Yardeni Research

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Morning Briefing

On the Farm, Rare Earth Minerals & Optical Semiconductors

Check out the accompanying chart collection.

Executive Summary: Farmers in America's Heartland are hurting as crop prices are dirt cheap. Supplies are high, and international demand has receded in the wake of Trump's tariffs. Jackie discusses their situation. … Also: The US/China trade deal waiting to be struck holds high stakes for both sides, which sits well with neither. As China races to produce high-end semiconductors at home, the US is scrambling to do the same for rare earth minerals. … AI data centers are notorious energy hogs. Researchers are exploring ways to transmit information using light instead of electricity and capturing an array of benefits.

Commodities: Farmers Face Low Crop Prices. US farmers are having a tough year. Many farm products—including corn, soybeans, and wheat—are at or near the lowest prices they've fetched in years. Favorable weather has meant high US crop yields, resulting in too much supply. Conversely, demand from international buyers has slackened due to Trump's Tariff Turmoil and the end of USAID. Add to that imbalance the dour backdrop of rising costs on everything farmers must buy, from equipment to fertilizer and labor, and you've got a scenario where folks in the Heartland are hurting.

President Donald Trump's recent *One Big Beautiful Bill Act* (OBBBA) did include roughly $66 billion of support over the next decade for US farmers, including extending commodity price support programs and boosting the prices guaranteed on major farm commodities by 10% to 20%. The OBBBA also increases assistance to farmers buying crop insurance. Farmers may need to rely on these programs while Trump hashes out trade deals with some of the largest buyers of US corn, soybeans, and other farm products.

Here's a look at some of the hurdles farmers are facing:

(1) *Tariff turmoil hits farm exports.* China was the largest buyer of US soybeans until President Trump placed tariffs on Chinese goods. China has responded to the tariffs, which currently stand at about 30%, by purchasing its soybeans from Brazil instead of US farmers. President Trump signed an executive order on Monday implementing another 90-day pause on additional US tariffs on Chinese goods. The lack of a deal between the two countries is expected to push back any Chinese purchases of soybeans until late this year, an August 12

Bloomberg *article* reported.

That's not good news for farmers. US soybeans exports in 2023 were valued at $28 billion worldwide, and the top buyers were: China ($15.2 billion, 54%), Mexico ($2.8 billion, 9.9%), Germany ($1.7 billion, 6.9%), Japan ($1.4 billion, 4.9%), and Indonesia ($1.2 billion, 4.5%), according to *data* from TradeImeX. As of late July, US government data showed that China had yet to book any cargoes for the upcoming season, starting in September, the Bloomberg article reported.

Mexico is the second-largest importer of US soybeans and the largest importer of US corn. Trump Tariff Turmoil (TTT) impacts that relationship, too. Trump has placed a 25% tariff on Mexican goods imported into the US that aren't shielded by the 2020 US-Mexico-Canada Agreement (USMCA), a trade agreement struck during Trump's first term and up for renegotiation next year. Exceptions to the USMCA include 25% tariffs on autos and 50% tariffs on copper, steel, and aluminum. At the end of last month, Trump announced that a 90-day negotiating period would begin with Mexico.

US corn exports totaled $14.3 billion last year and represent about 16% of total US corn production, according to *data* from TradeImeX. Top importers included Mexico (25.3 million tons worth $5.7 billion), Japan (12.5 million tons, $2.8 billion), Colombia (7.0 million tons, $1.6 billion), South Korea (3.0 million tons, $703.7 million), Canada (2.2 million tons, $620.5 million), Taiwan (1.7 million tons, $386.2 million), and China (1.3 million tons, $330.9 million).

Mexico's domestic corn production is forecast to increase this year by 7% to 24.5 million metric tons, and the country's imports are forecast to dip by 2% to 24.8 million metric tons, according to the US Department of Agriculture's *estimates*. The risk: Mexico takes a page out of China's playbook and turns elsewhere to purchase corn or places a tariff on US corn imports.

(2) *USAID, a buyer no more.* On top of the blows to demand delivered by TTT, farmers face declining demand due to the dismantling of the US Agency for International Development (USAID). The agency bought grains and other foods from US farmers and distributed them to people in need around the world. Under President Trump, the agency was defunded and merged into the US State Department, and it's unclear whether food aid programs will be reestablished.

"USAID spent about $5 billion in food assistance globally in the 2023/24 fiscal year, with roughly $2 billion of that going to purchase US commodities," reported a February 14 *article* on AgWeb.com. There were 400 US producers who had contracts to sell their products to USAID, in addition to the grain elevators from which USAID made direct purchases.

(3) *Trade wins, too.* Many of President Trump's new trade agreements are light on details, but some could provide new outlets for US farmers' products. The US/UK trade deal reduces UK tariffs on US ethanol imports to zero from 19%. The UK is the second-largest importer of US ethanol, purchasing 244 million gallons, or 12.7% of all US exports of the product. In Japan's *trade deal* with the US, Japan agreed to purchase $8 billion of US goods, including corn,

soybeans, and bioethanol, among other items. In the EU's trade deal with President Trump, the two parties agreed to "work together to address non-tariff barriers affecting trade in food and agricultural products."

(4) *Prices take a hit.* The prices of farm commodities have lagged relative to many other commodities' prices ytd through Tuesday's close (*Fig. 1*). The price of corn has tumbled 19.0% ytd, while wheat prices are 8.4% lower and soybean prices have risen only 1.4% (*Fig. 2*, *Fig. 3*, and *Fig. 4*). Compare that to the runaway price gains enjoyed by platinum (50.1%), silver (30.4), gold (27.4), and palladium (25.6). Contrarian investors might want to bet that the President successfully negotiates deals that open foreign markets for US farmers, sending farm commodity prices higher.

Materials: US's Chips vs China's Rare Earths. When President Trump and China's President Xi Jinping finally sit down to hash out a trade deal, China's access to the most sophisticated US semiconductors and United States' access to China's rare earth minerals will be two of the largest negotiating chips on the table. To gain the upper hand, China is racing to develop its own high-end semiconductors, and the US is spending billions on the development of domestic production of rare earth minerals.

China has half of the world's rare earth minerals reserves and most of its refining capacity. In its most significant move toward rare earth independence, last month the US Department of Defense (DoD) took a 15% equity stake in MP Materials, a US rare earth miner. Long-term purchase agreements guarantee that the DoD will pay the company a minimum price for rare earth minerals and magnets. News of the multibillion dollar deal sent the company's shares soaring. They're up 380.5% ytd.

Here's a look at some of the other projects and research that are in the works to boost domestic supplies of rare earths:

(1) *Uncle Sam opens his pockets.* Critical Metals received in June a $120 million loan from the US Export-Import Bank to fund the development of a rare earth mine in southern Greenland, which has one of the largest untapped deposits of heavy rare earths outside of China. The mine is expected to produce 85,000 tonnes of rare earth concentrates in 2026 and subsequently scale up to produce 425,000 tonnes. The company hopes to receive additional funding from the US government to help it build a rare earth processing plant in the US, a June 15 *article* in Mining.com reported.

Lynas USA, a division of an Australian company, aims to build a heavy rare earths processing facility in Texas. The company received $258 million of funding from the DoD in 2023. But the project has yet to break ground, having run into unexpected expenses and permitting issues related to the plant's wastewater. So the company has asked the US government to bear some of the additional financial costs, an April 28 *WSJ* *article* reported. Ironically, any material produced at the plant would have to be shipped to Vietnam, where Lynas's parent has plants that turn the material into a magnet.

(2) *A focus on recycling, too.* The DoD is also funding efforts to recycle rare earth metals and magnets. It has awarded REEcycle $5.1 million to recover rare earths from electronic waste and Ucore Rare Metals *$22 million* to build a rare earth recycling machine and facility in Louisiana. Alta Resource Technologies has raised almost $10 million from private investors to develop and commercialize its biochemical separation of rare earth metals from low-grade ores and waste streams. Alta's technology was developed in partnership with the Lawrence Livermore National Laboratory and Pennsylvania State University.

The DoD-funded Critical Materials Innovation Hub, Western Digital, and PedalPoint recycling have developed an acid-free dissolution recycling technology to separate out rare earths. Microsoft tested the process, which was able to separate rare earths, gold and copper from shredded hard disk drives, mounting caddies, and other materials, a May 9 *article* in Mining Technology reported.

There are also folks trying to kick the US dependency on rare earths altogether. Funded by the Department of Energy, Ames National Laboratory is working to identify rare-earth-free metals. In April, it announced the development of a magnet that used manganese and bismuth and could retain its magnetism at high temperatures. Likewise, Niron Magnetics has produced an iron nitride magnet that performs at high temperatures.

Disruptive Technologies: Semis Turn to the Light. Artificial intelligence (AI) can do some amazing things, but it comes at a price. The data centers that handle AI computing power generate a ton of heat and use vast amounts of electricity. Seeing an opportunity, scientists in labs and at startups are racing to develop specialized semiconductors and switches that use light (a.k.a. photonics) instead of electricity to transmit data. These are faster, use less energy, and generate less heat than traditional digital chips and switches. Let's take a look:

(1) *MIT has a light chip.* The brains at MIT have created a specialized semiconductor that uses the photons in light instead of the electrons in electricity to perform calculations. The chips could mean data centers consume 90 percent less energy and generate almost no heat. And when these chips are used in devices "on the edge," they'll be able to handle massive computing with less latency. These chips could enable autonomous vehicles to analyze information about their surroundings and make decisions faster, an August 2 item on *Autoblog* explained.

The most advanced digital devices can perform machine learning inference in microseconds (one millionth of a second), but optical chips can perform the task in nanoseconds (one billionth of a second) or even picoseconds (one trillionth of a second)! Used in electric vehicles (EVs), these optical chips would consume less energy, leaving more energy to extend the car's driving range.

The chips still need to undergo extensive testing before they can be used in cars, proving that they can withstand extreme temperatures and years of vibration. So we might not see them used in EVs until 2027.

(2) *Startups seeing the light, too.* A number of startup companies are using light to transmit information between traditional semiconductors. Lightmatter uses silicon photonics in its interposer, a layer of material that transmits information between the chips that sit on top of it. The company also has an optical chiplet that is placed on top of an AI chip.

"With photonics, you can perform multiple calculations at the same time because the data is coming in on different colors of light," explained Lightmatter co-founder and CEO Nicholas Harris in a March 9, 2024 *interview* with SciTechDaily. "In one color, you could have a photo of a dog. In another color, you could have a photo of a cat. In another color, maybe a tree, and you could have all three of those operations going through the same optical computing unit, this matrix accelerator, at the same time. That drives up operations per area, and it reuses the hardware that's there, driving up energy efficiency." In the future, he plans to build computers that use light to operate.

Another startup harnessing light to improve inter-chip communication is Ayar Labs. Its Universal Chiplet Interconnect Express aims to reduce latency, power consumption, and eliminate data bottlenecks, a company *press release* states. Ayer counts Intel, AMD, and Nvidia as investors. Celestial AI, another startup, has produced the *Photonic Fabric*, an optical interconnect technology platform for AI computing systems.

(3) *Big guys in photonics, too.* Nvidia has developed switches that include silicon photonics optical transceivers, a company *blog* explains. Using photonics to connect the many racks of computers in a data center dramatically reduces power consumption, decreases the number of parts needed, and enhances performance, all of which are important in data centers running AI programs. And in May, AMD purchased Enosemi to help develop "a variety of photonics and co-packaged optics solutions across next-gen AI systems," an AMD *press release* states.

Calendars

US: Thurs: Initial Claims 220k; Headline & Core PPI 0.2%/0.2%; Barkin; Fed's Balance Sheet. **Fri:** Retail Sales 0.5%; Consumer Sentiment 62.5; Empire State Manufacturing Index 1.8; Industrial Production 0.0%; Capacity Utilization Rate 77.6%; Business Inventories 0.2%; Import Price Index 0.0%. (Source: FX Street)

Global: Thurs: Eurozone GDP 0.1%q/q,1.4%y/y; Eurozone Industrial Production -0.9%; UK GDP 0.1%; UK Industrial Production 0.4%; UK Trade Balance -£21.7b; France CPI 0.2%m/m,1.0%y/y; Eurogroup Meetings; Japan GDP 0.1%q/q,0.4%y/y; China Retail Sales 4.6%; China Unemployment Rate 5.1%; China Industrial Production; China NBS Press Conference. **Fri:** Japan Industrial Production 1.7%. (Source: FX Street)

Strategy Indicators

S&P 500 Earnings, Revenues, Valuation & Margins (*link*): During the August 7 week, the S&P 500's forward revenues jumped 0.7% w/w to its second straight weekly record high and forward earnings soared 1.4% to a new record high. The forward profit margin rose 0.1ppt w/w to 13.8%, also a new record high and 3.7ppts above its seven-year low of 10.3% during April 2020. The consensus expectations for forward revenues growth rose 0.2ppt w/w to a 35-month high of 6.0%. It has gained 3.7ppts from its 33-month low of 2.3% during the February 23, 2023 week. That's down from a record high of 9.6% growth at the end of May 2021 and compares to 0.2% forward revenues growth during April 2020, which was the lowest reading since June 2009. The forward earnings growth forecast rose 0.3ppt w/w to an 18-week high of 12.3%, up 1.4ppts from its 15-month low of 10.9% during the May 29 week. From a longer-term perspective, that's a bit stronger than its 20-year average of 11.4% and slowing from a 38-month high of 14.3% during the December 12 week. That's also down from its 23.9% reading at the end of April 2021, which was boosted by the recovery from the pandemic to its highest reading since June 2010 and up substantially from its record low of -5.6% at the end of April 2020. Analysts expect revenues to rise 5.4% in 2025 (up 0.3ppt w/w) and 6.1% in 2026 (unchanged w/w), compared to a 4.9% rise in 2024. They expect an earnings gain of 10.7% in 2025 (up 0.6ppt w/w) and a 13.3% rise in 2025 (down 0.3ppt w/w) compared to 2024's earnings gain of 11.3%. Analysts expect the profit margin to rise 0.6ppt y/y to 13.1% in 2025 (unchanged w/w) and 0.9ppt y/y in 2026 to 14.0% (unchanged w/w), compared to 2024's 12.5%. Looking at valuation data as of August 7, the S&P 500's weekly forward P/E fell 0.4pt w/w to 22.1 from a 4-1/2 year high of 22.5, but remains 2.9pts above its 16-month low of 19.2 during the April 17 week. It's now 6.8pts above its 30-month low of 15.3 in October of 2022. It also compares to 23.1 in early September 2020, which was the highest level since July 2000, and to a 77-month low of 14.0 in March 2020. The S&P 500 weekly price-to-sales ratio fell 0.03pt w/w to 3.04, and is 0.04pt below its 3.08 record high during the July 24 week. That's up from a six-month low of 2.22 during the October 26, 2023 week and compares to a 49-month low of 1.65 in March 2020.

S&P 500 Sectors Revenues, Earnings, & Margins (*link*): During the August 7 week, forward revenues rose for 10 of the 11 S&P 500 sectors, and all 11 sectors posted gains in their forward earnings. These six sectors had record-high forward revenues this week: Consumer Discretionary, Consumer Staples, Financials, Health Care, Information Technology, and Real Estate. Also close to record high forward revenues are these three sectors: Communication Services, Industrials, and Utilities. Energy's ticked up 0.3% w/w, but remains depressed at 29.5% below its September 2008 record. Materials' has improved to a 12-month high to 4.5% below its June 2022 record high. These five sectors had record-high forward earnings this week: Communication Services, Financials, Industrials, Information Technology, and Utilities. Health Care remains 2.6% below its April 3 record, but these three sectors are just about 1% below their recent record highs: Consumer Discretionary, Consumer Staples, and Real Estate. Forward earnings remains depressed for the last two sectors, Energy and Materials, but have improved in recent months to 38.8% and 23.6% below their respective highs during 2022. Looking at the forward profit margin, six sectors rose w/w and none fell. These three sectors rose to new record highs: Communication Services, Financials, and Information Technology. These three sectors

remain close: Consumer Discretionary, Industrials, and Utilities. Energy and Materials are improving somewhat from their recent multi-year lows, but these two sectors are at or barely above cyclical or record lows: Consumer Staples and Health Care. Here's how the S&P 500 and its 11 sectors rank based on their current forward profit margin forecasts along with their record highs: Information Technology (27.7%, up 0.2ppt w/w to a new record high for the time since September, prior to low-margin Dell's addition to the index, which lowered the margin 1.3ppts then to 26.3%), Financials (20.7, up 0.1ppt w/w to a new record high), Communication Services (19.8, up 0.4ppt w/w to a new record high), Real Estate (16.7, at a five-month high and down from its 19.2 record high in 2016), Utilities (14.7, 0.1ppt below its 41-month high during the July 10 week and 0.4ppt below its April 2021 record high), S&P 500 (13.8, up 0.1pt w/w to a new record high), Materials (10.8, at a 27-week high and up 0.4ppt from 51-month low in late February and down from a 20-month high of 11.6 in July 2023 and a 13.6 record high in June 2022), Consumer Discretionary (9.3, up 0.1ppt w/w and down from a record high 9.4 in early April), Energy (8.9, up 0.1ppt w/w and up 0.4ppt from a 55-month low of 8.5 during the during the May 15 week and down from its 12.8 record high in November 2022), Industrials (11.2, up 0.1ppt w/w and down from its 11.3 record high in early January), Health Care (8.1, at a record low and down from its 11.5 record high in February 2022), and Consumer Staples (6.7, a 21-month low and down from its 7.7 record high in June 2020).

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