Fertilizer Means Food Security

Fertilizers account for 50% of global food production. With the world population expected to reach 10 billion people by 2050, fertilizer will become increasingly critical.

Economic Impact

Each year, the U.S. fertilizer industry generates more than $155 billion in economic benefit, creating 89,000 direct jobs and 406,000 indirect jobs.

About the Industry

Nitrogen, Phosphorous and Potash are the building blocks of all fertilizers. Phosphate and Potash are mined minerals, Nitrogen is extracted from air via a complex chemical reaction.

Greenhouse Gas Emissions (GHG)

In fertilizer manufacturing, GHG emissions come from ammonia, phosphoric acid, and nitric acid production. In 2018, industry spent $3.8 billion dollars in capital improvements and new facilities.

Nitrogen Fertilizer Manufacturing: Haber-Bosch Process

We Are Energy-Intensive

U.S. nitrogen fertilizer manufacturing consumes 41% of natural gas purchased as feedstock in the U.S. In 2018, the nitrogen fertilizer manufacturing industry spent $1.5 billion on natural gas purchased as feedstock, which is equal to 1.5 million households’ natural gas bills for a year.

We Are Energy-Efficient

From 1983-2003, there was a 10% increase in efficiency to produce 1 ton of ammonia (today, this takes 33 MMbtu).

“It’s a magical innovation that’s responsible for saving millions of lives from hunger and lifting millions more out of poverty by boosting agricultural productivity.”

—Bill Gates on Fertilizer
Reduce, Reuse, Recycle

Nitrogen fertilizer manufacturing produces 2 types of CO₂ emissions:

1. **PROCESS EMISSIONS**
   - Produces pure and recyclable CO₂

2. **COMBUSTION EMISSIONS**
   - Cannot be separated for recovery
   - The laws of chemistry prevent fixed process emissions from being reduced.

In 2016, the industry captured 8 MMT of CO₂ equivalent to taking 1.7 million cars off the road for a year.

Since 1990, CO₂ emissions from ammonia production have decreased by 6%. In 2016, ammonia and nitric acid production were 0.2% each of U.S. GHG emissions. Phosphoric acid emissions were negligible.

Fertilizer on the Farm

4Rs

1. **RIGHT SOURCE**
   - Matches fertilizer type to crop needs.

2. **RIGHT RATE**
   - Matches amount of fertilizer type crop needs.

3. **RIGHT TIME**
   - Makes nutrients available when crops need them.

4. **RIGHT PLACE**
   - Keep nutrients where crops can use them.

Fertilizer Use Efficiency

Nitrogen use per bushel of corn has declined from 1.67 lbs. in 1970 to 0.77 lbs. in 2016, a reduction of 64%.

Reduced Deforestation

If corn yields had remained constant from 1964-2016, the U.S. would have needed 175 million more acres to grow corn, equivalent to the size of Texas.

Impacts of Cap & Trade or a Carbon Tax

Analyses of potential cap & trade programs or carbon taxes consider the nitrogen fertilizer manufacturing industry among the most vulnerable, due to increased feedstock prices, carbon leakage, energy intensiveness, and trade exposure.

Decreased Global Competitiveness = Reduced Domestic Investments.

With higher production costs, fewer companies will invest in U.S.-based facilities. Growers and consumers will ultimately shoulder these costs, making the U.S. less competitive in global food production.

Every $2 increase in price of natural gas means $1 billion in production costs.

Shifting production to less efficient producers leads to more emissions. For example: 70% of Chinese ammonia production is coal-based, which emits 2.4 times more CO₂ than U.S. natural gas-based plants.

"This is a basic problem, to feed 6.6 billion people. Without fertilizer, forget it. The game is over."

—Dr. Norman Borlaug, father of the Green Revolution