



Knowledge grows

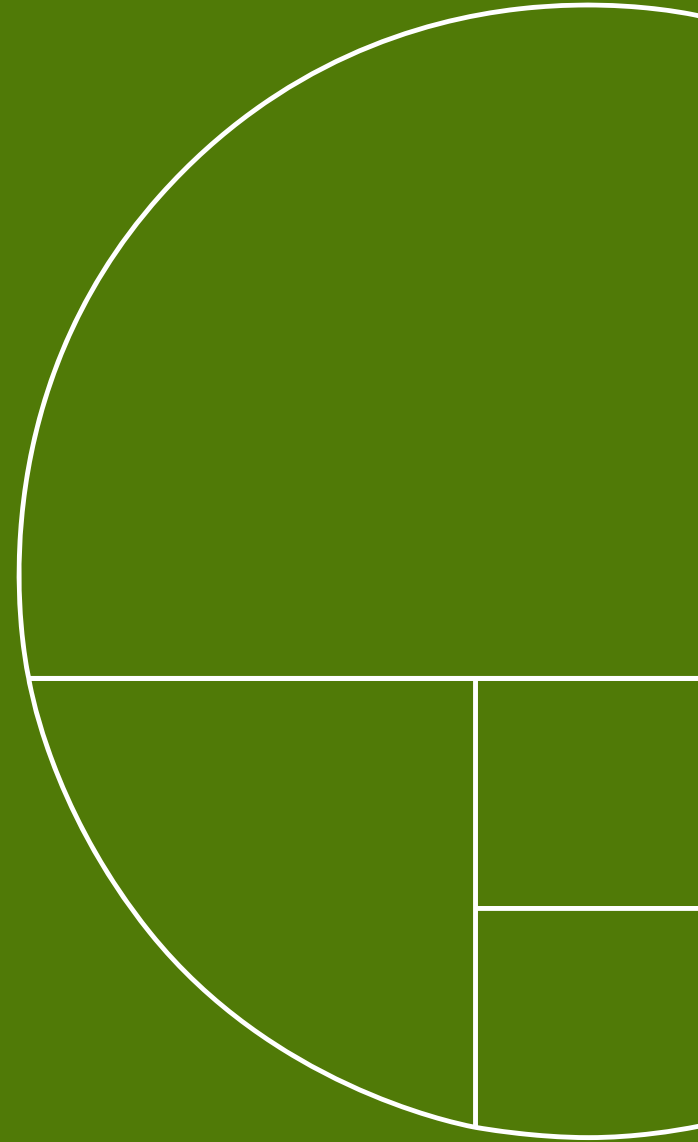
# Mineralgödsel med ultralågt klimatavtryck

Sara Ekström

Director Green Fertilizers

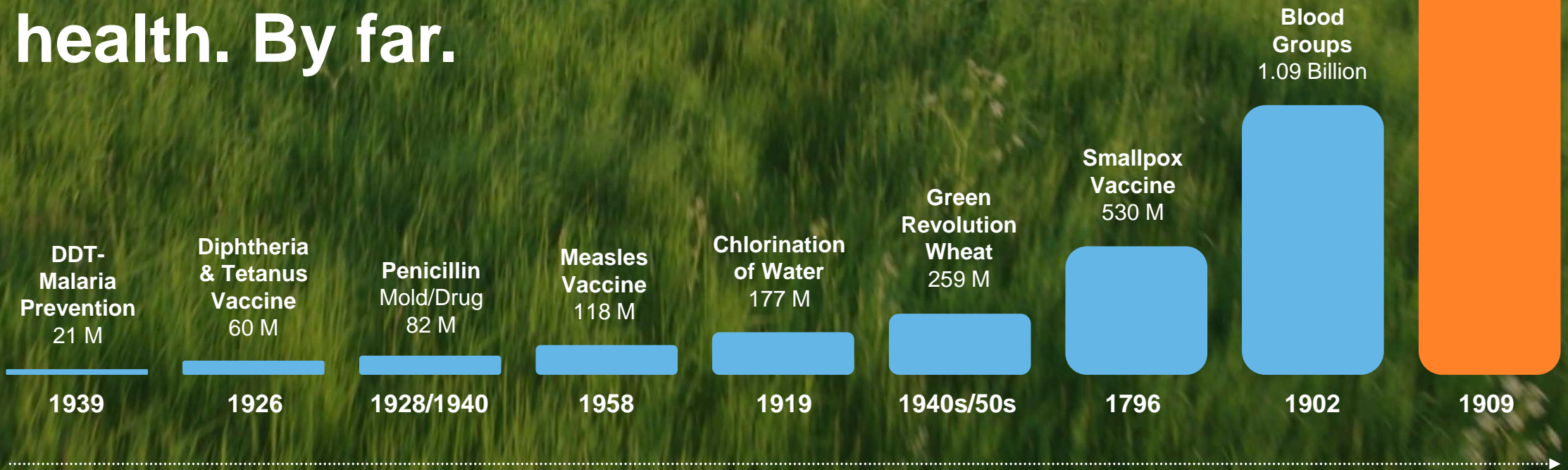


**The Why**



# Lifesaving innovations.

Mineral fertilizers. The single most important development in global health. By far.





**The food we eat is  
responsible for approx.**

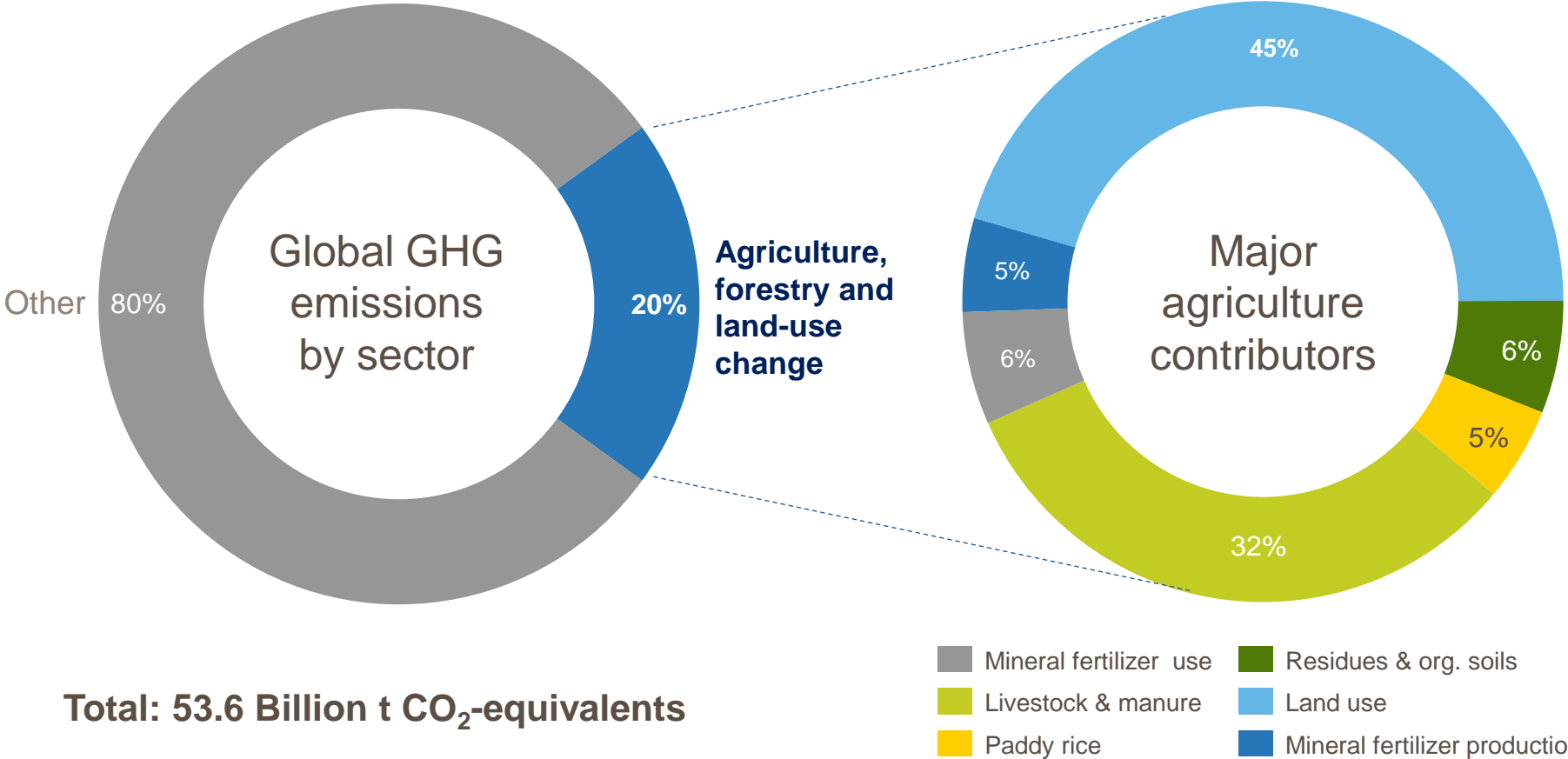
**25%**

**of the world's emissions  
– and most of that is emitted by  
the agricultural sector.**



# Agriculture is a major source of greenhouse gas emissions

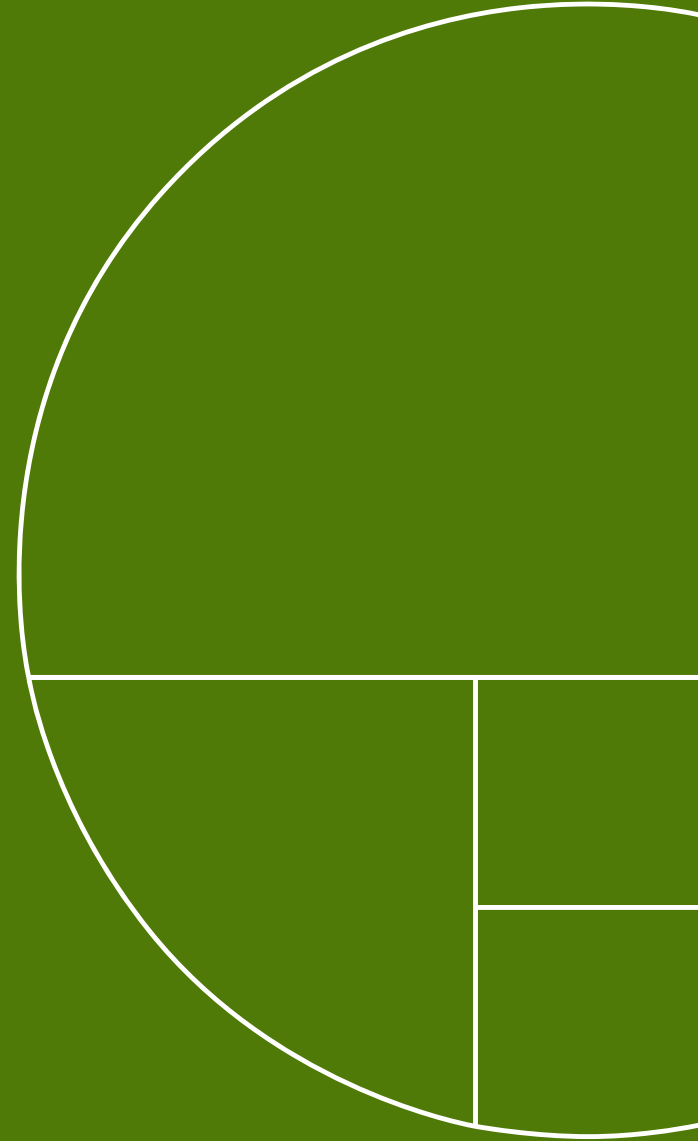
1% of global GHG comes from production of mineral fertilizers



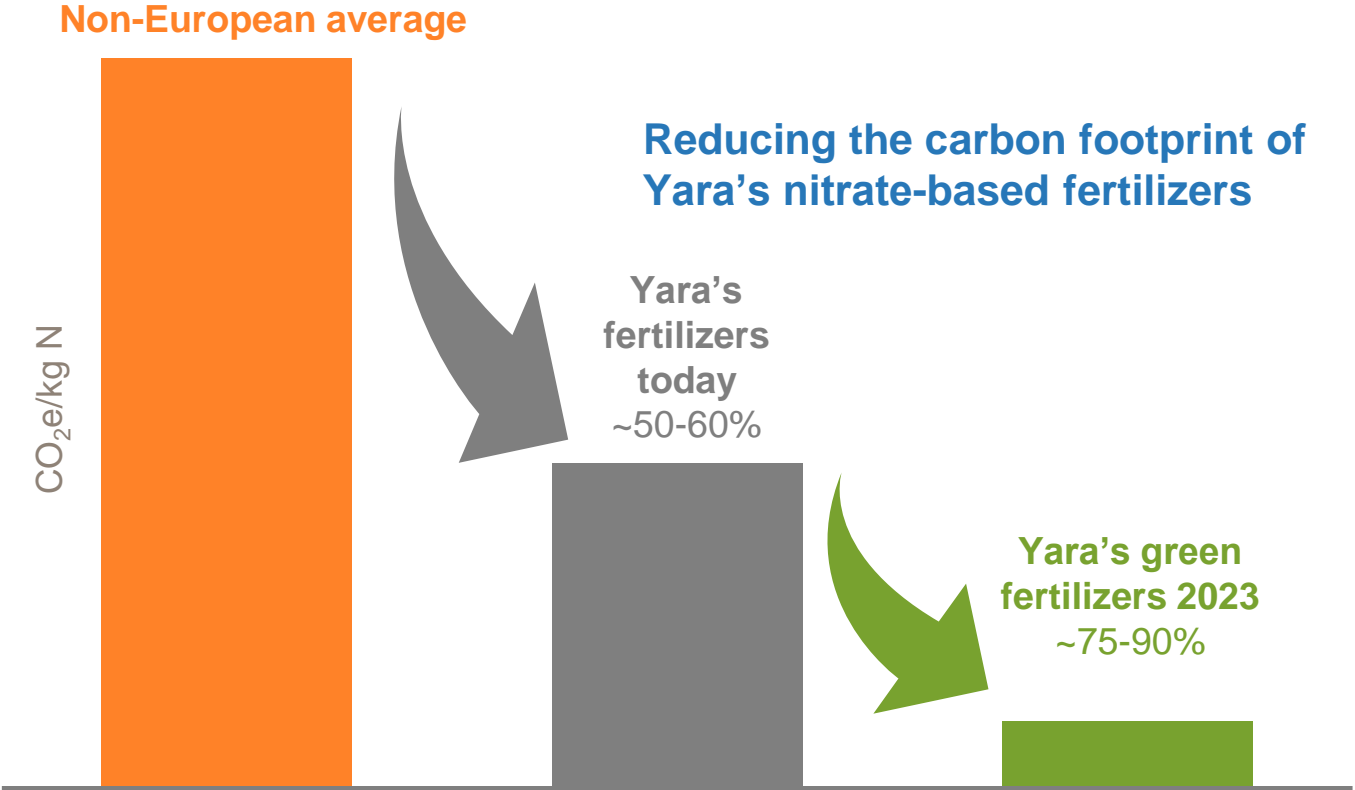
**Total: 53.6 Billion t CO<sub>2</sub>-equivalents**



# The Solution



# Yara Green Fertilizers are low carbon and fossil free



Nitrate-based fertilizers



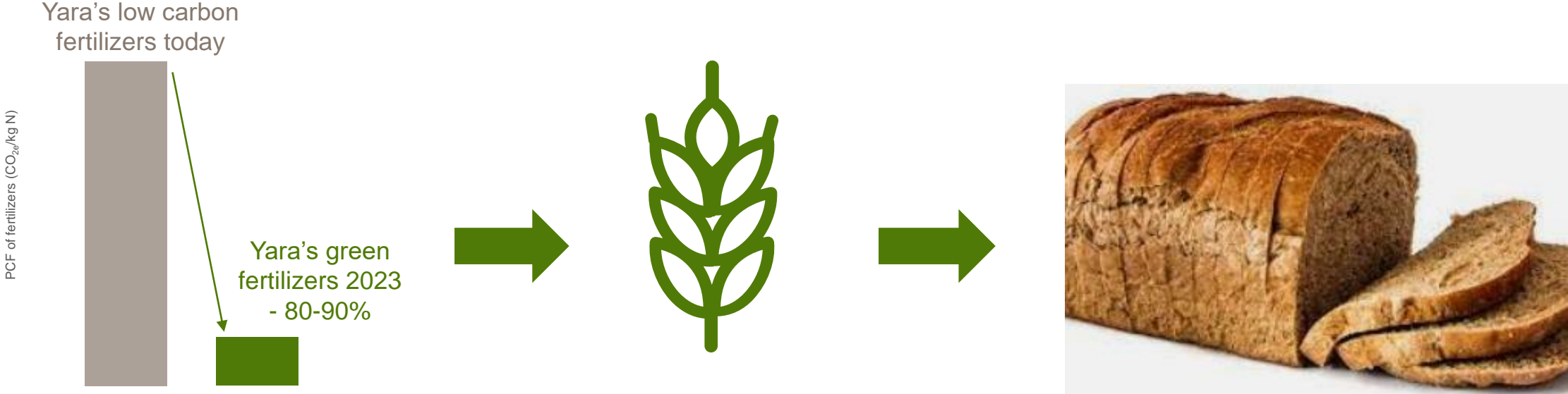
Produced with **N<sub>2</sub>O abatement** catalyst technology



Made with **green ammonia**, produced from **water** and **air** with **renewable energy**

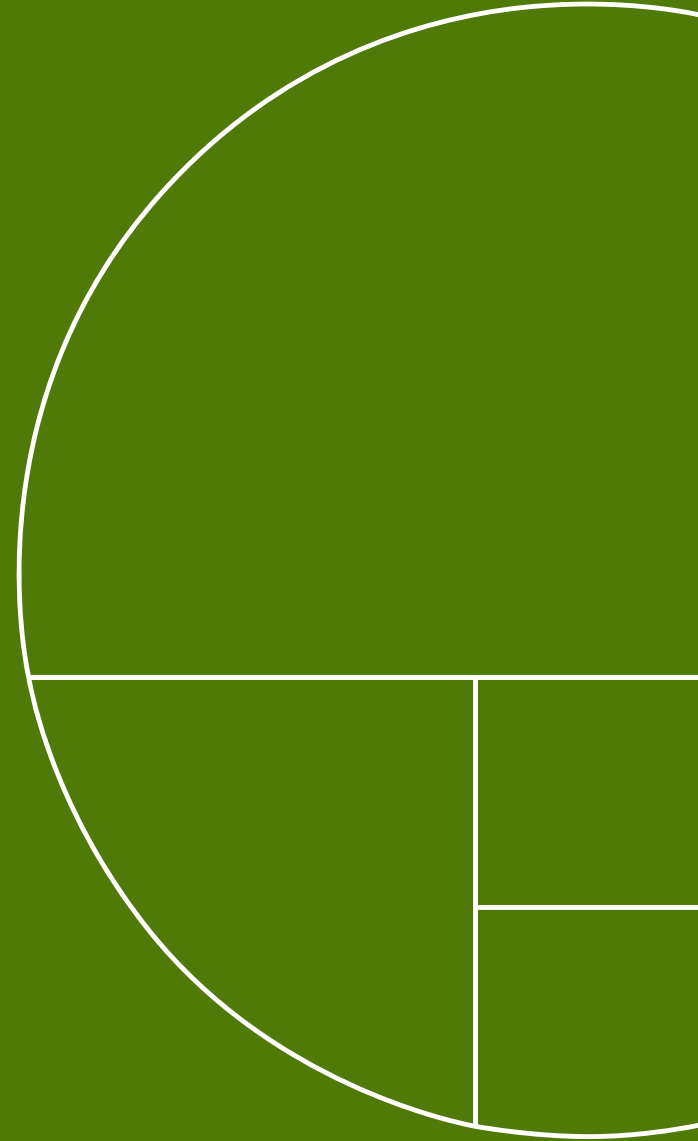
# Fertilizer PCF and impact on crop and end-product PCF

- example





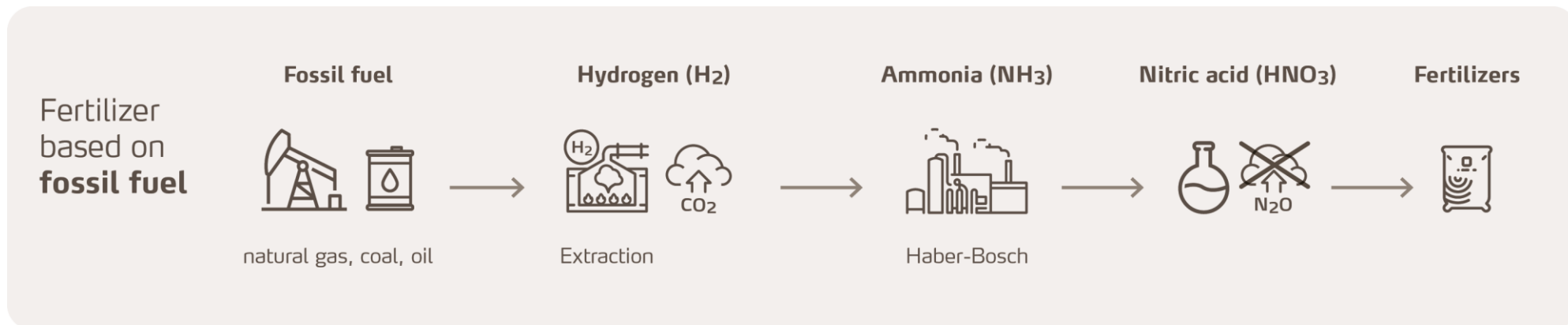
# The How



# How can we reduce the climate impact from production of our mineral fertilizers?

## Low carbon grey fertilizers

- Hydrogen from fossil sources such as natural gas with N<sub>2</sub>O catalytic cleaning from nitric acid production step
- Invention by Yara, shared with other fertilizer producers
- Reduces the N<sub>2</sub>O emission up to 90%, and product carbon footprint of fertilizers with 50-60%

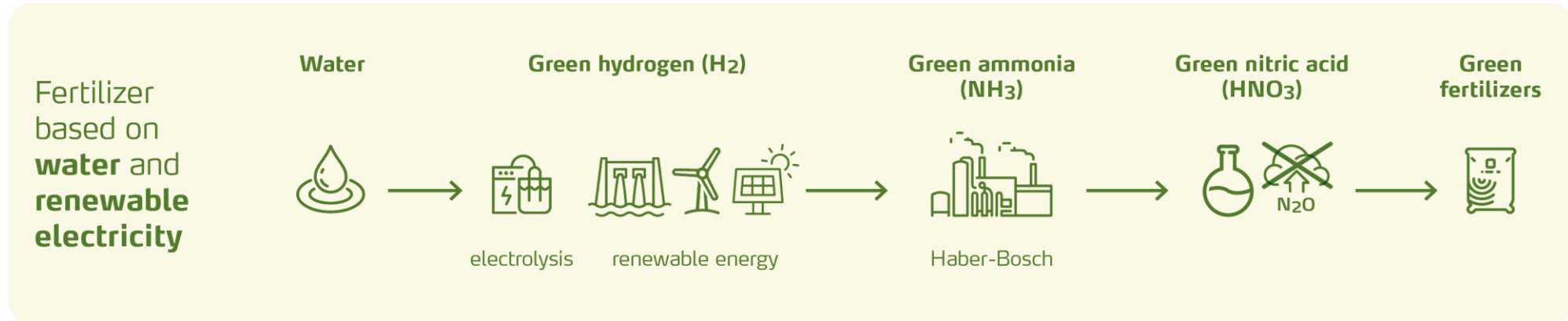




# How can we reduce the climate impact from production of our mineral fertilizers?

## Ultra-low Green fertilizers – from electrolysis

- Hydrogen from water via electrolysis using renewable electricity
- Minimize use of fossil sources
- Reducing fertilizer product carbon footprint with 75-90%
- Catalytic cleaning



# Green and low carbon projects

## Past, present, and potential future

- **Past:** Electrolysis not a new technology
- **Present:** POR



Rjukan, Norway; 1927 – 1970's



Glomfjord, Norway; 1953 – 1991



Porsgrunn, Norway; April 2023

- Skrei project in POR
  - 20 MW electrolyzer
  - 20 kT green  $\text{NH}_3$
  - 60-80 kT gödsel



# Bilder från Porsgrunn





# Bilder från Porsgrunn





# Branding – work in progress

- Inte ersätta befintliga powerbrands



# Green and low carbon projects

## Past, present, and potential future

- **Past:** Electrolysis not a new technology
- **Present:** POR, SLU
- **Future:** see YCA capital market day 2023

2 Deep-dives across the value chain



### Project pipeline to 2030 weighted towards blue projects in North America

| Type          | Project names                    | Framework in place | Volume (kT) <sup>1</sup> | Type           | YCA capex                    | Indic. start of production |
|---------------|----------------------------------|--------------------|--------------------------|----------------|------------------------------|----------------------------|
| Blue ammonia  | Grey to blue (CCS) North America | ✓                  | ~600                     | Offtake        | -                            | 2026 – 2029                |
|               | Sluiskil CCS Europe              | ✓                  | ~400                     | Offtake        | -                            | 2025 – 2029                |
|               | New project North America        | ✓                  | ~1,100                   | Majority stake | USD 1.5 – 1.8bn <sup>2</sup> | 2028 – 2030                |
| Green ammonia | HEGRA Norway                     | ✗                  | ~400                     | Majority stake | TBA <sup>3</sup>             | 2027 – 2030                |
|               | Skrei (pilot project) Norway     | ✓                  | ~20                      | Owned          | USD ~50m <sup>4</sup>        | 2023                       |
|               | Yuri (pilot project) Australia   | ✓                  | ~3                       | Offtake        | -                            | 2025 – 2026                |

- 4 commercial-scale projects
- 3 blue projects for which sufficient frameworks are already in place
- Framework, including sufficient level of government support, yet to be concluded for HEGRA. Company to revert on capex
- 2 pilot projects to provide important technical and commercial insights
- Additional mid-term volumes from third-party offtake (not included in the project summary)

Pipeline is continuously evaluated and projects may be replaced from a deeper project hopper

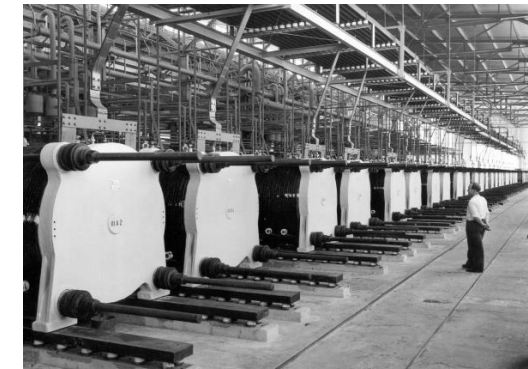


Yara Clean Ammonia

Source: Company information, based on current estimates/expectations  
 1) Assuming 100% offtake from upstream projects for YCA. Under the current agreement for Sluiskil, YCA has the right to offtake 50% of the gross volume of ~400kT plus any surplus from Yara's 50% share of the volumes  
 2) Capex calculated based on an assumed 70% ownership for YCA  
 3) Framework, including sufficient level of government support, yet to be concluded for HEGRA. Company to revert on capex  
 4) Net capex after ENOVA support, which is still subject to ESA approval



Rjukan, Norway; 1927 – 1970's



Glomfjord, Norway; 1953 – 1991



Porsgrunn, Norway; April 2023

- Skrei project in POR
  - 20 MW electrolyzer
  - 20 kT green NH<sub>3</sub>
  - 60-80 kT gödsel



Global News

Yara invests in CCS in Sluiskil and signs agreement with Northern Lights

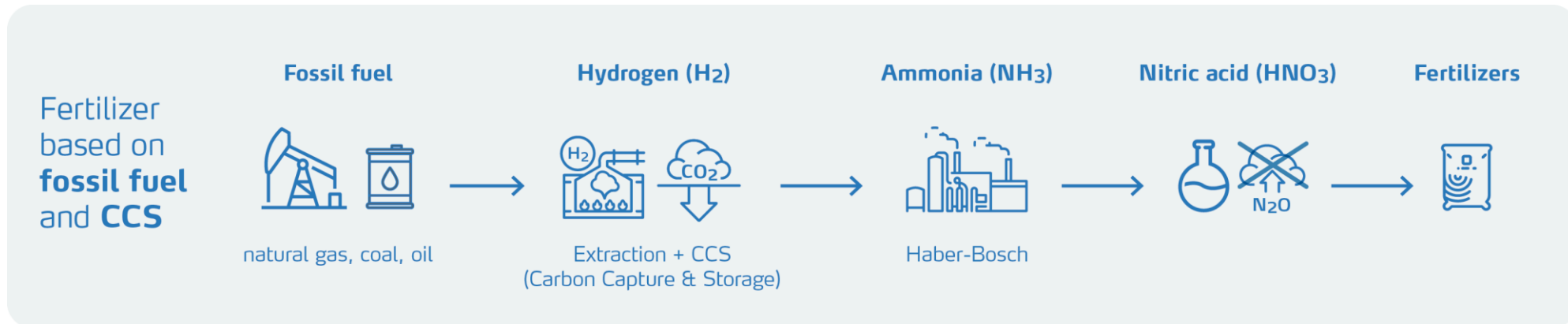
Yara invests in CCS in Sluiskil and signs binding CO<sub>2</sub> transport and storage...

- Sluiskil blue

# How can we reduce the climate impact from production of our mineral fertilizers?

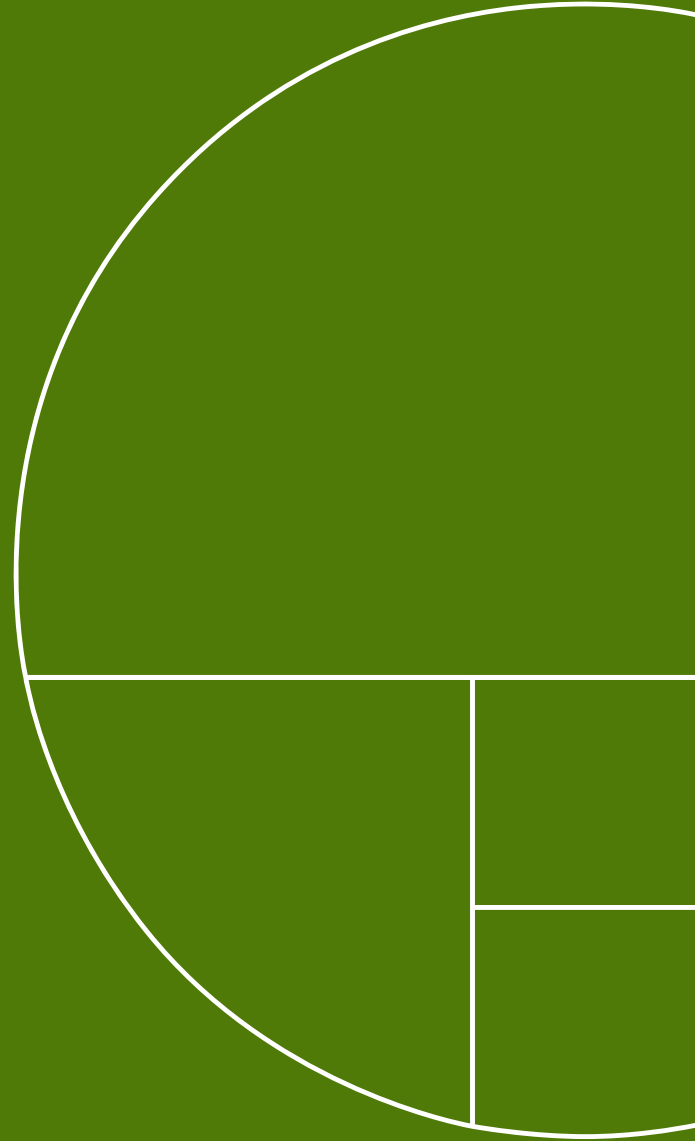
## Low and ultra-low Blue fertilizers

- Hydrogen fossil sources such as natural gas
- Carbon capture and storage (CCS) in hydrogen extraction step
- 60/90% reduction depending on method (process gas and/or flue gas)
- CO<sub>2</sub> stored for minimum 100 years
- Catalytic cleaning





# The Proof



# Growing evidence of food chain interest in decarbonization and green fertilizers

Examples of partnerships in different markets and for different food chains

## Food Security Consortium Coffee (COL)

### Cooxupe (BR, coffee)



### El Parque Papas (AR, potato)



## Simpsons Malt (UK, malt for whisky)



Simpsons Malt Limited announces collaboration with Yara and Varda

## Felleskjøpet, Rema1000 (NO, cereal)



## Lantmännen (SE, wheat)

Yara and Lantmännen sign first commercial agreement for fossil free fertilizers



## Nordzucker (DK, sugarbeet)

Yara og Nordic Sugar vil kortlægge mulighederne for CO<sub>2</sub>-reduktion i r

Yara Danmark og Nordic Sugar har indgået aftale om et samarbejde for at se på mulighederne for CO<sub>2</sub>-reduktion i roedyrkningsmulighederne for implementering af grønne løsninger til sukkerroens værdikæde.



## Bindewald & Gutting Milling Group and Harry-Brot (DE, wheat)



# Proven commercial interest from the food value chain



## Yara and Lantmännen sign first commercial agreement for fossil free fertilizers

JANUARY 13, 2022

Oslo and Stockholm, January 13, 2022: Yara and Lantmännen are the first companies to sign a commercial agreement to bring fossil free fertilizers to market. Produced with renewable energy, these green fertilizers are crucial for decarbonizing the food chain and offering consumers more sustainable food choices.







- År **2015** lanserade Lantmännen sitt odlingsprogram Klimat & Natur.
- Programmet innehåller konkreta och mätbara åtgärder på gård för **främjad biologisk mångfald** och **minskad klimatpåverkan**.
- Lantmännen kontrakterar lantbrukare enligt programmet, vilka erhåller en **premie** för att odla enligt programmet.
- Klimat & Natur är dynamiskt och **utvecklas kontinuerligt** för att klimatpåverkan från odlingen i **linje med Parisavtalet**.



# Våra åtgärder på gården

## Precisionsodling:

Möjliggör ökad effektivisering av resursförbrukandet på gården.

Sänkt klimatpåverkan

## Blommande zoner:

Planterade zoner som skapar utrymme för blommor och pollinerare att frodas.

Gynnar biologisk mångfald.

## Fossilfri växtnäring:

Tillverkat genom hydrolys med förnybar energi

Sänkt klimatpåverkan

## Fossilfritt bränsle:

Använder enbart förnybart bränsle i tanken.

Sänkt klimatpåverkan

## Termisk behandlat utsäde:

Utsädet värmebehandlas för att begränsa mängden bekämpningsmedel.

Gynnar biologisk mångfald.

## Lärkruta:

Osådd ruta på åkern där sånglärkan kan landa för att hitta mat.

Gynnar biologisk mångfald.

## Sparsam körning:

Bättre resursutnyttjande leder till minskad bränsleanvändning.

Sänkt klimatpåverkan

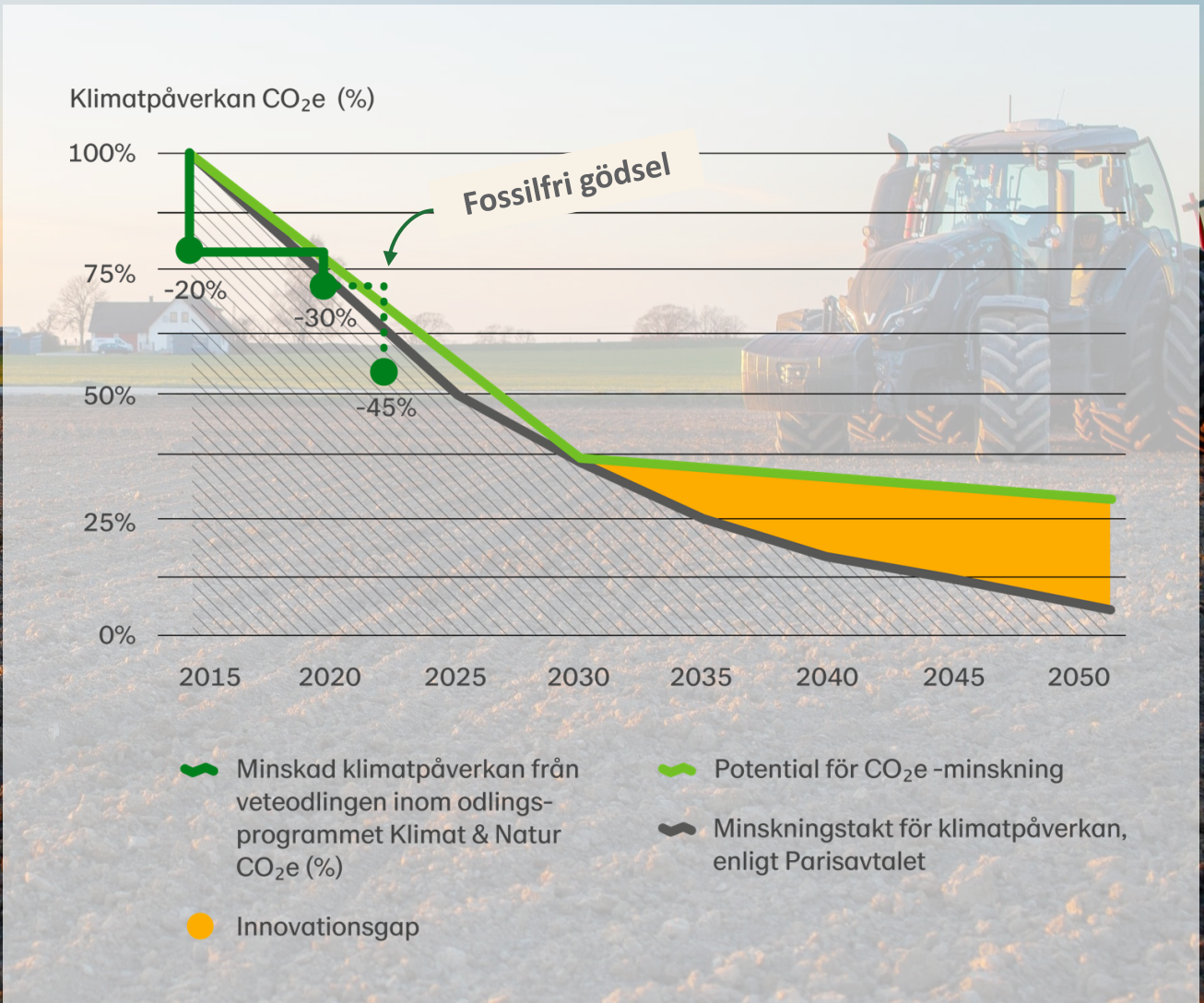


**KLIMAT & NATUR**

Lantmännens program för framtidens jordbruk



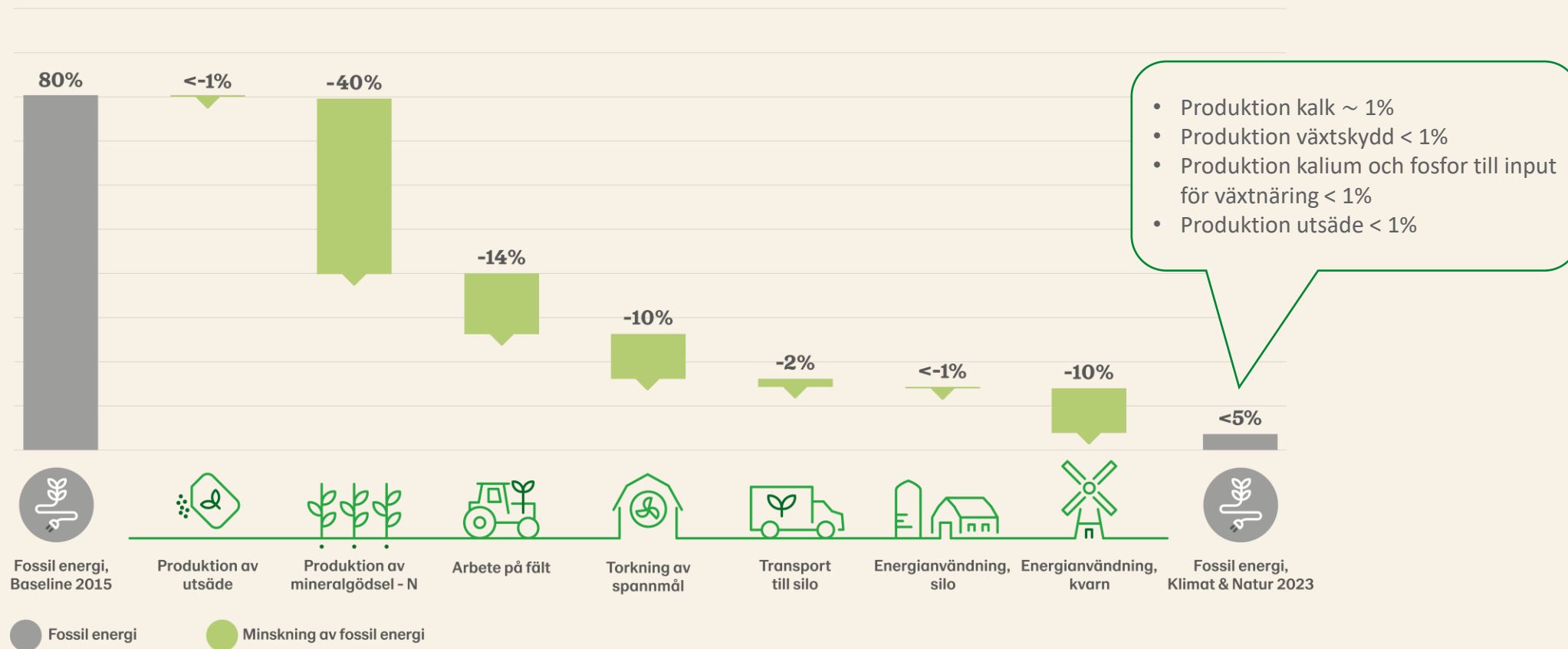
# Dags för nästa steg på resan!





# Fossilfri värdekedja

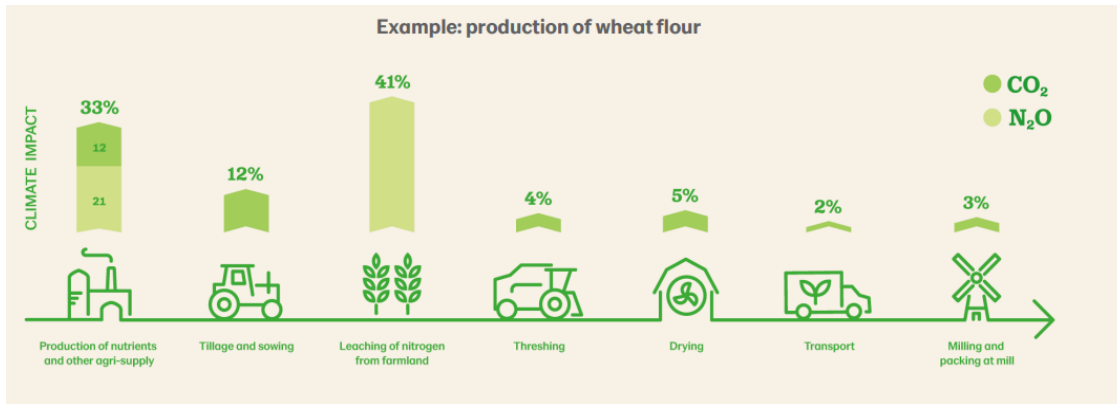
Procent av total kwh energianvändning i värdekedjan för produktion av mjöl på svenskt vinteravete



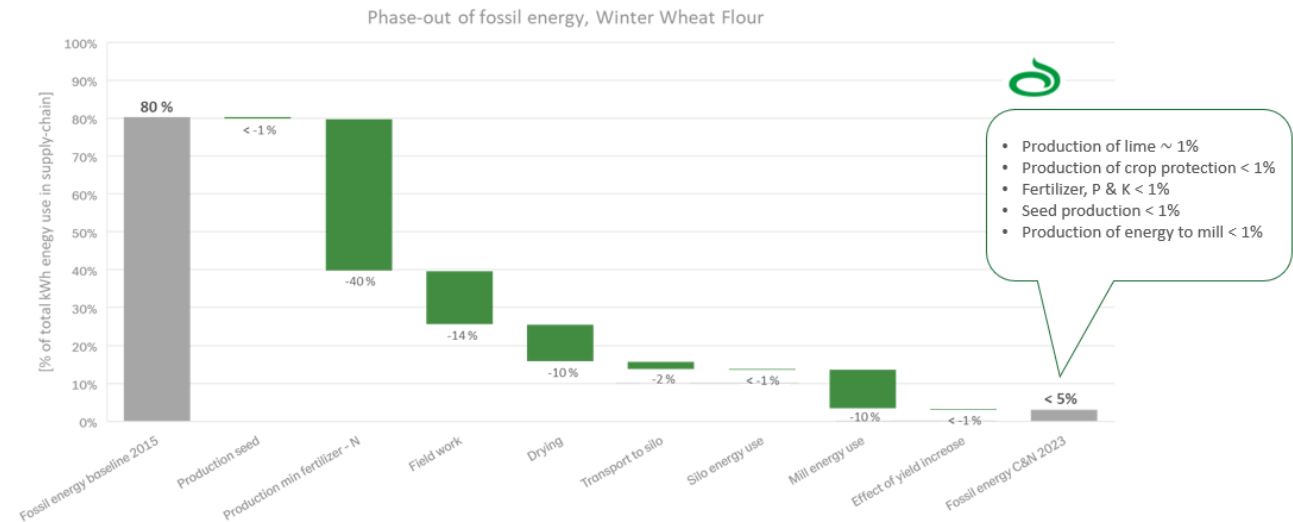
With right practices and products, we can achieve 50% reduction on wheat flour product carbon footprint, and a close-to (<5%) fossil free value chain



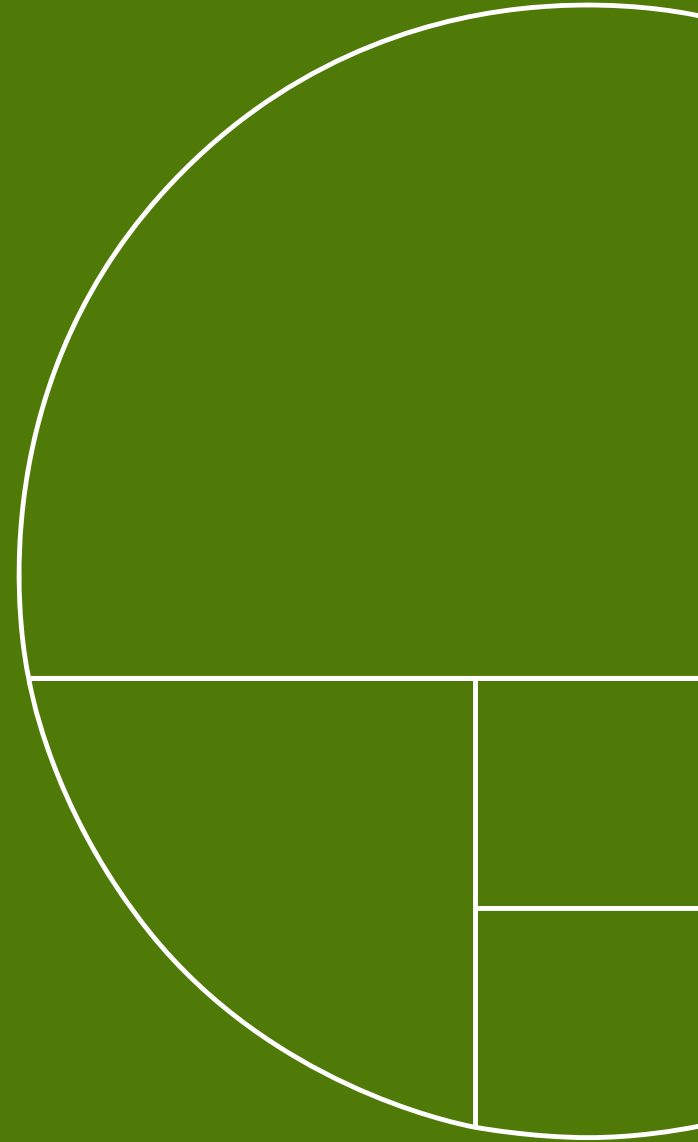
### 50% PCF reduction on wheat flour



### A close-to (<5%) fossil free food chain



**The But**





# Green fertilizers is not a stand-alone solution



# Yara Green Fertilizer is an integral part of a wider Yara offer

## Soil Health

- Balanced Nutrition
- Soil Analytical services
- Crop Diversity



## Reducing GHG emission – climate solutions

- Green Fertilizers and other low carbon fertilizers
- Precision Ag. For high NUE- & low in-field emissions



## Circular Economy

- Solutions for circular agriculture
- Nutrient up-cycling pilots
- Organic fertilizer



## Digital tools for farming

- At Farm, N-Sensor, Adapt N, N-Tester, Megalab , etc.



## Water Safety & Reliability

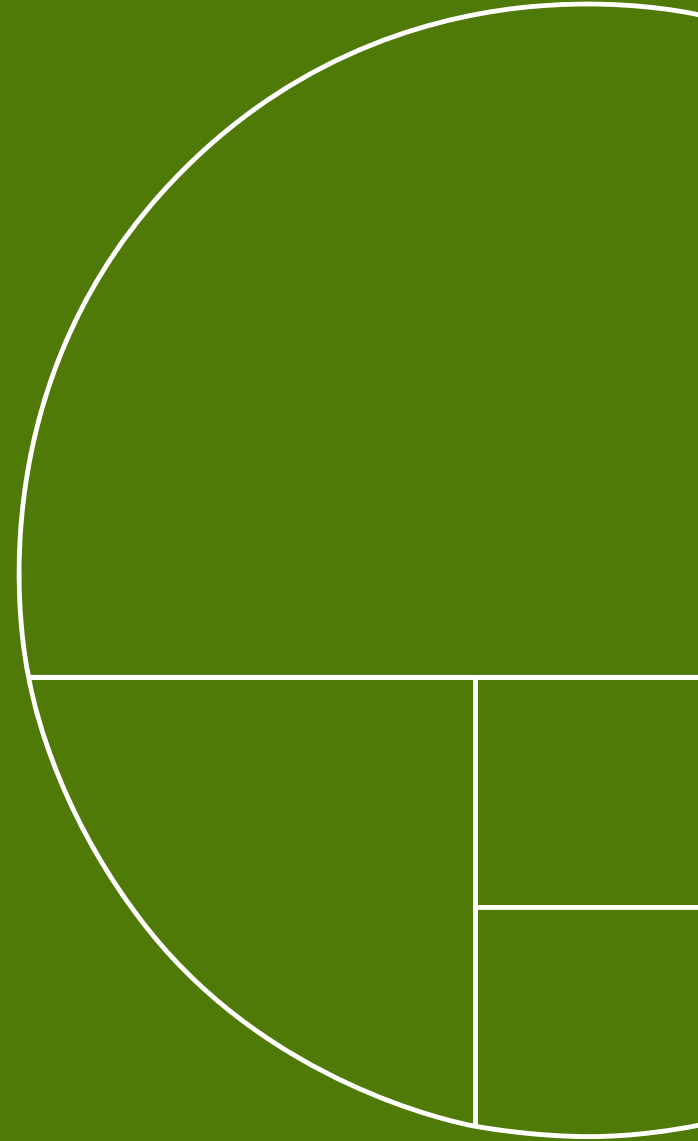
- Fertigation solutions
- Digital Farm Water Advisor
- Minimize nitrate leaching



## Regenerative Agriculture



# The Summary



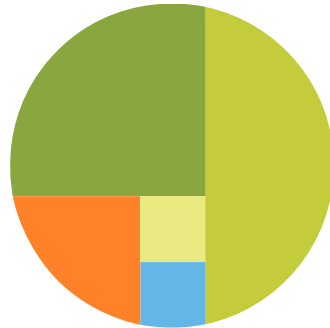




# Green fertilizers

- Impactful
- Fossil free\*
- Effortless

# Tack!



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