Agricultural Fertilizer Industry

Basic Materials - Chemicals

Investment Thesis

The Agricultural fertilizer industry is poised for continual growth. As the world population rises, a continual demand will be placed on fertilizer to boost crop yields without the expansion of harvestable acreage. We are confident in placing a market weight on the industry due to the long range upside potential and global dependence.

Drivers of Thesis

• Global population is expected to reach 9 billion by 2040, increasing the need for higher crop yields. Human population is incredible dependent on cultivation with fertilizer playing a key role in the success of modern harvests.

• Acreage for planting has remained constant, as yearly crop yields have risen. Fertilizers produce a stronger, denser crop yield on existing square acreage of farmland, providing adequate supply for rising crop demand.

• Bio fuels have increased its percentage of crop yield consumption. This furthers the need for larger crop yields and the fertilizers that make them possible. As new uses for commodity crops emerge, it will only further supply strain.

• Highly profitable opportunities exist in the industry, mainly in exports and genetically modified seed.

Risks to Thesis

• The US is currently in a fertilizer trade deficit. The Middle East and China are boosting production creating a threat of further imports and price reduction.

• Anti trust allegations have previously came forward as result of dominating mergers and acquisitions. Though no current allegations exist, there is a continual threat to larger fertilizer companies that litigation could arise.

12 Month Performance

Fertilizers are key to aiding plant growth, as well as replacing the stripped natural fertilizers found organically in soil. The agriculture fertilizer industry consists of three main segments: nitrogen, potash, and phosphate. Each fertilizer base has a specific role in plant growth. Genetically modified seed, resistant to pests and drought, is a rapidly growing segment associated with agricultural fertilizers. However, some geographical regions have been reluctant to accept modified seed due to social beliefs.
EXECUTIVE SUMMARY

The agricultural fertilizer industry is stable and will experience growth into the foreseeable future. Farmers are becoming increasingly dependent on the application of fertilizers. Crop yields are growing year over year with the trend expected to continue. However, the available acreage for planting has remained stagnant, near 100 million acres, placing a heavier need on the use of fertilizers. Additionally, record harvests as of late are stripping natural nutrients from the soil, increasing the dependence on man-made fertilizers to meet demand.

Natural gas is a major input for fertilizers, especially nitrogen based. With increased shale drilling from areas such as North Dakota’s Bakken shale and Pennsylvania’s Marcellus shale, the US has the world’s cheapest access to natural gas. These prices are projected to remain low well into the future due to vastly supplies. US fertilizer producers have gained a competitive advantage over companies abroad, providing a major export opportunity.

Overall, the industry is expected to see growth with the rising global population, as well has having the opportunity to capture global market share. We are confident in a market weight rating. If exports do increase and revenue outperforms estimates, over weighting the industry would be highly considered.

INDUSTRY DESCRIPTION

The agriculture fertilizer industry consists of three main segments: nitrogen, phosphate, and potash. Each fertilizer base has a separate primary function in spurring plant growth.

Nitrogen is the widest used fertilizer among farmers. Nitrogen is key for plants production of chlorophyll. Plants would become yellow in color and whither without the chemical. Most plants are able to absorb necessary amounts of nitrogen naturally though the atmosphere and soil, however mass planting practiced by commercial farmers strip natural levels and requires a yearly spread of nitrogen to soil. Corn is mainly dependent on a yearly application of nitrogen, making prices very inelastic year to year.

Phosphate

Phosphate fertilizers help strengthen plant roots. Two situations will need phosphate. First, crops grown in sub prime soil need additional root strength to absorb natural nutrients. Second, in times of drought phosphate will push roots deeper to find the water base necessary for growth. Phosphate has been popular in the southeast US during a lasting water shortage.

Potash

Potash (potassium) boosts crop resistant to disease, natural extreme elements, and to a lesser extent drought. Potash can increase a plants water storage/usage and help withstand extreme hot and cold temperatures. Potash is not a base fertilizer, meaning it is not applied every year. Potash will see increased usage when harvest elements are outside of normal. Fluctuating supply and demand make potash’s pricing elastic, pending environmental conditions.

Genetically Modified Seed

Genetically modified seed (GMS) is defined as seed that cannot be created in nature. Farmers will use GMS to either increase durability during growth and transportation, or to increase nutrients for the end user. GMS will usually include the toxin Bacillus thuringiensis (Bt) to boost resistance to insects. It is safe for human consumption. The US has accepted GMS, with most of the corn yield having some form of genetic modification. Europe has been slower to adapt based on society preference.

Industry Analysis

The industry is dominated by nitrogen, phosphate, and potash based fertilizers. Each fertilizer has a specific role in plant growth. In general, each segment will grow in proportion to rising crop yields, but certain elements of...
volatility do exist. First, the yearly acreage, or amount of each crop planted, will demand specific types of fertilizer. If higher levels of corn are planted, higher levels of nitrogen will be consumed. Second, prices per bushel and profit margins will determine excess levels of fertilizer farmers’ purchase. Fertilizer levels will be one of the first expenses cut in periods of low prices and low profits. Finally, weather patterns, environmental hazards, and changes in soil complexity will mean different fertilizers will be needed. If pests are predicted to harm crop yields, a farmer will be more prone to spread potash to boost a plant’s defense against disease.

**RECENT DEVELOPMENTS**

The agricultural fertilizer industry has been experiencing rapid growth along with above average returns. Recent gains in US natural gas production has given US based producers a global competitive advantage. With rising global demand, US based producers could experience above expected growth rates.

Falling Natural Gas Prices

The US has increased natural gas production with expanded shale drilling, mainly in North Dakota. In November 2014 natural gas saw a near 40% price reduction as supply continued to increase and global oil prices dramatically fell⁴. Nitrogen fertilizers utilize higher levels of natural gas as an input than phosphate and potash, reducing costs of goods sold. Supply is expected to remain at record highs for the foreseeable future, which should provide above average returns to companies dependent on natural gas inputs. Since the mid 2000’s, the US has had access to lower than global average natural gas prices. As the existing possibility of fertilizer export increases, US companies are positioned to gain significant market share in the global fertilizer market. World market conditions are prime for major US fertilizer producers expand their output through exportation, as emerging markets are able to consume larger amounts of fertilizer.

**Mergers and Acquisitions**

The agricultural fertilizer business has seen several mergers and acquisitions in recent years. Top companies in the nitrogen (CF), phosphate (MOS), and potash (POT) segments have aligned their companies to become undisputed specialty leaders. CF sold their phosphate production to Minnesota based Mosaic in early 2014 furthering MOS’s lead in phosphate production. CF’s 2010 acquisition of Terra Nitrogen expanded its hold on the nitrogen segment. International companies have also shown interest in merging with US based fertilizer corporations. Norway’s Yara publicly expressed interest in merging operations with CF. They would create the world’s largest nitrogen fertilizer company. Yara has an extensive global customer base while US based CF has access to the world’s cheapest natural gas. In October 2014, merger talks ceased due to concerns of the “unsteady markets and questions about so-called inversion deals.”⁵ Though this merger did not come to fruition, future deals with industry leaders will surely shape the agriculture fertilizer business.

**Anti-Trust Accusations**

Because of recent M&A activity, speculation has emerged of top producers from each fertilizer segment colluding to control supply and pricing. CF’s phosphate sale to Mosaic Co. furthered its position as the largest producer of phosphate-based fertilizer. MOS has fought past legal trouble as it has expanded. In 2013 the Mosaic Company agreed to pay a portion of the $98 million settlement accusing MOS of being involved of collusion to raise and maintain fertilizer prices. Mosaic claimed they agreed on the settlement to, “avoid significant losses in the future.”⁶ Though there currently is no legal action being
pursued, there is an ongoing threat to the industry of similar cases being presented.

**Bio-Fuels**

Ethanol bio-fuel has been gaining market share in recent years. In 2005 ethanol fuel accounted for 14% of the US corn harvest. By 2008 ethanol accounted for a quarter of corn output, and today it is estimated to have reached 38%. Several factors, such as personal preference, increase food demand, and hybrid vehicles, could have future negative effects on the ethanol’s portion of corn. However, today the market share is strong and will put further demand on crop production and fertilizer. The main threat to continued bio-fuel growth is government regulation. The Environmental Protection Agency (EPA) is responsible for setting the yearly Renewable Fuel Standard (RFS).\(^7\) The RFS sets federal standards of percentage of crop yield used for renewable fuel each year. 2015 numbers have not ben finalized. Past acts of congress have attempted to reduce or eliminate the RFS all together, but have been unsuccessful. The 2015 legislative session is again predicted to feature debate on the RFS, with few predicting ensuing change. Percentage of crop yields allocated to bio-fuels appears to be moderately favorable, with possibility of negative policy change in the future.

[Graph: U.S. Corn Yield (bu/ac)]

\(\text{Source: Our Finite World}\)

**Population and Crop Demand Growth**

World population is currently nearing seven billion and growing. The US Census Bureau projects world population to hit eight billion by the mid 2020’s and exceed nine billion in early 2040’s.\(^8\) With positive correlation to population growth, crop demand will naturally rise over time. Fisher Investments believes world food demand will raise 2.5 - 3 fold by 2050. Acreage per person will also be decreasing over this time. Fertilizers will help produce stronger yields and quality, as well as hedge against drought and insect destruction. World diets are also changing, placing a heavier emphasis on meat. It takes two pounds of feed

[Graph: World Population: 1950-2050]

\(\text{Source: U.S. Census Bureau, International Data Base, June 2011 Update.}\)

**INDUSTRY TRENDS**

The agriculture fertilizer industry has experienced solid growth and stability in recent years. Through the 2000’s, the fertilizer industry experienced astounding ROE and profit margins. With so few industries competing at the top level, growth should remain positive into the future. Catalysts such as global population, diet change, and bio-fuels have created a higher demand on fertilizers. Global export and import trends will have heavy influence on growth of domestic companies as low US natural gas prices give US companies a global competitive advantage, however, the constant growth of yearly crop yield since the mid 20\(^{th}\) century prove fertilizers will trend favorably.

[Graph: Corn Consumption]

\(\text{Source: Market Realist}\)
to produce one pound of chicken, four pounds to produce one pound of pork, and seven pounds to produce one pound of beef. If trends continue a further demand will exist on crop yields, and thus on fertilizers.

**US Crop Outlook and Fertilizer Demand**

The US saw a record harvest in 2014. High domestic production coupled with increased international imports dove down crop prices. If corn is traded at its predicted $3.50 per bushel in 2015, farmers could be facing upwards of a $50-$100 loss per acre planted. Farmers are reluctant to purchase fertilizer during times of low crop prices in effort to cut cost. In turn, crop commodity prices have direct correlation with demand of fertilizer. The expected 1.79% reduction in corn production is attributed to farmers planting the higher margin yielding soybean crop (soy beans expected drop is .25% in 2015). Nitrogen fertilizers are mainly used in corn, which will see a slight decrease in usage in relation to crop production estimates. Soybeans are able to utilize natural nitrogen from the atmosphere, and mainly rely on phosphate and potash fertilizers to spur growth. Though corn production is projected to lower 1.79%, price per bushel is only dropping 4.28%. While soybeans appear to be more attractive to farmers, based on the relatively small .25% reduction in planting, price per bushel is expected to fall by 13.33%, more than 3x that of corn. Corn is the highest consumed crop per harvest and the market is not expected to react negatively to a 1.79% decline in the near term.

<table>
<thead>
<tr>
<th>Crop</th>
<th>2014 Bushels (Million)</th>
<th>2015E Bushels (Million)</th>
<th>Price per Bushel</th>
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</thead>
<tbody>
<tr>
<td>Corn</td>
<td>90.6</td>
<td>89</td>
<td>$3.65</td>
</tr>
<tr>
<td>Soybean</td>
<td>83.7</td>
<td>83.5</td>
<td>$10.20</td>
</tr>
<tr>
<td>Wheat</td>
<td>55.8</td>
<td>56.5</td>
<td>$6.00</td>
</tr>
</tbody>
</table>

Source: Farm Futures

**Global Market**

The US is currently trading at a nitrogen deficit. Increase exports from China, the Middle East, and Africa have dominated global shipping as well as stabilized pricing elasticity. CF reduced its global exports from $468.4 million in 2013 to $205.4 in 2014. The US has recently been declared as having a competitive advantage globally due to its cheap domestic accessibility to natural gas. US firms are now able to take advantage of nitrogen fertilizer production. The chemical industry as a whole is forecasting strong US exports into the future, especially to emerging markets. US fertilizers should expect to see the same growth and export opportunities as growth is heavily linked to population growth.

Unrest in certain areas of the world is predicted to create imbalances in supply and demand. Ukraine imports a majority of its natural gas from Russia, but recent boarder skirmishes with Russian loyalists could cut import lines into the country. Similar military conflicts across Northern Africa are disrupting normal trade cycles. The US has an arbitrage opportunity if exports are increased. Given the already low price of natural gas, it should be appealing to managements.

Currently, Brazil is expected to capture upwards of 40% of the global potash market share due to easy access to raw materials. Potash Co., the global leader of Potash, has purchased the leading potash distributer in Brazil, furthering their global reach over the potash market. Potash Co. is leading the way in creating a globally integrated segmented fertilizer distribution company.

Donaldsonville, LA, the location of CF’s soon to open production plant, has easy access to global shipping lanes via the Gulf of Mexico. CF has not announced plans to increase exports, but it poses as a prime opportunity. CF could globally ship cheap nitrogen fertilizers via US waterways and the Gulf of Mexico.

**Decreasing Acreage per Yield Worldwide**

Rising demands referenced above coupled with a rising global population is putting a continued strain on farming production. 1960 saw major shift in farming trends requiring higher crop yields per historically planted acreage. From 1060-present, increased crop output per acre as been possible via accessibility to arrogation and advances in technology. Available acreage for farming will begin to trend downwards as population growth pushes communities further outwards into rural communities. Chemically produced fertilizers are capable of producing 40% additional crop per acre over natural soil. Fixed global trends will produce safe returns on fertilizer long positions.
MARKETS AND COMPETITION

The agricultural fertilizer industry has seen several shifts in recent years. The nitrogen, phosphate, and potash segments have seen industry leaders emerge. CF is dominating the nitrogen segment, Mosaic Co. controls the phosphate segment, and Potash Co. is the leading potash segment. Other key players shape the industry an attempt to diversify their product lines.

Below is a comparison an analysis of CF’s peers. Large oil and chemical companies, such as Dow Industries and DuPont, have small divisions in agricultural fertilizers and seed. However, their product diversification and corporate finance structures do not align with the firms below and would skew comparative analysis. This comparison has been limited to pure fertilizer companies.

Peer Comparisons

<table>
<thead>
<tr>
<th>Company</th>
<th>Forward PE</th>
<th>Profit Margin</th>
<th>ROE (%)</th>
<th>Debt/ Equity</th>
<th>Dividend Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>(AGU)</td>
<td>14.39</td>
<td>4.71%</td>
<td>11.83</td>
<td>71.52</td>
<td>2.90%</td>
</tr>
<tr>
<td>(POT)</td>
<td>16.59</td>
<td>23.61%</td>
<td>16.68</td>
<td>48.28</td>
<td>4.10%</td>
</tr>
<tr>
<td>(MOS)</td>
<td>-</td>
<td>11.36%</td>
<td>9.35</td>
<td>35.75</td>
<td>1.9%</td>
</tr>
<tr>
<td>(MON)</td>
<td>18.4</td>
<td>16.78%</td>
<td>25.9</td>
<td>110</td>
<td>1.6%</td>
</tr>
<tr>
<td>(TNH)</td>
<td>-</td>
<td>36.94%</td>
<td>133.2</td>
<td>-</td>
<td>8.0%</td>
</tr>
</tbody>
</table>

Agrium (AGU)

Agrium is a diversified agricultural company operating in North and South America, Western Europe, Australia, and Egypt. Along with producing nitrogen, phosphate, and potash fertilizers, AGU manufactures and distributes herbicides, pesticides, genetically altered seed, and livestock health products among others. 14% of AGU’s revenue comes from products sold outside of the agriculture industry including paper, home remodeling, and refrigerant. AGU’s stock price has risen near 30% since October 2014. Positive outlook on higher free cash flows, stock buy back programs, and a $0.03 increase to dividends had increased shareholder optimism. With revenue diversification and additional shareholder value AGU appears to be a stable investment going forward, though low profit margins can limit growth.10

Potash Corp. (POT)

POT is the worlds leading supplier of Potash based fertilizers in the world. Their Canadian production alone accounts for one fifth of global consumption. From July to October 2015 POT experienced a 20% drop in stock price. Uralkali, Russia’s largest potash producer and a leading global supplier saw their potash mine flooded causing a sudden 20% reduction of global supplies. POT stock has recovered since on expectation of demand increase. It is still undetermined if the Russian mine will be able to reopen in the future. POT has the potential to gain global market share if they can position correctly in the coming months. POT offers high yearly dividends yields, low comparative debt levels and respectable ROE in relation to their competitors.11

The Mosaic Company (MOS)

MOS is the largest phosphate based fertilizer manufacture in the world producing 19 million tons per year. They also have a potash segment producing 10.3 million tons per year. This year they will have “near a half dozen” multi year projects becoming operational expected to increase potash output by 5 million tons per year. While gaining market share in the potash sector, MOS has reaffirmed their position as the industry leader in phosphate. In 2014 they purchased CF Industries.
Potash segment including mining operations in Florida. MOS is a fully vertically integrated company. They own the mines producing the raw materials, process the fertilizers, and ship the finished product to over 40 countries.12

Monsanto (MON)

MON is a global leader in genetically modified seed and agricultural technologies. MON produces biochemical to reduce destruction caused by insects and weeds. They distribute to large-scale industrial farmers along with household names such as Round Up. MON formed a specific growth strategy to expand its genetically modified seed and Biotechnologies into the South American market. The region just experienced a record soy crop, which should increase earnings for MON. MON management took a different growth strategy and it appears to have been beneficial. MON has the highest forward P/E amongst its industry peers, though it does operate in a slightly different capacity. Profit margins and ROE are also respectable, however the extremely high debt to equity ratio is reason for concern.13

Terra Nitrogen (TNH)

TNH is a recently created, fully owned subsidy of CF Industries. In 2010 Terra and CF industries merged creating one of the largest nitrogen producers globally. Shareholders of Terra had a buy out option in addition to a fraction of a share percentage in CF. Shareholders opting not to take the buy out were offered the same percentage deal in the Terra subsidy. TNH’s performance ratios are astounding, however, having CF as a holding company must be considered when comparing metrics. Terra is expected to stay profitable, though it has seen recent decline in stock price. In the first half of 2013, TNH was trading around $220. In addition, their quarterly dividend payouts topped $4.00 per share, or around 7.25% yield. The stock currently trades around $150, but dividend yields have increased to 8%. TNH is appealing as a substitute to fixed income during low interest rates, but monitoring the statement of cash flow will be important to see how excess cash is invested.14

Syngenta (SYT)

SYT is a Switzerland based agriculture chemical company aiming to boost crop yield and food quality. SYT operates over 200 product lines producing herbicides and seeds for corn, soy, flour, oat, and turf. SYT expands the typical large-scale commodity crop enhancement by focusing on nearly all holistic yield. SYT is one of the few agriculture chemical companies that place a heavy emphasis on research and development in attempts to be an industry leader going forward. They are a relative newcomer to the industry being formed in 2000 by the merger of Novartis and Astra Zeneca’s agribusiness’s. They have above average ROE as well as a well below average debt to equity. SYT recently received an outlook upgrade from negative to stable from Moody.15

Analysis

Increased US crop production, lower US natural gas, higher global imports, and lower per bushel crop prices have created a highly volatile company competition in recent years. However, correct management strategy will be able to lead a company to solid growth.

Fertilizer companies have experienced favorable profit margins. Industry average is 13% compared to 5% for the Basic Materials sector. Heavy capital expenditures bar entry to the industry, but once infrastructure is established high returns are experienced. CF and TNH lead the industry, each topping 30%. CF’s 75% ownership in Terra suggests a stable business model is in place. Mosaic and Potash may have higher market cap, but CF offers higher payback to equity holders.

Patterns in debt to equity seem to repeat in the industry. Companies will leverage their balance sheet to heavily invest in additional assets or modernizing current ones, then gradually shift toward equity financing as current
payments come due. Since 2013, CF has issued large quantities of corporate bonds, increasing debt levels 150% to $5.5 billion in long-term debt. If CF follows peer patterns and reduces D/E in the coming years, this increase should not be alarming. Debt raised was used to build a new production facility, modernize old ones, and repurchase shears outstanding; all showing signs of investing in future growth and increasing value to shareholders.

![Debt to Equity Chart](https://via.placeholder.com/150)

Source: Yahoo Finance

Exporting fertilizers is the biggest opportunity for growth in the industry. The US operates a nitrogen trade deficit, predicted to expand in 2015, while US firms have access to the cheapest natural gas in the world. CF cut its net exports in half in 2014 to around $200 million in revenue. At the same time, Mosaic purchased stake in a Brazilian phosphate distribution company. Brazil is projected to the worlds leading phosphate producer, and Mosaic shows it is committed to increasing its global reach with the partnership. 2015 will reveal the industries strategy for exportation. Further, US fertilizer companies should be able to capture domestic market share from importers as COGS decreases.

Source: Schlumberger

Aside from MON, the industry appears to be trading at a discount. Forward P/E tends to be below the S&P 500 averages (for those reporting). Negative P/E contributing factors cannot be ignored, but with solid performance metrics across the board and given the recent bullish run on fertilizer stock prices, fertilizer companies are a cheap investment with high payoff potential.

### ECONOMIC OUTLOOK

Though industry growth is not likely to experience sudden spikes in production, it is poised to see stable growth far into the future. The increasing population, bio fuels, and stagnant available acreage will place a bigger emphasis on the use of fertilizers. As the population rises, so must the crop yields. If land planted remains stagnant, fertilizers must be utilized produce the higher yields needed.

### Global GDP Growth

The World Bank is projecting developing countries GDP growth to be above 5% through 2017. This could bode well for the US export outlook. The Federal Reserve projects long-term US GDP growth near 3%, meaning emerging markets should have more relative buying power than they do today. Pending the direction the dollar moves going forward, emerging markets could import cheap US fertilizer at a discount relative to current exchanges.

### CATALYSTS FOR GROWTH

Outside of organic growth, the biggest catalyst will be the ability to increase exports to emerging markets. With cheap access to natural gas, the US has a major opportunity to lead global market share. Overseas business may currently be difficult in light of the recent rally of the dollar, but the US’s competitive advantage will remain as long as the natural gas supply remains constant.

Additional room for growth exists in the GMS segment. New threats and climate change will pose additional difficulties for farmers. Increasing currently low research and development budgets could aid in discovering new products to revolutionize the industry. Additionally, not every fertilizer company has a GMS division. Individual companies have a tremendous opportunity to boost revenue and quickly gain market share.
INVESTMENT POSITIVES

- Rising population, increased bio fuel usage, and changing diets are putting a heavy demand on higher crop yields. With limited available acreage for planting, fertilizers will be increasingly needed to produce strong yields.
- Crop prices have most likely hit bottom with upward potential in the near future. Increases in crop prices will directly result in higher sales of fertilizers.
- Strong opportunities exist in exports and GMS. Companies poised to engage in either could see substantial gains in revenue.

INVESTMENT NEGATIVES

- Most fertilizer companies specialize in a specific fertilizer type. Since fertilizers are dependent on various conditions, companies can experience cyclicality. Investing in the wrong fertilizer company on a downward cycle could result in heavy losses.
- Fertilizer components are highly flammable and dangerous. Additionally, CF cites the risk of terror attacks on their facilities in their 10k. Accidents or attacks could result in catastrophic damage to assets, resulting in sharp declines in revenue.

KEYS TO MONITOR

Crop prices will have the most immediate effect on fertilizer consumption. Farmers will be more likely to purchase and utilize fertilizer when they experience high margins. 2015 projections show slight improvements over 2014 prices, however, corn prices are not projected to make a full recovery, to over $4.00 per bushel, in five years.

Increasing exports is the biggest opportunity for US based fertilizer producers. The US has access to the cheapest natural gas in the world, giving them a global competitive advantage. The larger chemical industry, parent to agricultural fertilizers, is projected to increase exports as a whole. The fertilizer industry should be able to follow suit. The strengthening US dollar must also be considered when monitoring exports. Markets with weakening currencies to the dollar will be less willing to purchase imports in US denominations.

Finally, yearly weather predictions and USDA projected harvests should be monitored. As highlighted earlier, the major three fertilizers all have distinctive uses and applications. For example, if drought is expected, phosphate fertilizers are likely to be used to strengthen plant roots and increase water storage capacity. Therefore, Mosaic may see higher revenues for the season. If the USDA projects a high corn harvest, CF would be an optimal investment being the nitrogen segment leader.

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