

The Cheapest Month to Buy Nitrogen

August Offers the Best Average Price, but the Pattern Is Recent and Risky

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Anhydrous ammonia purchased in July 2025 averaged \$762 per ton. By April 2026, the same product intended for the same 2026 corn crop averaged \$1,117 per ton—a 47% difference attributable to the timing of the purchase. The 2026 buying window was unusually dramatic, but the underlying spread was not exceptional. Across the 17 buying windows from 2010 through 2026, the average difference between the highest- and lowest-priced months was about 30% of that window's nitrogen price.

That hindsight comparison, however, is not a purchasing strategy. A farm cannot know the lowest-priced month until the buying window has ended. The relevant question is whether a farm can improve its expected outcome by adopting a repeatable calendar rule—and whether the expected savings are large enough to cover the cost of financing an early purchase.

The data point to August as the strongest candidate. Anhydrous ammonia prices in August averaged about 11% below April prices. After accounting for eight months of financing at an 8% annual interest rate, the estimated net saving is about \$4.74 per acre for a northeast Kansas dryland corn budget. That is a real, if modest, benefit. It is not a risk-free gain: nitrogen and corn prices tend to move together, so buying nitrogen early sacrifices some of the natural hedge that higher spring input costs can provide when corn prices are also high.

There is another important qualification. Most of the estimated seasonal pattern appears in the most recent nine buying windows, not in the first eight. August is therefore best viewed as a useful rule of thumb—not a permanent law of fertilizer markets.

1 Data and definition of the buying window

The analysis uses DTN's national average retail fertilizer-price series, with monthly observations beginning in January 2009 and weekly observations beginning in December 2008. The combined weekly history contains 920 observations. Both series end in August 2026; the data file is updated manually, so September and October 2026 are not included. Four nitrogen products are examined: anhydrous ammonia (82% nitrogen), urea (46% nitrogen), UAN-28, and UAN-32.

Each buying window runs from May through the following April and is labeled by the spring crop year. Thus, the 2026 window covers May 2025 through April 2026. This definition is designed around the actual purchasing decision. A conventional fertilizer year running from July through June would include May and June after the April endpoint used here, even though those months are too late for a farm seeking to purchase nitrogen for that spring's application. The May-through-April window keeps every month within the period in which the crop's nitrogen can realistically be purchased. The analysis contains 17 complete windows, from 2010 through 2026.

2 Separating seasonality from the price trend

A conventional seasonal index compares each month's price with that year's average and then averages those relative prices across years. In a market where prices tend to rise over time, this approach can mistake a within-window price trend for seasonality: early-window months will appear relatively inexpensive simply because they occur earlier.

That concern matters for nitrogen. Over the sample, nominal prices rose by an average of 2.4% per year for anhydrous ammonia, 2.3% for urea, and 2.1% for UAN-28. The price series also behaves much like a random walk with positive drift. Including year indicators controls for differences in price levels across windows, but it does not fully remove the trend within each window.

The primary specification therefore models month-to-month changes in log prices as a function of calendar-month indicators. Differencing removes the annual price level and the within-window level trend, allowing the analysis to ask a more focused question: does price typically rise or fall in a particular calendar month? Newey-West standard errors are used throughout to account for serial correlation in adjacent monthly changes.

Anhydrous Ammonia Is Cheapest in Late Summer

Seasonal price path through the buying window, 2009-2026, with 68% and 90% bootstrap bands

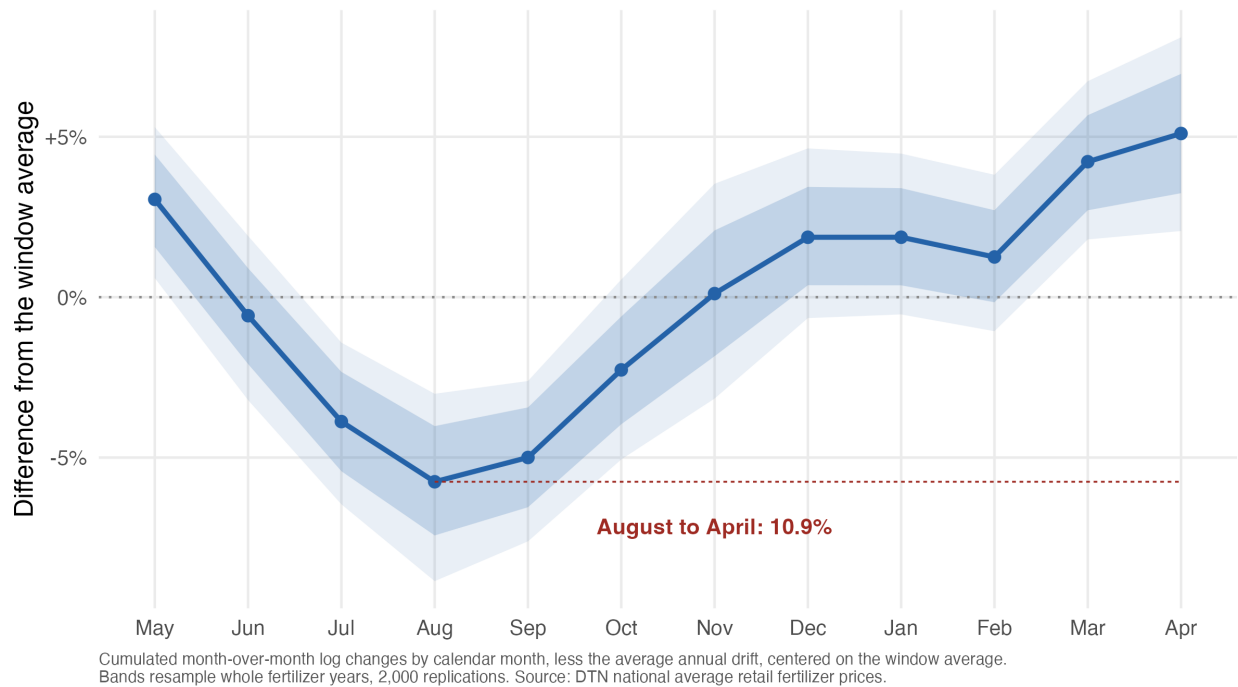


Figure 1: Anhydrous seasonal path

A joint test rejects the hypothesis that all 12 monthly means are equal for each product: the p-value is 0.008 for anhydrous ammonia, 0.0003 for urea, and below 0.0001 for both UAN grades. Two estimates are used in the results. The month-to-month-change specification identifies the seasonal path; a direct comparison of prices in each month with April across the 17 buying windows provides the dollar comparisons. Because the two approaches are constructed differently, their agreement offers a useful cross-check.

3 August is the center of the low-price period

Figure 1. Anhydrous ammonia reaches its seasonal low in late summer

The estimated seasonal path places anhydrous ammonia 5.8% below its buying-window average in August and 5.1% above that average in April. The resulting peak-to-trough spread is 10.9%. This percentage spread is the most portable result because the dollar value changes with the underlying price level. Using the average nominal price of \$709 per ton across the 17 windows, the spread is approximately \$77 per ton. Expressed in August 2026 dollars, the

equivalent is about \$100 per ton; at August 2026's observed price of \$964, it is about \$105 per ton.

The result is similar when prices are deflated by the Consumer Price Index: the estimated spread is 10.7%, with August still the trough. The largest monthly declines occur in June and July, at 3.4% ($p = 0.003$) and 3.1% ($p = 0.010$). The largest increases occur in March and October, at 3.2% and 2.9%, respectively; both estimates are marginal at $p = 0.06$.

The uncertainty bands are estimated by resampling entire fertilizer years 2,000 times. Resampling at the year level preserves the relationship among months within a buying window and respects the fact that the 12 monthly deviations sum to zero. The 68% interval places August between 7.4% and 4.0% below the window average, while April falls between 3.2% and 7.0% above it. Both ends of the estimated seasonal path are therefore separated from zero.

The evidence supports a late-summer buying period more strongly than it supports one exact month. In the direct comparison with April, August averaged \$94 per ton less, September \$84 less, and July \$81 less across the 17 windows. These three months are too close to distinguish confidently from one another. Eleven individual month-versus-April comparisons were tested, so the smallest unadjusted p-value should not be treated as decisive evidence. After a Holm correction for multiple comparisons, none of the 11 comparisons is significant at the 5% level; January's smallest raw p-value of 0.013 becomes 0.140. The joint test is more informative because it asks whether seasonality exists before selecting a preferred month.

A bootstrap analysis reinforces that interpretation. When whole fertilizer years are resampled 2,000 times and the lowest-price month is identified in each sample, August is the trough in 61% of draws, September in 33%, and July in 5%. Together, those three months account for 99.7% of the draws. No other month is the trough in even 0.5% of samples. The robust conclusion is that late summer tends to be the low-price period; the precise month within that period is less certain.

There is no meaningful evidence that a particular week within August offers an additional advantage. The average weekly log-price change in the first week of the month is +0.19%, with a standard error of 0.17%. In the fourth week, the average is -0.05%, with a standard error of 0.15%. Neither differs significantly from zero. Trying to time a specific week within August is not supported by these data.

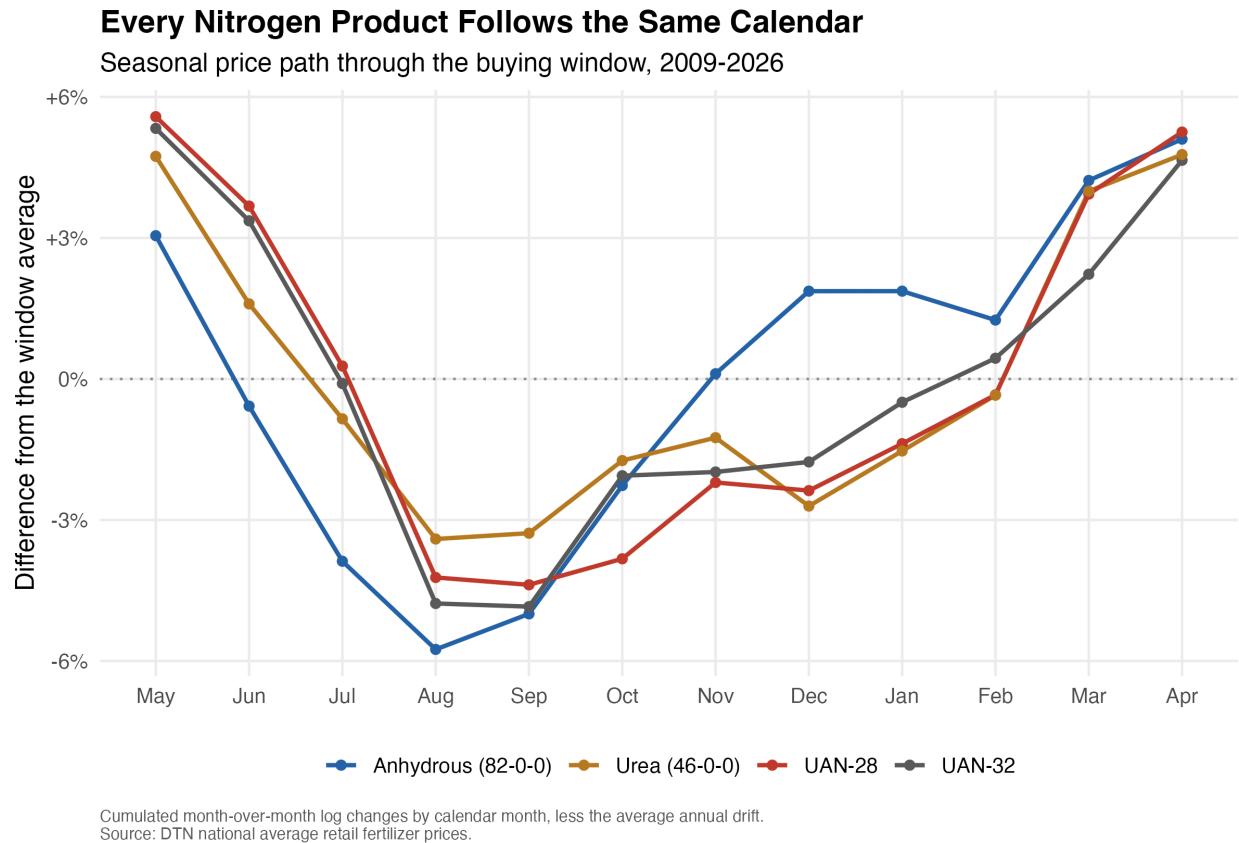


Figure 2: Seasonal path by product

4 The seasonal pattern appears across all four nitrogen products

Figure 2. All four nitrogen products follow a similar seasonal path

The seasonal pattern is visible across all four products. Peak-to-trough spreads are 10.9% for anhydrous ammonia, 10.2% for UAN-32, 10.0% for UAN-28, and 8.2% for urea. At each product's average nominal price, those spreads equal approximately \$77, \$39, \$33, and \$42 per ton, respectively.

The similarity across products is consistent with their shared upstream exposure to ammonia markets. It should not, however, be interpreted as four independent confirmations of the same result. The estimated seasonal paths correlate between 0.71 and 0.91, while price levels correlate between 0.94 and 0.99. The four tests therefore represent substantially overlapping evidence.

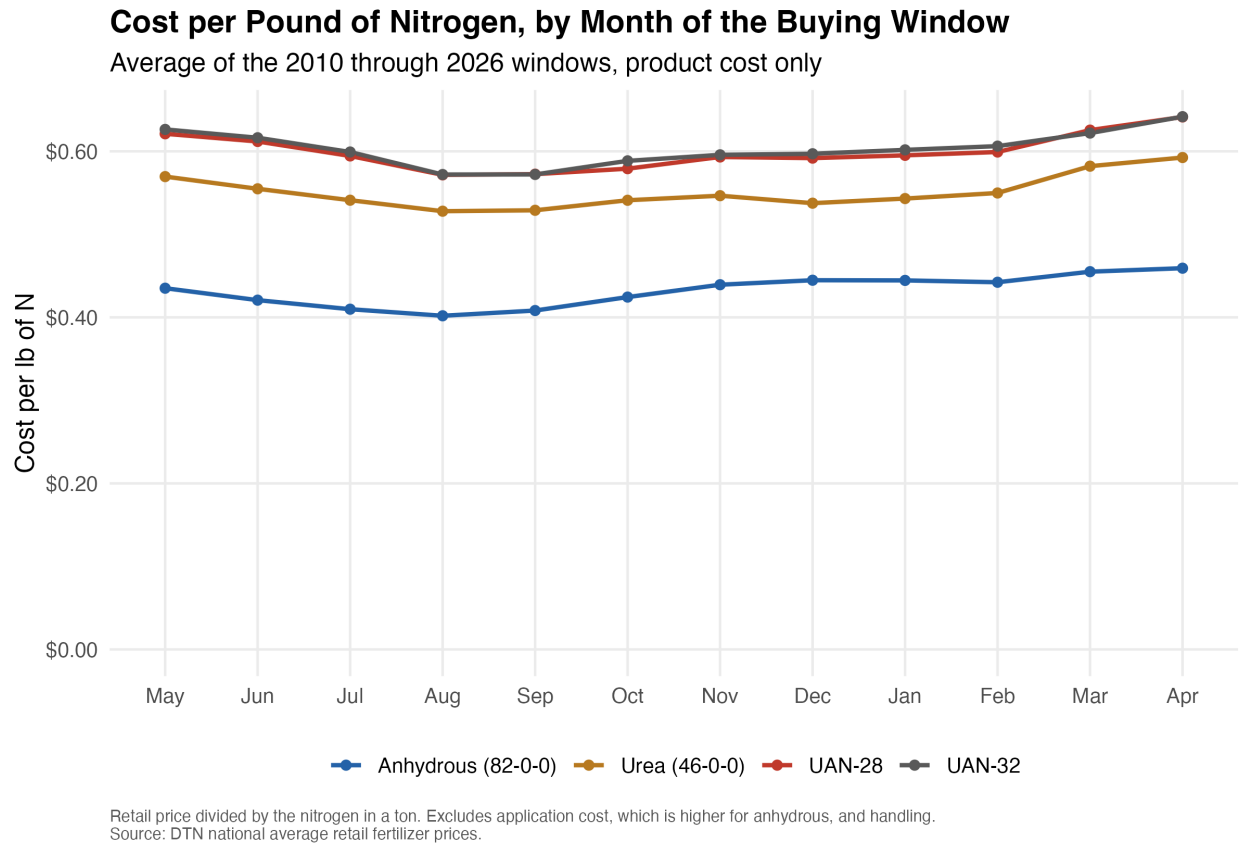


Figure 3: Cost per pound of nitrogen by month

The products diverge during the middle of the buying window. Anhydrous ammonia rises above its window average by December and remains above it. Urea and UAN-28, by contrast, remain roughly 2.5% to 3% below their respective averages. One plausible explanation is fall application: anhydrous ammonia is the product whose prices move in October and November, while the other products do not show the same pattern. If so, the low-price period may be shorter for anhydrous ammonia—roughly July through September—than for urea and UAN, for which it may extend from August into February.

Figure 3. Anhydrous ammonia has the lowest product cost per pound of nitrogen throughout the window

On a product-price basis, August averages are approximately \$0.40 per pound of actual nitrogen for anhydrous ammonia, compared with \$0.46 in April. The corresponding August and April prices are \$0.53 and \$0.59 for urea, and \$0.57 and \$0.64 for UAN-28. These figures compare fertilizer product costs only. Anhydrous ammonia also requires application, and the

Kansas State University budgets include a separate custom-application charge of \$17.69 per acre.

5 Financing costs reduce—but do not erase—the savings

Anhydrous ammonia is not typically stored on the farm after a summer purchase. Instead, the transaction is generally a prepay: the dealer holds the product in a pressurized tank, while the farm commits its money and holds an invoice. The economic cost of buying early is therefore primarily the cost of capital, rather than a physical-storage charge.

The seasonal discount can be compared with the interest cost of paying early. An 10.9% discount realized over eight months corresponds to a simple annualized break-even financing rate of approximately 16.3%. The federal prime rate was 6.87% in September 2026, and Kansas farm operating-loan rates are generally somewhat higher. On that basis, the estimated discount exceeds a plausible financing cost. September's implied break-even rate is higher still, at 17.3%, because a similar discount is captured over a shorter period.

Figure 4. Financing costs absorb roughly one-third to three-fifths of the seasonal discount

The dollar savings depend on both the fertilizer price and the interest rate. At an 8% annual rate and the August 2026 price of \$964 per ton, the gross seasonal discount is approximately \$105 per ton. Estimated interest is \$51, leaving about \$53 per ton after financing. At the historical nominal average price of \$709 per ton, the same 8% financing assumption leaves about \$39 per ton.

Per-acre calculations use nitrogen application rates from Kansas State University's November 2025 Kansas corn budgets. The six dryland budgets range from 63 to 146 pounds of nitrogen per acre, with a median of 104 pounds. Four center-pivot irrigated budgets range from 174 to 217 pounds, with a median of 194 pounds. The northeast Kansas dryland corn budget uses 146 pounds of nitrogen per acre.

Nitrogen rate	Net saving per acre at 8%	At 6%	At 10%
Dryland median, 104 lb N	\$3.39	\$4.21	\$2.57

Nitrogen rate	Net saving per acre at 8%	At 6%	At 10%
Northeast Kansas, 146 lb N	\$4.74	\$5.88	\$3.60
Irrigated median, 194 lb N	\$6.31	\$7.84	\$4.79

These are modest savings. For the northeast Kansas example, the estimated \$4.74 per acre is measured against a nitrogen bill of about \$86 at the August price—roughly 5% of the nitrogen expenditure. That amount is worth capturing when it fits a farm’s existing purchasing and financing practices, but it is not large enough to justify reorganizing the entire operation around a calendar rule.

Financing costs consume an estimated 37% of the gross discount at a 6% rate, 49% at 8%, and 61% at 10%. The calculations also omit some product-specific costs. Urea, for example, can be stored on the farm, replacing the dealer’s promise with physical inventory but adding storage-space requirements, shrink, and handling costs. Only interest is included in the table.

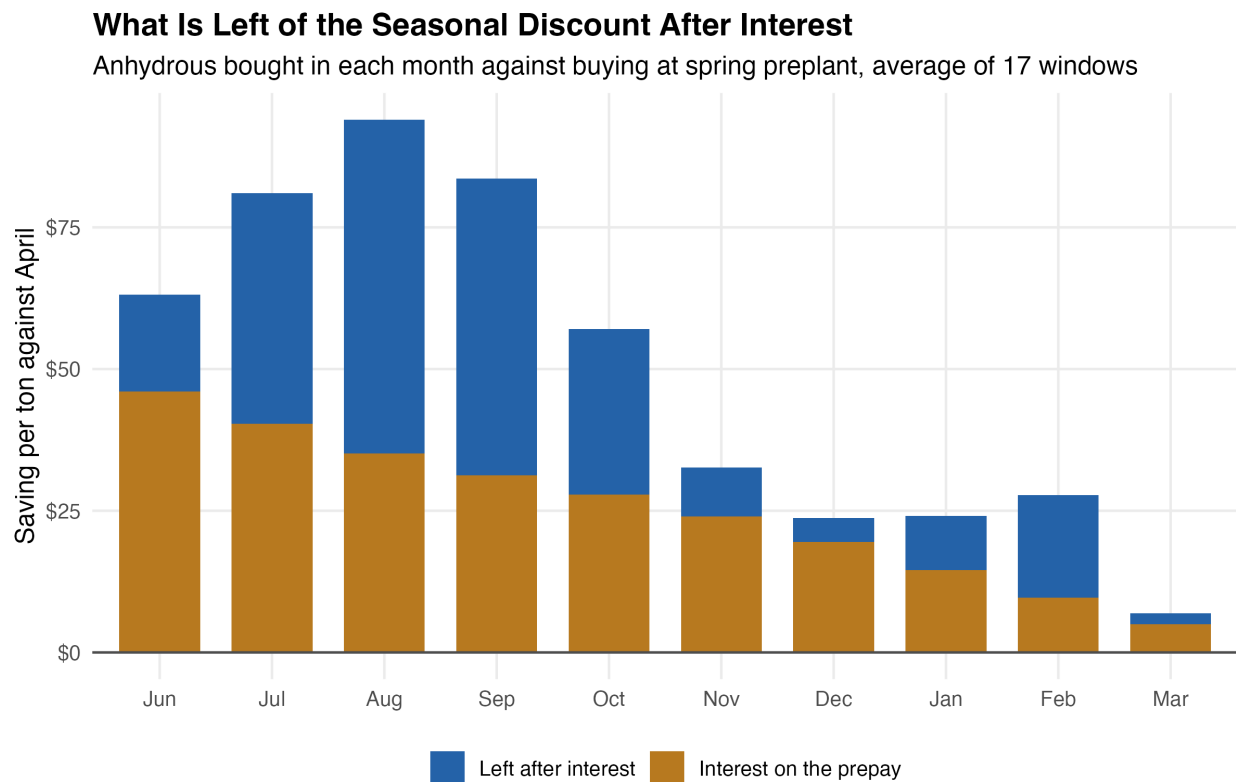
6 The seasonal pattern is concentrated in the past nine years

Figure 5. The seasonal pattern is much stronger in the second half of the sample

The full-sample result masks a substantial difference between the two halves of the data. In the first eight buying windows, from 2010 through 2017, the peak-to-trough spread is 5.9%, and the joint test does not reject the absence of seasonality ($p = 0.43$). In the nine windows from 2018 through 2026, the spread is 16.2%, and the joint test rejects at $p = 0.009$.

The difference is not driven solely by the extraordinary 2022 window. Removing that window from the full sample leaves a 10.2% peak-to-trough spread, with a joint-test p -value of 0.005. The stronger pattern is distributed across the second half of the sample rather than being attributable to one exceptional year.

Two explanations are plausible, and the available data cannot distinguish between them. Fertilizer dealers may have changed inventory practices after 2018, carrying less product through winter and pricing more of the cost into spring delivery. Alternatively, the second



Interest charged from the purchase month to April at 8% a year. Bars sum to the average gross saving against April.
Source: DTN national average retail fertilizer prices.

Figure 4: Seasonal saving net of interest



Figure 5: Seasonal path by subsample

The Average Hides a Very Wide Spread

Anhydrous price in each month of the buying window, each year indexed to its own average = 100

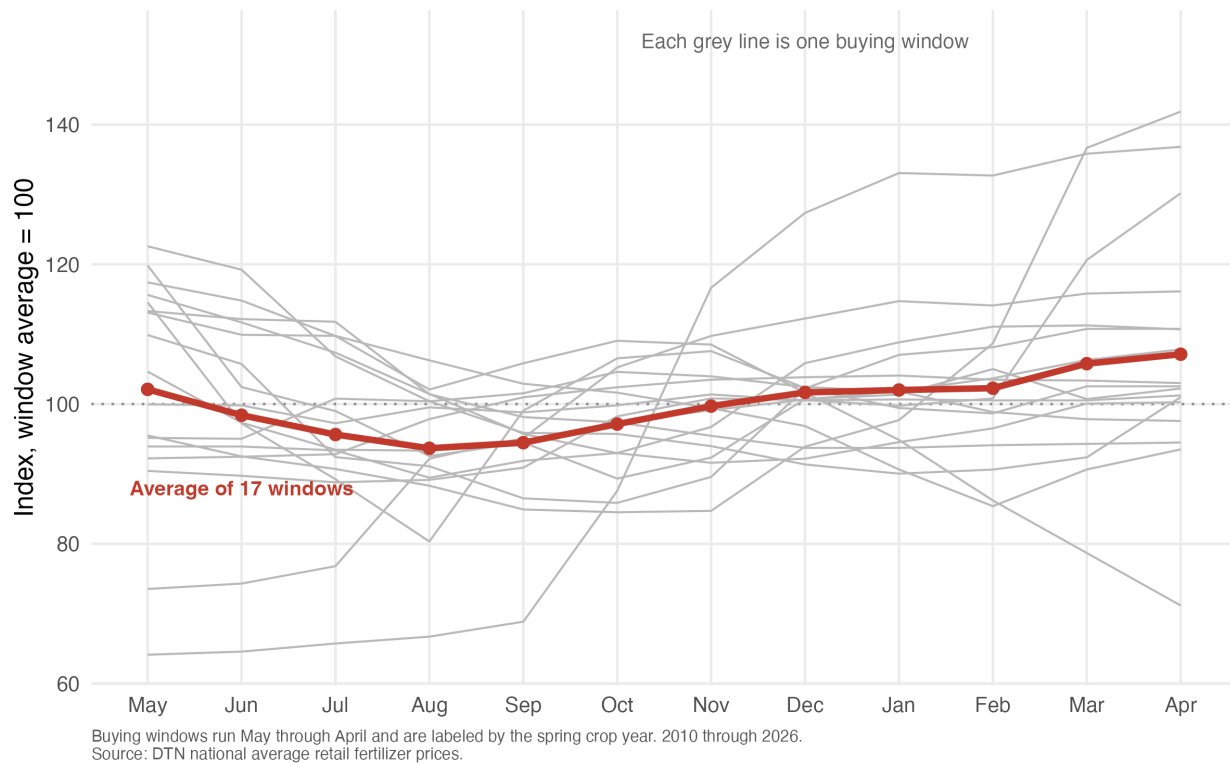


Figure 6: Every buying window indexed to its own average

half of the sample may simply contain a run of years in which supply disruptions repeatedly emerged in late winter. The first explanation would imply a more persistent seasonal pattern; the second would imply that the recent pattern may fade.

For planning purposes, the 16% spread observed in the recent subsample should be treated as an upper bound, while the 6% spread in the earlier subsample provides a more conservative reference point. Neither should be treated as a fixed forecast. The estimate should be revisited as additional buying windows become available.

7 The average advantage comes with substantial year-to-year risk

Figure 6. The average seasonal discount conceals wide variation across buying windows

An average across 17 windows does not describe what happens in any one year. Figure 6 indexes each buying window to its own average. Under the August rule, the farm would have paid more than the following April price in five of the 17 windows. Four of those losses were relatively small: \$22, \$80, \$6, and \$36 per ton in 2012, 2016, 2017, and 2020. The fifth was much larger. In the 2023 window, an August 2022 purchase at \$1,331 per ton was followed by an April price of \$928, a \$403-per-ton reversal as the post-invasion price spike unwound.

The best outcome occurred in the 2022 window: an August 2021 purchase at \$748 per ton compared with \$1,534 in April 2022. Across all 17 windows, the average August advantage over April was \$94 per ton, the median was \$45, and the standard deviation was \$240. The large gap between the mean and median reflects the influence of a few unusually large price movements.

Weekly log-price changes for anhydrous ammonia have a standard deviation of 2.32%. Compounded over the 35 weeks from August to April, that implies price variation of about 13.7%, larger than the estimated 10.9% seasonal spread. In other words, the seasonal signal is smaller than the market noise surrounding it. A calendar rule can improve the average outcome while still producing an unfavorable result in a meaningful share of years.

The comparison with perfect hindsight also helps put the rule in perspective. Buying in each window's actual lowest-priced month would have beaten April by an average of \$153 per ton. The fixed August rule captures \$94 of that potential advantage, or about 61%. That is a useful share of the hindsight opportunity, but it does not eliminate the uncertainty of any individual purchase.

The risk is also related to the farm's broader revenue exposure. Nitrogen and corn prices respond to some of the same energy-cost and demand forces. Consequently, a higher spring nitrogen price may coincide with a higher corn price. Across the 17 windows, the correlation between the August-to-April change in anhydrous ammonia prices and the change in corn prices is 0.51 ($p = 0.036$). Waiting until spring therefore provides a partial natural hedge; purchasing in August gives up some of that protection.

Using 146 pounds of nitrogen per acre and a dryland corn yield of 120 bushels per acre, the estimated mean margin is \$540 per acre with an August nitrogen purchase and \$532 with an April purchase. The corresponding standard deviations are \$173 and \$166. Before interest, the August strategy increases expected margin by about \$8 per acre; after financing, the estimated advantage falls to \$4.74. That gain comes with roughly \$7 per acre of additional

margin standard deviation. A risk-averse producer could reasonably reject a trade-off that small.

8 What the data say about the 2027 buying window

The 2027 buying window began in May 2026. National average anhydrous ammonia prices were \$1,118 per ton in May, \$1,076 in June, \$960 in July, and \$964 in August. July is therefore the low month observed so far, although the series ends in August. September and October observations are not yet available. At the end of August, urea averaged \$678 per ton, UAN-28 \$446, and UAN-32 \$458.

For a farm that has not yet purchased nitrogen, the historical seasonal averages generally favor buying sooner rather than later. October prices average 2.3% below the buying-window average, November is near the average, and December and January are about 1.9% above it. February is estimated at 1.3% above the average, March at 4.2% above, and April at 5.1% above. February's estimated advantage over January is only about 0.6 percentage points—well within the statistical noise.

The calendar therefore offers a modest argument for acting sooner rather than later, consistent with the historical pattern in most Octobers. It does not provide a forecast of the 2027 nitrogen price. That price will depend more heavily on factors such as European natural-gas markets and the treatment of imported nitrogen under tariffs. Seasonality is best used as a tiebreaker when a farm is already choosing between purchase dates, not as a substitute for monitoring market fundamentals.

9 Important limitations

The price series records posted national retail quotes, not completed transactions. DTN surveys dealer prices, and an individual farm's ability to secure an August quote depends on whether its dealer offers a prepay program, whether the farm has sufficient credit capacity, and whether it is comfortable holding an unsecured claim against the dealer over the winter. Those practical constraints are not captured in the data and can reduce the value of the strategy.

Purchase timing is also distinct from application timing. This analysis does not evaluate the agronomic merits of fall-applied anhydrous ammonia or the risk of nitrogen loss over winter. A decision to buy early should not dictate when nitrogen is applied. Farms planning fall application face a different comparison: purchasing in August rather than November has historically offered a gross difference of about \$61 per ton over three months, or roughly \$54 after financing, but August was cheaper in only 10 of 17 windows, and the evidence is not statistically strong ($p = 0.10$).

Finally, 17 annual buying windows are a limited basis for estimating a recurring seasonal pattern. Although the monthly data help estimate the shape of the path, the underlying evidence still comes from only 17 windows. The analysis also uses national prices rather than a Kansas-specific retail basis relative to the national average. Regional prices may follow a different calendar or exhibit a different seasonal spread. These are important questions for further analysis, not issues resolved by the current results.

10 Sources

- DTN. National average retail fertilizer prices, weekly and monthly series via Prophet X, December 2008 through August 2026.
- Board of Governors of the Federal Reserve System. “Bank Prime Loan Rate.” FRED series MPRIME. <https://fred.stlouisfed.org/series/MPRIME>
- Kansas State University, Department of Agricultural Economics. “Cost-Return Budgets for Kansas Crops.” Corn and irrigated corn budgets, November 1, 2025. <https://www.agmanagermgmt-guides/crop-production-budgets>
- Newey, Whitney K., and Kenneth D. West. “A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix.” *Econometrica* 55, no. 3 (1987): 703–708.

Reproducibility note: The analysis script is `Nitrogen seasonality best month to buy.R`. The script writes the figures and tables to `backtest_output/` and can be reproduced from the two data files it reads.

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