DANGER

Anhydrous ammonia.
Risk of blindness, lung damage, burns and death.
Wear ventless goggle or full face shield & rubber gloves. Know emergency procedures.
Fertilizer consumption since 1980

Source: International Fertilizer Industry Association
Fertilizer consumption since 1980

Source: International Fertilizer Industry Association
Nitrogen consumption as a percentage of total fertilizer consumption

- Western/Central Europe: 67%
- India: 66%
- China: 64%
- Russia: 60%
- United States: 58%
- Brazil: 28%

Sources: International Fertilizer Industry Association (IFA) (2014)
“The fertilizer nutrient balance in the Brazilian agriculture is unsatisfactory...soils are being progressively depleted of nutrients. This represents a threat to long-term agricultural sustainability.”

Brazil uses over 80% compound fertilizers

Sources: UN FAO
Global nitrogen use by crop

- Corn & Other Coarse Grains: 22%
- Wheat: 18%
- Rice: 15%
- Fruits & Veg.: 15%
- Oilseeds: 7%
- Other: 23%

Source: IFA 2011
Percentage of the global market controlled by the top three producers

- Nitrogen: 15%
- Phosphorus: 24%
- Potassium: 48%

Sources: Yara Industry Handbook 2013
Synthetic N fertilizer has a serious **metabolic rift**, and the way in which this rift has been handled (namely through state support and consolidated agribusiness power) has resulted in a growth treadmill of **self-reinforcing need and investment** beset with farmer dispossession, techno-spatial fixes and crisis tendencies.

Urbanization is extended and concentrated, but most importantly unstable and on a destructive path.
TREADMILL 1: LABOR DISPOSSESSION

Fertilizer is reinforced by the dispossession of farmers through induced migration, “price-cost squeeze” and agribusiness control over agro-food production.
The farmer has been changed from a primary producer into an immediate converter of manufactured goods. Farming, carried out by millions of petty producers, is now completely dominated by the total system of agricultural production under the control of a few oligopolies, who sell farmers their inputs, and buy their outputs, and control (directly or indirectly) their conditions of production. In 1910, farmers gathered their own seeds from last year’s crop, raised the mules and horses that provided traction power, fed them on hay and grains produced on the farm, and fertilized the fields with the manure they produced. In 1986, farmers purchase their seed from Pioneer Hybrid Seed Co., their “mules” from John Deere, the “oats” for their “mules” from Exxon, their “manure” from American Cyanamid.

TREADMILL 2: SPATIAL & TECHNOLOGICAL FIX

Efforts to resolve fertilizer (and capitalism’s) inner crisis tendencies through technological fixes + geographical expansion and restructuring
Koch Fertilizer, LLC and its affiliates are collectively one of the world’s largest producers and marketers of fertilizers. Its product portfolio includes ammonia, urea, UAN, phosphate, potash and sulfur-based products.

Koch Energy Services, LLC markets natural gas throughout North America and provides a full line of services including purchasing, transportation/scheduling, storage optimization and market analysis.

Koch Methanol, LLC optimizes the supply of methanol to both affiliates and third-party companies, as well as pursuing growth opportunities across the methanol value chain.

Koch Agronomic Services, LLC and its affiliates produce and market plant performance solutions for the world’s top agriculture producers and turf and ornamental professionals.
Commercial farm hubs or block farms can provide major benefits for large numbers of smallholder farmers

- Ag Growth Corridor promotes investment in “hub” farms with (irrigated) outgrower schemes
- Each hub provides access to inputs, finance, storage, processing and markets . . .
- . . . with benefits for thousands of smallholder farmers in the vicinity
“By overcoming the antithesis between town and country...the materials removed from the soil would be able to flow back in full” - Karl Kautsky

FAO assumes 60% use efficiency for synthetic nitrogen

Source: The Agrarian Question (1899)
Natural Gas

“Unlike many of the industries capitalizing on the low price of natural gas, ammonia producers don’t use it primarily as a fuel source. They use it as an ingredient—a source of abundant, accessible hydrogen”
2018 study reveals $\text{CH}_4$ emissions 5x higher than reported for natural gas

Source: Environmental Defense Fund
Fertilizer Production (Fixation)

Of total global energy use, 1.2% is used for ammonia production.

Sources: Drawdown and Scientific American
Fertilizer Production (Fixation)

Sources: Drawdown and Scientific American

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Fertilizer</td>
<td>41%</td>
</tr>
<tr>
<td>Atmospheric Deposition</td>
<td>7%</td>
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<tr>
<td>Confined Animal Manure</td>
<td>26%</td>
</tr>
<tr>
<td>Manure</td>
<td>7%</td>
</tr>
<tr>
<td>Urban Wastewater</td>
<td>9%</td>
</tr>
<tr>
<td>Ag inputs from legume</td>
<td>10%</td>
</tr>
</tbody>
</table>

Ammonia production accounts for 3-5% of global carbon emissions.

Sources: Drawdown and Scientific American
Nitrogen Fertilizer Application

- Acidity
- Carbon losses
- Compaction
- Erosion

Source: Drawdown
Nitrogen Fertilizer Application

Nitrous Oxide has 298x the warming potential of CO₂

Source: Drawdown
Runoff

500

algal blooms and oxygen-depleted oceanic dead zones worldwide

Source: Drawdown
Sources of nitrogen delivered to the Gulf of Mexico:

- Farm Fertilizer: 41%
- Atmospheric Deposition: 7%
- Urban Areas: 26%
- Confined Animal Manure: 7%
- Ag inputs from legume crops: 9%
- Wastewater Treatment Plants: 10%
- Urban Areas: 4%
Thank you