Introduction
Mineral fertilizers replace nutrients removed with the harvest

Supply of crop residues and organic fertilizer

Crop residues are decomposed to minerals

Mineralisation

- Export of nutrients with the harvest
- Growing demand for food & feed

Mineral fertilizers are necessary to replace those nutrients that have been removed from the field
Improving crop nutrition efficiency and sustainability from factory to field is core to Yara and crucial for the planet

Ag sector represents 25% of global GHG emissions

- Fertilizer production (2%)
- Enteric Fermentation (4%)
- Manure (3%)
- Mineral fertilizer application (1%)
- Rice (1%)
- Residues, organic soils (1%)
- Land use change (12%)*

Significant improvement potential

**Tonnes output per hectare**

- **Corn:**
  - US: 11.0
  - Mexico: 3.7

- **Rice:**
  - China: 6.9
  - India: 3.7

* Emissions only, no sinks such as re-forestation considered
**Fertilizer reduces the carbon footprint of farming**

**Fertilizer - an efficient solar energy catalyst**
- Production is a marginal part of the carbon footprint; efficient application is more important
- Huge positive effects of fertilizer use, since higher yields enable lower land area use

**Production**
- Yara’s production is more energy-efficient than competitor average

**Application**
- Higher efficiency with nitrates
- Precision farming tools

Numbers show emissions as CO2eqv per kg Nitrogen in fertilizer product
Yara’s ambition is to become climate neutral by 2050

Past 15 years

Yara’s total greenhouse gas emissions halved by almost eliminating N₂O
- Equal to 15 million tonnes CO₂ every year

Present

Further improving on world leading performance by CO₂ reduction target:
-10% reduction of CO₂ per tonne of N by 2023

Future

Ambition to become climate neutral by 2050, including:
- Green hydrogen/low carbon fertilizer production
- Reduce in-field emissions
Yara is improving an already world leading performance with CO$_2$ intensity reduction target: 10% reduction by 2025

Our ambition:
10% reduction$^1$ in CO$_2$eq intensity by 2025

- 2025 target reflects GHG emissions already considerably reduced from 2005
- Lower emissions improve our cost position
- Positive business cases; 200-450 MUSD capex required
- Supports our ambition to become climate neutral by 2050

1) From 2018 base
2) Estimated based on historical data
The next step change requires green ammonia production

Main challenges

- Major gap is capex and opex (not technology)
- Ammonia plants linked to nitrate production most suitable
- Value chain premium initially key success factor

Yara responses:

- Decarbonize – pilots
- Food / value chain initiatives
Decarbonize Yara: exploring climate neutral solutions through innovative partnerships

<table>
<thead>
<tr>
<th>What</th>
<th>Example – “Green ammonia” in Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduce Yara’s direct GHG emissions</td>
<td>Feasibility study with ENGIE to produce zero-emission ammonia</td>
</tr>
<tr>
<td>• Produce zero-carbon nitrogen</td>
<td>Designing a green hydrogen plant integrated with Yara’s existing ammonia plant in Pilbara</td>
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<tr>
<td>• Solutions to reduce in-field agricultural GHG emissions</td>
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<tr>
<td>• Contribute to green energy carrier solutions and green food value chains</td>
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</table>
Circular Economy – create new business models through recycling nutrients in food and agriculture production chains

<table>
<thead>
<tr>
<th>What</th>
<th>Value drivers</th>
<th>Example</th>
</tr>
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<tbody>
<tr>
<td>• Solutions to use recovered materials as sources for N, P and K</td>
<td>• Strengthen competitive advantage; respond to consumer and regulatory trends</td>
<td>Yara-Veolia partnership</td>
</tr>
<tr>
<td>• Shape new business and value creation models in circular agriculture</td>
<td>• Create new business models/revenue streams</td>
<td>What? Develop the circular economy in Europe’s food and agriculture value chains</td>
</tr>
<tr>
<td>• Alternative sustainable raw material sourcing to production plants</td>
<td>• Increased resource use efficiency</td>
<td>How? By recycling nutrients and promote cooperation across the value chain (e.g. Nutrient Upcycle Alliance)</td>
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<td></td>
<td>• Secure alternative resource supply and lower cost</td>
<td>Why? Secure access to nutrients, position Yara in circular value chain</td>
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Application
Annual nitrogen application is required in order to maintain yields

Annual N-application is critical for yield

Grain yield from Nitrogen fertilizer
Ton per hectare

-43%

9.6
5.5
1.8

With N Fertilizer 1 year without N Long term without N

Stable global nitrogen consumption pattern

Million tonnes nitrogen

Source: Broadbalk long term trial Rothamsted UK
Source: IFA, June 2019
The right nitrogen fertilizer rate is key to avoid nitrate leaching

- Leaching of nitrate into groundwater affects water quality and contributes to eutrophication\(^1\)

- The main driver for nitrate leaching is over-application of organic and mineral nitrogen fertilizer

- Optimum fertilizer application and high grain yields achievable with low levels of nitrate leaching

\(^1\) Eutrophication is when a body of water becomes overly enriched with minerals and nutrients which induce excessive growth of algae
Knowledge and research underpin our advice and services provided to customers
Yara drives sustainable agriculture with the right nitrogen fertilizer products and precision farming tools

Premium products give higher output per hectare and lower infield emissions (coffee field trial, Brazil 2018/2019)

- **Precision farming tools promote sustainable farming**
  - Precision farming promotes best agricultural practices
  - Yara’s digital tools help optimize application rates
  - Yara’s solutions help farmers reduce environmental footprint while supporting their competitiveness

### Bean yield (t/ha)

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<tr>
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<th>Bean yield (t/ha)</th>
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<tbody>
<tr>
<td>Urea</td>
<td>2.31</td>
</tr>
<tr>
<td>Urea + UI*</td>
<td>2.68</td>
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<tr>
<td>Nitrates (AN)</td>
<td>3.29</td>
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<th>Ammonia emissions (kg NH3-N/ha)</th>
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<tbody>
<tr>
<td>Urea</td>
<td>52</td>
</tr>
<tr>
<td>Urea + UI*</td>
<td>41</td>
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<tr>
<td>Nitrates (AN)</td>
<td>1</td>
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* UI = Urease Inhibitor
Source: trial 2018/2019 - Lavras University, Minas Gerais, Brazil & Yara Research
Precision Farming requires tools as enablers – Yara provides innovative solutions

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<tr>
<th>Level of mainstreaming</th>
<th>Offered Solutions</th>
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<tbody>
<tr>
<td>Low</td>
<td>Yara-Plan</td>
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<tr>
<td></td>
<td>Planning tools</td>
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<tr>
<td></td>
<td>MegaLab</td>
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<tr>
<td>High</td>
<td>Lab Analysis</td>
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<td></td>
<td>Soil</td>
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<td></td>
<td>Crop</td>
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<td>On-farm analysis</td>
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<td>N-Tester</td>
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<td>ImageIT</td>
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<td>N-Sensor</td>
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<td>AtFarm</td>
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Results using Yara solutions: Wheat example from France

21,000 French farmers used the N-Tester to measure the nitrogen status of 710,000 hectares of wheat

- €19 million additional income
- 310,000 additional people fed
- 71,000 tonnes CO₂ reduction
Results using Yara solutions: Coffee example from Vietnam

- Improved ripening
- Farmer income: ca. +500 USD / ha
- Reduced losses
- Yields: +10%
- GHG emissions: -15–20%
- Bigger berries
Industry-shaping partnerships
Yara and IBM partner to transform the future of farming

• Combining world-leading capabilities
• Building the globally leading Digital Farming data and services platform
• Joint innovation teams across Digital Hubs
• Bold ambition: reaching 100 million ha incl. millions of smallholder farmers
Yara Food Chain initiatives address key global challenges

The environmental footprint of agriculture is at the top of the political agenda

Yara’s food chain initiatives create connections from production to end consumers

- Yara is strengthening its Food Chain Collaboration activities to grow both value and reach
- Yara and Nel collaborating to produce clean hydrogen for low-carbon fertilizer production
- Cooperation with Lantmännen aims to eliminate fossil fuels throughout the supply chain to reduce the carbon footprint of Lantmännen’s end-products
Partnering to promote carbon footprint measurement

Production:
- Catalyst technology halves the emissions

Use:
- Best practice application
Closing remarks
Sustainability is integrated in our strategy

- Yara’s strategy is to become the **Crop Nutrition Company for the Future**, delivering sustainable crop nutrition solutions to farmers and industry, while delivering superior return on capital.

- Crop nutrition solutions include products, knowledge and services including digital farming tools that enable farmers to optimize crop yield, resource efficiency and financial return.