2022 Fertilizer Prices and Risk Management

Understanding & Managing Fertilizer Application and Cost
January 25, 2022
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Take Home Message

• Fertilizer prices are likely to continue to be high in 2022.
  – Will prices moderate / come down or is there another leg up on the increase?

• Need to be thinking about profit maximizing decisions not yield or price maximizing.

• More aggressive with output price risk management.
Not Just Fertilizer: Input Prices and Availability

• Land prices and rents are up.
• Prices for most crop protection products are up.
• Availability of inputs is currently a concern.
• Machinery costs are up.
• Labor shortages.
• Domestic trucking and logistical issues.
  – Port delays.
  – 11 hour driving time?

• Will prices be cheaper before they are needed in 2022?
Factors Influencing Fertilizer Prices

• Supply chain logistical issues.
• Tariffs (Morocco and Russia).
• Constrained foreign production (China).
• Domestic production (hurricanes).
• Natural gas prices.
• Increased global demand / high commodity prices.
• Geopolitical stability.
Supply Chains

• Supply chains go unnoticed when they work well.

• Supply chain efficiency versus resiliency.

• Risk in owning inventory when prices run up.
Share of World Crop (2020/21) and Fertilizer Products (2020) Traded

- **604 MMT Crop Exports**
  - Average = 22%

- **176 MMT Fertilizer Exports**
  - Average = 44%

Averages computed as total exports (crop or fertilizer material) divided by total production.
The U.S. is not a major share of global production.
China Curbs Exports

Producers Face Fertilizer Price Squeeze
China Phosphate Fertilizer Export Freeze Adds to Global Supply Challenges

China customs to inspect fertilizer exports from 15 Oct
China’s General Administration of Customs will start inspections on fertilizer exports from 15 October, according to an official notice published today.

Chinese urea futures slide from record highs on new export measures

Global Phosphate Exports
- China: 25%
- Rest of the World: 75%

Global Urea Exports
- China: 10%
- Rest of the World: 90%
Russia Restricts Exports

03 Nov 2021

Russia to impose export quotas on nitrogen, complex fertilizers

Russia to Impose Nitrogen, Complex Export Quotas

Russia halts nitrogen, phosphate fertilizer exports to support local farmers

Market
Russia sets 6 month quotas for fertilizer exports from Dec. 1
3 Nov 2021 | Masha Belkova
<table>
<thead>
<tr>
<th>Fertilizer Type</th>
<th>$ billion</th>
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</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td><strong>$6.25</strong></td>
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<tr>
<td>Potassium Chloride</td>
<td>2.65</td>
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<tr>
<td>Urea</td>
<td>1.31</td>
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<tr>
<td>Monoammonium Phosphate</td>
<td>0.59</td>
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<tr>
<td>Urea-Ammonium</td>
<td>0.40</td>
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<tr>
<td>Diammonium Phosphate</td>
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<tr>
<td>Ammonium Sulphate</td>
<td>0.11</td>
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<tr>
<td>Nitrogen-Phosphorus</td>
<td>0.09</td>
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<tr>
<td>Fertilizers, Mixes</td>
<td>0.10</td>
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<tr>
<td>Other Fertilizers</td>
<td>0.59</td>
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Source: U.S. Department of Agriculture, Global Agricultural Trade System (GATS)
Global container freight rate index from July 2019 to Dec. 2021 (in U.S. dollars)

Container freight rate index worldwide 2019-2021

Source(s): Freightos; ID 1250636 (download from statista.com)

Source: https://tradingeconomics.com/commodity/baltic
FERTILIZER PRICES

Up, down, or sideways?
Dry Fertilizer Price, 2019-2022

Compared to last year at this time:
- DAP up 79%
- MAP up 71%
- Potash up 119
- UREA up 148%

Liquid Fertilizer Price, 2019-2021

Compared to last year at this time:
- ANHYD up 204%
- UAN28 up 179%
- UAN32 up 171%
Is There Hope For Lower Fertilizer Prices?

- Natural gas accounts for 70-90% of variable production costs for nitrogen fertilizer.

- Natural gas prices are down 30% from the peak – Up 59% compared to last year.

- Lower natural gas prices should help with lowering nitrogen costs...... but there are a lot of other moving parts in fertilizer prices.
Nitrogen Price

- Increased value in natural gas only accounted for about 15% of the increased in nitrogen fertilizer cost.

- Increased N demand due to higher corn prices/increased acres globally.

- Market power by nitrogen manufacturers and extraction of economic rents from producers. (CF Industries, Nutrien, Koch, and Yara-USA (75% concentration ratio).

Source: Texas A&M: Economic Impact of Nitrogen Prices on U.S. Corn Producers
Corn, wheat, and soybean plantings drive U.S. fertilizer demand and it is this influence that results in crop and fertilizer prices being highly correlated! That is, when crop prices rise, fertilizer prices also generally rise as fertilizer demand increases!

Price Correlations:
- Fertilizer and 3-crops: 0.888
- Fertilizer and corn: 0.847
- Fertilizer and wheat: 0.858
- Fertilizer and soybeans: 0.861
SO, WHAT CAN YOU DO?
Reducing Input Costs

- Not an easy task and will require creativity. “Right place, right time, and right amount to maximize returns.”
  - Soil testing – know what you have.
  - Alternative nutrient sources – poultry litter, manure, other.
  - Lime / PH adjustment?
  - Variable rate application.
  - Eliminate / reduce products that are not contributing to sufficient yield gains relative to cost.
  - You will need a plan A, B, C.... If “typical” inputs are not available.
  - Crop rotation and species composition.
  - Crop share leases – balance the risk/reward.
  - Maximum Return to Nitrogen (MRTN).
  - Protect output prices / manage the margin.
### Crop Share Arrangements

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<thead>
<tr>
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<th>2022</th>
<th>2021</th>
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<tbody>
<tr>
<td>Price ($/bu)</td>
<td>$5.65</td>
<td>$4.60</td>
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<tr>
<td>Yield (bu/acre)</td>
<td>180</td>
<td>180</td>
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<tr>
<td>Expenses (excluding land)</td>
<td>$771</td>
<td>$530</td>
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<tr>
<td>Revenue</td>
<td>$1,017</td>
<td>$828</td>
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<tr>
<td><strong>1/4 Revenue Share</strong></td>
<td><strong>$254</strong></td>
<td><strong>$207</strong></td>
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<tr>
<td>Profit</td>
<td>$(8)</td>
<td>$91</td>
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</table>

Need to have conversations with landowners if you are using a crop share arrangement.

The risk profile has changed dramatically.
Possible solutions: Move to cash rent or negotiate a portion of the expenses to the landowner.
### Rates and Charts

**State: Ohio**  
**Number of sites: 228**  
**Rotation: Corn Following Soybean**

**2021**

<table>
<thead>
<tr>
<th>Nitrogen Price ($/lb)</th>
<th>0.40</th>
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<tr>
<td>Corn Price ($/bu)</td>
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<td>MRTN Rate (lb N/acre)</td>
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<tr>
<td>Profitable N Rate Range (lb N/acre)</td>
<td>168 - 198</td>
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<tr>
<td>Net Return to N at MRTN Rate ($/acre)</td>
<td>$248.82</td>
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<tr>
<td>Percent of Maximum Yield at MRTN Rate</td>
<td>98%</td>
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<tr>
<td>Urea (45% N) at MRTN Rate (lb product/acre)</td>
<td>404</td>
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<tr>
<td>Urea (45% N) Cost at MRTN Rate ($/acre)</td>
<td>$72.80</td>
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**2022**

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<tr>
<th>Nitrogen Price ($/lb)</th>
<th>0.91</th>
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</tr>
<tr>
<td>Price Ratio</td>
<td>0.17</td>
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<tr>
<td>MRTN Rate (lb N/acre)</td>
<td>151</td>
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<tr>
<td>Profitable N Rate Range (lb N/acre)</td>
<td>139 - 162</td>
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<tr>
<td>Net Return to N at MRTN Rate ($/acre)</td>
<td>$264.88</td>
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<tr>
<td>Percent of Maximum Yield at MRTN Rate</td>
<td>96%</td>
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<tr>
<td>Urea (45% N) at MRTN Rate (lb product/acre)</td>
<td>335</td>
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<tr>
<td>Urea (45% N) Cost at MRTN Rate ($/acre)</td>
<td>$137.41</td>
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Maximum Return to Nitrogen (MRTN): [http://cnrc.agron.iastate.edu/](http://cnrc.agron.iastate.edu/)
• For producers, there are more risk management tools available to manage output price risk than input price risk.

• Risk management tools need to be utilized this fall/winter to avoid potential catastrophic outcomes.
Corn Average December Futures Price and Price Range (Max-Min), January to Contract Expiration plus USDA MYA Price

![Corn Price Chart]

- **2010:** $2.46
- **2011:** $2.33
- **2012:** $3.34
- **2013:** $1.82
- **2014:** $1.92
- **2015:** $0.94
- **2016:** $1.33
- **2017:** $0.79
- **2018:** $0.83
- **2019:** $1.14
- **2020:** $1.06
- **2021:** $2.06
- **2022:** $0.23

**Average Price:**
- **2010:** $2.46
- **2011:** $2.33
- **2012:** $3.34
- **2013:** $1.82
- **2014:** $1.92
- **2015:** $0.94
- **2016:** $1.33
- **2017:** $0.79
- **2018:** $0.83
- **2019:** $1.14
- **2020:** $1.06
- **2021:** $2.06
- **2022:** $0.23

**Price Range (Max-min):**
- **2010:** $2.46 - $2.33
- **2011:** $2.33 - $1.00
- **2012:** $3.34 - $2.00
- **2013:** $1.82 - $1.00
- **2014:** $1.92 - $0.94
- **2015:** $0.94 - $0.00
- **2016:** $1.33 - $0.79
- **2017:** $0.79 - $0.00
- **2018:** $0.83 - $0.00
- **2019:** $1.14 - $0.00
- **2020:** $1.06 - $0.00
- **2021:** $2.06 - $0.00
- **2022:** $0.23 - $0.00

**USDA MYA Price:**
- **2013:** $5.59
- **2014:** $5.28

**Price $/bu:**
- 2010: $2.46
- 2011: $2.33
- 2012: $3.34
- 2013: $1.82
- 2014: $1.92
- 2015: $0.94
- 2016: $1.33
- 2017: $0.79
- 2018: $0.83
- 2019: $1.14
- 2020: $1.06
- 2021: $2.06
- 2022: $0.23
What About Corn in 2022?

- December 2022 contract average since January 1 = $5.59
- 2021 Range of $2.06
- +/- $1.03
- +/- $2.06
December Corn Futures

Tennessee Average Monthly Corn Basis (Elevators and Barge Points), 5-Year Average and 2021

Cents/Bushel

December Corn Futures

Basis ($/bu)

January
February
March
April
May
June
July
August
September
October
November
December

2022
2021
2020

Real. Life. Solutions.
## 2022 Corn, No-Till, Non-Irrigated Budget

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>Quantity</th>
<th>Price ($/Acre)</th>
<th>Total</th>
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<tr>
<td><strong>Revenue</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Corn</td>
<td>Bu/acre</td>
<td>180</td>
<td>$5.65</td>
<td>$1,017.00</td>
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<tr>
<td><strong>Total Revenue</strong></td>
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<td><strong>Variable Expenses</strong></td>
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<td>Seed</td>
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<td>Fertilizer &amp; Lime (Table 1)</td>
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<td>$328.63</td>
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<td>Chemical (Table 2)</td>
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<td>Crop Scout or Consultant</td>
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<td>$15.00</td>
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<td>Repair &amp; Maintenance (Table 3)</td>
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<td>Operator Labor (Table 3)</td>
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<td>Crop Insurance (Table 6)</td>
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<td>Operating Interest (Table 7)</td>
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<td><strong>Return Above Variable Expenses</strong></td>
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<td>Cash Rent (Table 8)</td>
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<td><strong>Return Above Specified Expenses</strong></td>
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### Year-Over-Year Increase in Expenses
- Corn: Up 31-39%
- Cotton: Up 21-27%
- Soybeans: Up 18-29%

What do you have invested in the crop?
### Corn - Net Return Table ($/acre): $950/acre COP

<table>
<thead>
<tr>
<th>Yield (bu/acre)</th>
<th>150</th>
<th>160</th>
<th>170</th>
<th>180</th>
<th>190</th>
<th>200</th>
<th>210</th>
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<td>589</td>
<td>659</td>
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**When am I making money?**
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<th>2021</th>
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<tbody>
<tr>
<td>Price of Corn</td>
<td>$5.65</td>
<td>$4.40</td>
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<tr>
<td>Variable Seed</td>
<td>20.7</td>
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<tr>
<td><strong>Fertilizer &amp; Lime</strong></td>
<td>56.4</td>
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<tr>
<td>Chemical</td>
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<td>Consultant</td>
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<tr>
<td>R&amp;M</td>
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<tr>
<td>Fuel, Oil &amp; Filter</td>
<td>3.5</td>
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<tr>
<td>Operator Labor</td>
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<td>Crop Insurance</td>
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<tr>
<td>Operating Interest</td>
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<tr>
<td><strong>Total Variable Expenses</strong></td>
<td>110.0</td>
<td>94.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fixed</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Recovery</td>
<td>18.4</td>
<td>22.7</td>
</tr>
<tr>
<td>General Overhead</td>
<td>3.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Cash Rent</td>
<td>18.4</td>
<td>22.0</td>
</tr>
<tr>
<td>Management Labor</td>
<td>4.4</td>
<td>4.1</td>
</tr>
<tr>
<td><strong>Total Fixed Expenses</strong></td>
<td>44.7</td>
<td>48.8</td>
</tr>
</tbody>
</table>

| Total Expenses           | 154.8| 143.0|
| Bushels Above Specified Expenses | 20.2 | 32.0 |

**# of Bushels to Cover Specified Expenses**

- Price risk management or sales to offset production costs for specified expense categories.

- Example:
  - 500 acres of corn x 56.4 bu/acre to cover fertilizer expense = 28,200 bushels (32% of anticipated production @ 175 bu/acre).

- Avoid exchanging price risk for production risk.

- Price risk management and final cash sales are not the same.

- Always adjust prices for basis.
Risk Management Tools

- Crop insurance
- Options
- Futures
- Contracts
- Cash sales
- Storage

- In the current market environment, options are a great alternative to remove downside price risk while maintaining upward price mobility.
Example #1: Bridging Price Risk Gaps

- Buy a $5.30 December 2022 put option for 31 cents, sets a $4.99 per bushel futures price floor.
  - If Dec FC>$5.30, then option has no intrinsic value.
  - If Dec FC<$4.99, then value = $4.99-Dec FC
- Assuming a projected yield of 175 bu/acre
  - Provides a projected revenue floor (not accounting for basis) of $873/acre (175 bu/acre x $4.99).
  - $950 - $873 = $77/acre, unprotected if yield is achieved.
- Cost for 500 acres
  - 175 bu acre x 500 = 87,500 bu
  - 87,500 x $0.31 = $27,125
- Remove 87% of the futures price risk ($4.99/$5.70)

- Can keep the put option or exit the position and recoup the time value of the put option.
Concluding Thoughts

• Prices are strong, but volatility will continue, and there is downside price risk.

• Between now and planting, nobody knows definitively if input prices will be higher, the same, or lower than current prices.

• The risk profile has dramatically changed compared to recent years.

• If you are buying inputs, protect the value of the output through risk management.

• Inaction is a decision, usually not the correct one.
Thank you

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