, on the other hand, is more volatile due to the nature of capital gains realization. That being said, a reasonable amount of variations in the tax base of individual income estimated payments is captured by changes in the (1) state's property income, i.e., personal rental income, personal dividend income, and personal interest income. State property income is the single driver for individual income tax submitted as estimated payments.

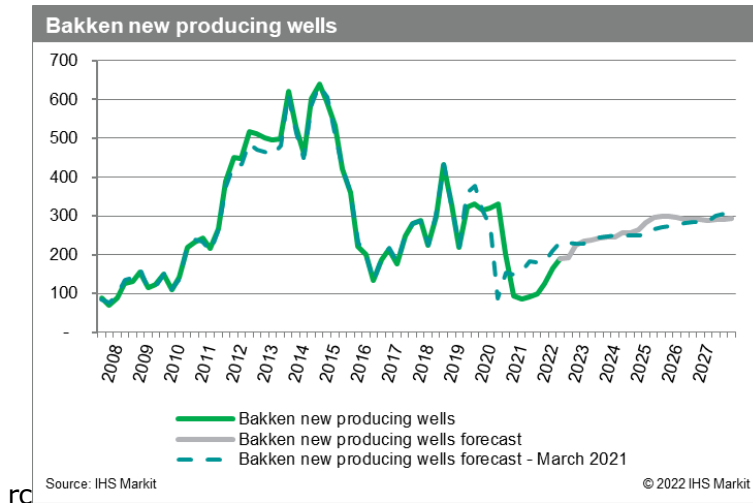


- > Insight about the estimated transfer to reserve fund accounts was provided by NDLM. About 21.2% rounded to the nearest million of the gross individual income tax revenue at the annual level is transferred to the reserve fund account. The percentage is based on the average of the past five years.
- > In total, IHSM expects net individual income tax collections to decline by 2.1% in FY 2023, followed by positive growth of 31.6% in FY 2024 and 4.8% in FY 2025.
- > The big volatility in gross individual income tax collections in FY 2020, FY 2021 and FY 2022 reflects the filing and payment extension from April 2020 to July 2020. It is estimated that the annual changes of gross income tax collection would be 3.2%, 0.3%, 2% in FY 2020, FY 2021 and FY 2022 respectively barring the impacts of the extension. Increase in net individual income tax collections in FY 2024 is primarily related to the expiration of a tax credit.

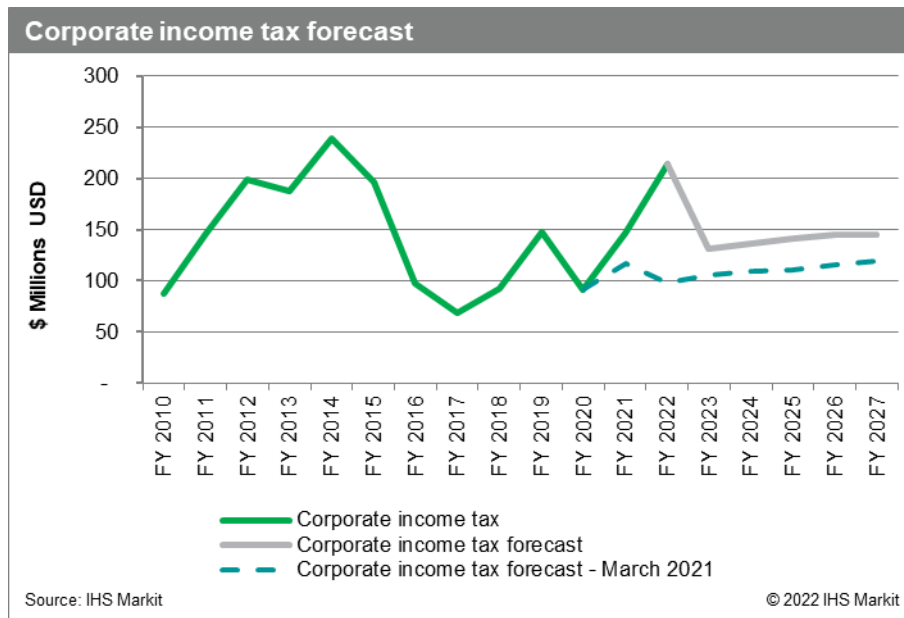


**Corporate income tax**

- > Gross corporate income tax collections are affected by (1) new producing wells in the Bakken play as an indicator of the well-being of oil companies. During the pandemic, new wells in the Bakken play dropped to a low not seen since 2008. Recently, new wells have started to recover. In the forecast, Bakken new wells are expected to rise through the forecast horizon, though still below levels seen pre-pandemic.



- > Insight about the estimated transfer to reserve fund accounts was provided by NDLM. About 16.9% rounded to the nearest million of the gross corporate income tax revenue at the annual level is transferred to the reserve fund account. The percentage is based on the average of the past five years.
- > The IHSM forecast for net corporate income tax collections is -38.5% growth in FY 2023 followed by a 3.8% increase in FY 2024 and a 3.7% growth in FY 2025.



## V. Scenarios

Given the significant fiscal impacts of oil price variations in North Dakota, IHSM customizes high/low scenarios. The Optimistic scenario assumes oil supply falls. The Pessimistic scenario assumes that there are unexpected supply gains and weak demand. IHSM then runs the model under each scenario to create forecast for major revenue streams.

Revenue Source	2021-23 Biennium Baseline	2021-23 Biennium Optimistic	2021-23 Biennium Pessimistic
Sales and use tax	1,940,581,097 6.4%	1,966,253,315 7.8%	1,909,469,742 4.7%
Motor vehicle excise tax	287,940,849 10.9%	292,063,175 12.5%	279,744,131 7.7%
Net individual income tax	902,379,966 10.4%	942,032,644 15.2%	875,759,208 7.1%
Net corporate income tax	344,712,321 44.6%	352,821,702 48.0%	336,888,483 41.3%

Revenue Source	2023-25 Biennium Baseline	2023-25 Biennium Optimistic	2023-25 Biennium Pessimistic
Sales and use tax	2,037,598,143 5.0%	2,118,360,091 7.7%	1,949,233,312 2.1%
Motor vehicle excise tax	338,775,687 17.7%	351,059,529 20.2%	306,870,106 9.7%
Net individual income tax	1,202,901,926 33.3%	1,310,982,548 39.2%	1,148,055,428 31.1%
Net corporate income tax	277,575,978 -19.5%	302,905,877 -14.1%	251,372,012 -25.4%

Note: The percentages in the table reflect the change from the prior biennium

## V. Disclosures

The forecasts included in this report, including, but not limited to, those regarding tax revenues, are estimates, which have been prepared on the basis of certain assumptions and hypotheses. No representation or warranty of any kind is or can be made with respect to the accuracy or completeness of, and no representation or warranty should be inferred from, these forecasts. The tax revenue forecast contained in this report is based upon assumptions as to future events and, accordingly, is subject to varying degrees of uncertainty. Some assumptions inevitably will not materialize and, additionally, unanticipated events and circumstances may occur. Therefore, for example, actual tax revenues inevitably will vary from the forecasts included in this report and the variations may be material and adverse.