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CBAM and Agriculture: Opportunities, Challenges, and Perspectives

Jeremy Jelliffe and Fabio Santeramo

Selected presentation for the International Agricultural Trade Research Consortium's (IATRC's) 2023 Annual Meeting: The Future of (Ag-) Trade and Trade Governance in Times of Economic Sanctions and Declining Multilateralism, December 10-12, 2023, Clearwater Beach, FL.

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USDA Economic Research Service
U.S. DEPARTMENT OF AGRICULTURE

CBAM and agriculture: opportunities, challenges, and perspectives

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IATRC annual meetings, Clearwater, FL
Dec 10—12, 2023

Disclaimer: The findings and conclusions in this presentation are those of the authors and should not be construed to represent any official USDA or U.S. Government determination or policy.

Background: What is the EU Carbon Border Adjustment Mechanism aka 'CBAM'?

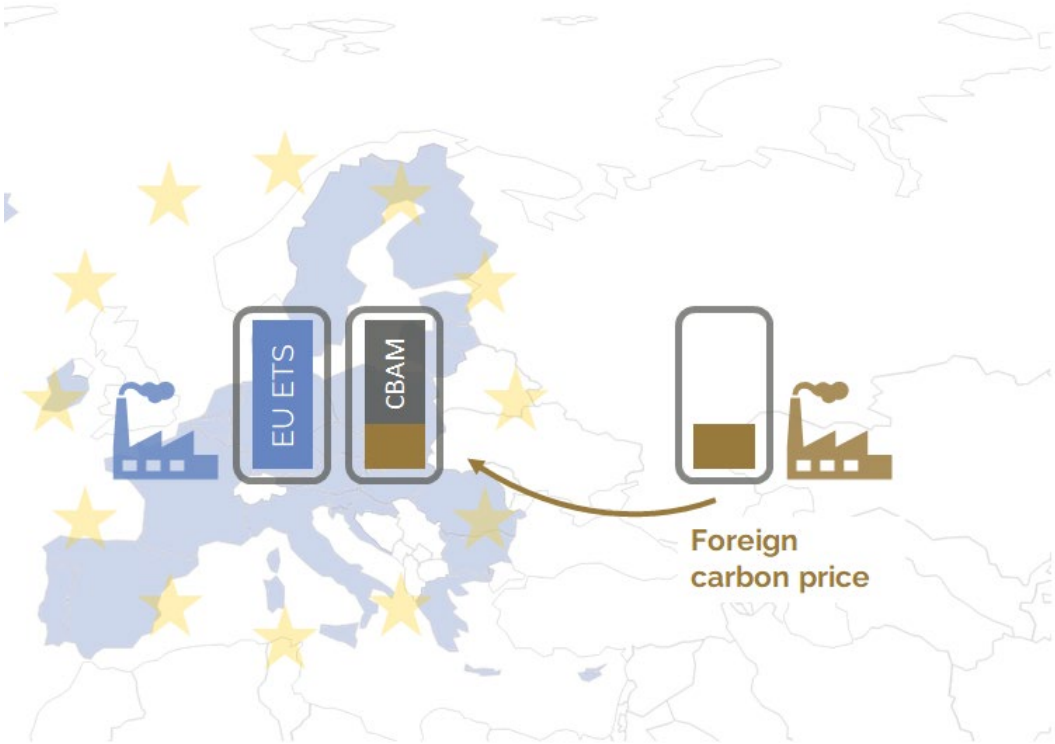
- EU vision: importers buy carbon certificates […] under the EU's carbon pricing rules
- […] if a non-EU producer[…] has already 'offset' the cost can be fully deducted
- […] helps reduce leakage by encouraging non-EU producers' 'green' production
- […] imports subject to carbon price set by EU emissions trading scheme (ETS)

→ → → CBAM to ensure equal treatment for domestic and imported products […] avoid(ing) carbon leakage, i.e., all relevant products in single market are 'offset'

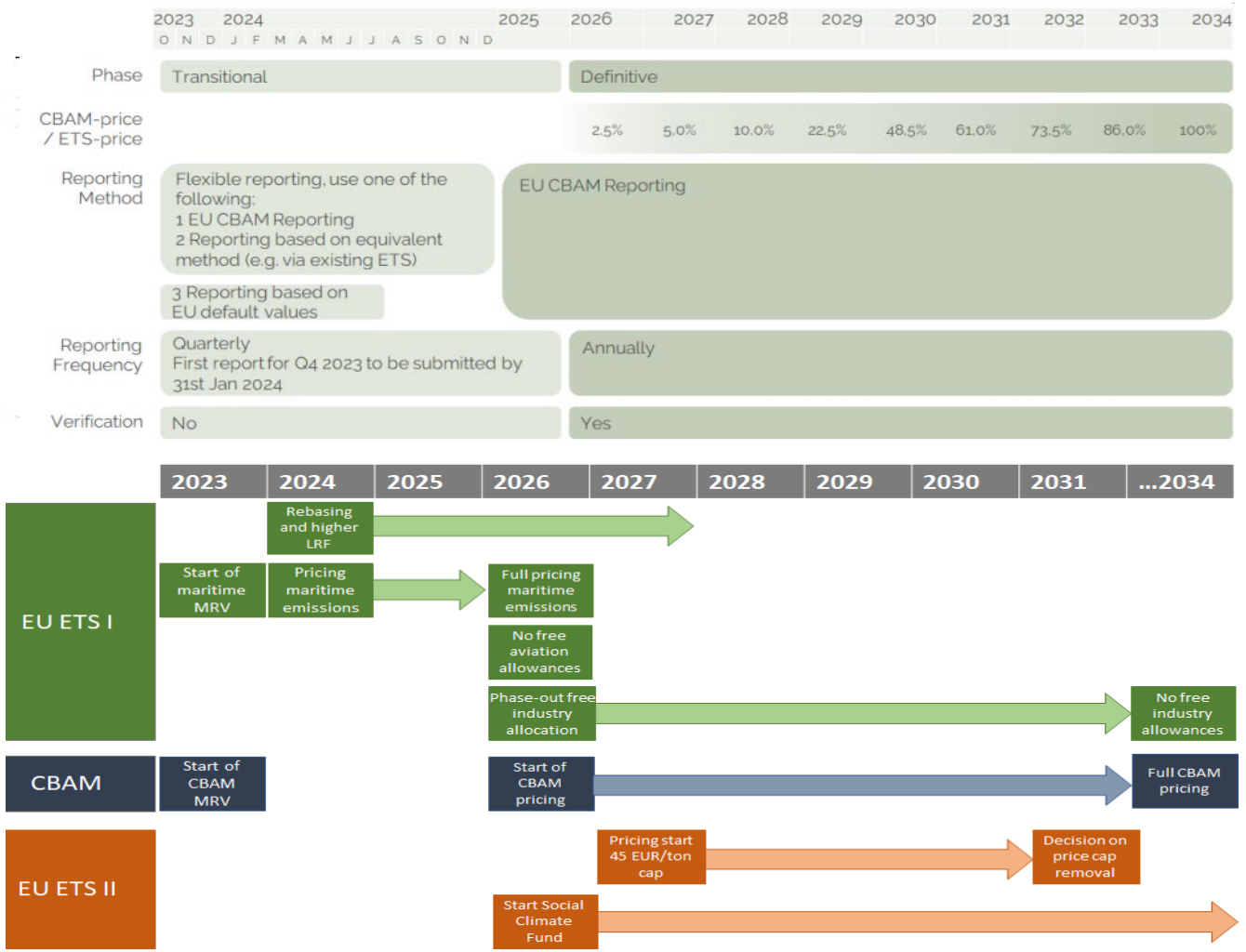
CBAM applies to imports of the following (emissions intensive) goods:

- aluminum, cement, electricity, **fertilizers**, and iron & steel
- … and "How will the CBAM work in practice?"

Background: Picturing CBAM implementation & timelines

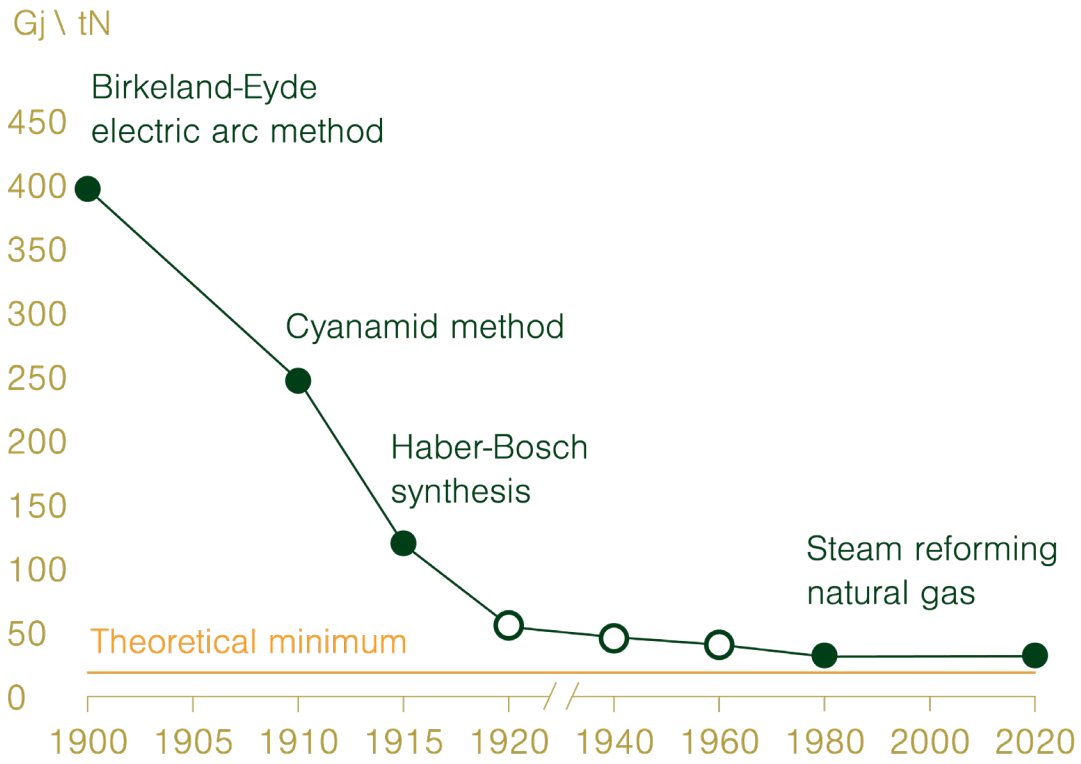


Source: carboneer (2023) based on European Commission (2021)

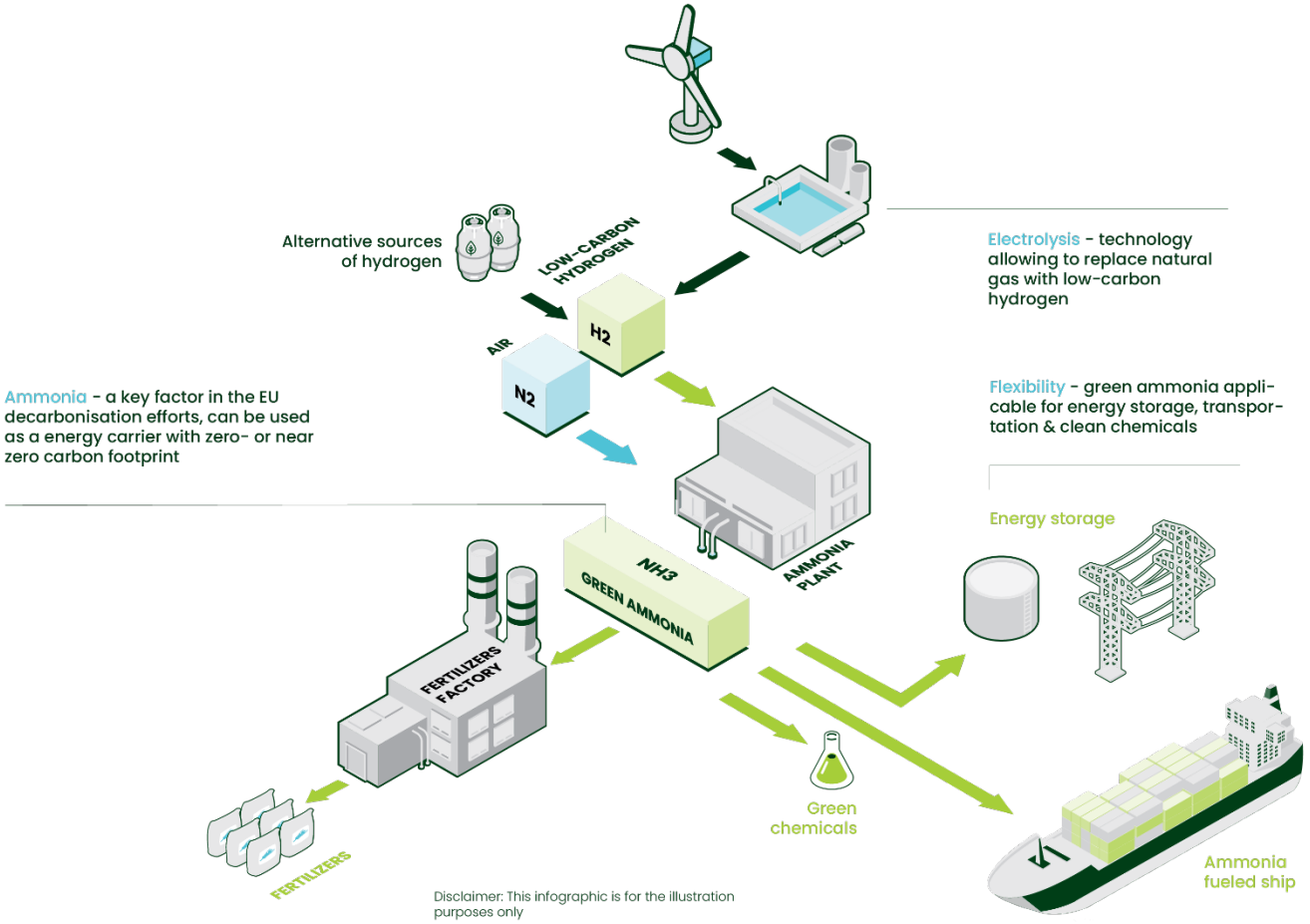


Source: carboneer (2023) based on European Commission (2021)

ETS and CBAM work jointly to ‘green’ fertilizer industry complimented by R&D and CapEx



Source: Fertilizer Europe (2023)



Source: Fertilizer Europe (2023)

Economic theory suggests that CBAM could shift trade patterns from increased marginal costs

<u>In implementing importer countries</u>

1st order (SR, macro):

- "Tax" effect: Lower imports, trade deficit

2nd order (LR, micro):

- Competitiveness loss (MC shift/rotation)

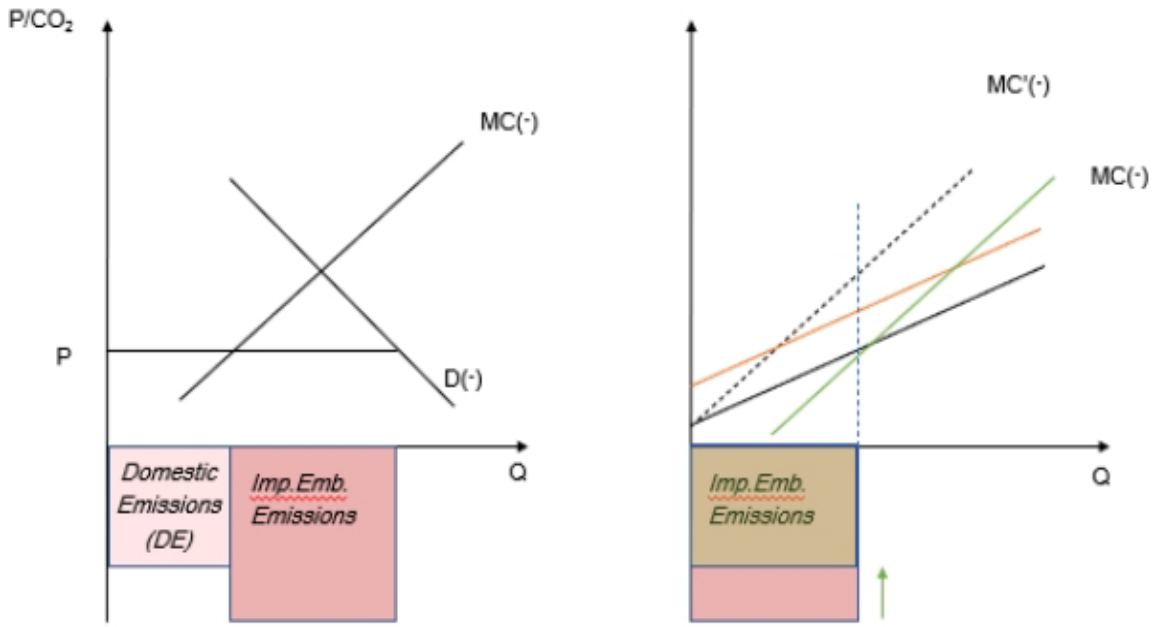
<u>In affected exporter countries</u>

1st order:

- "Tax" effect: Lower exports, trade diversion

2nd order:

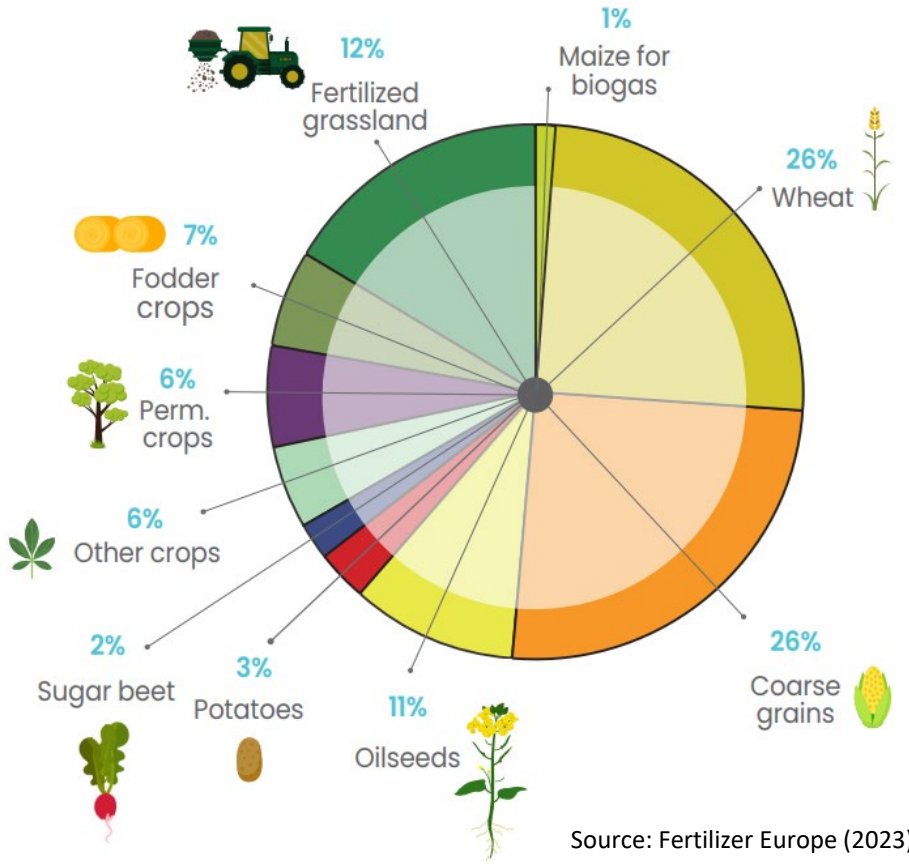
- MC shift/rotation, leakage reduction



Source: authors' elaborations

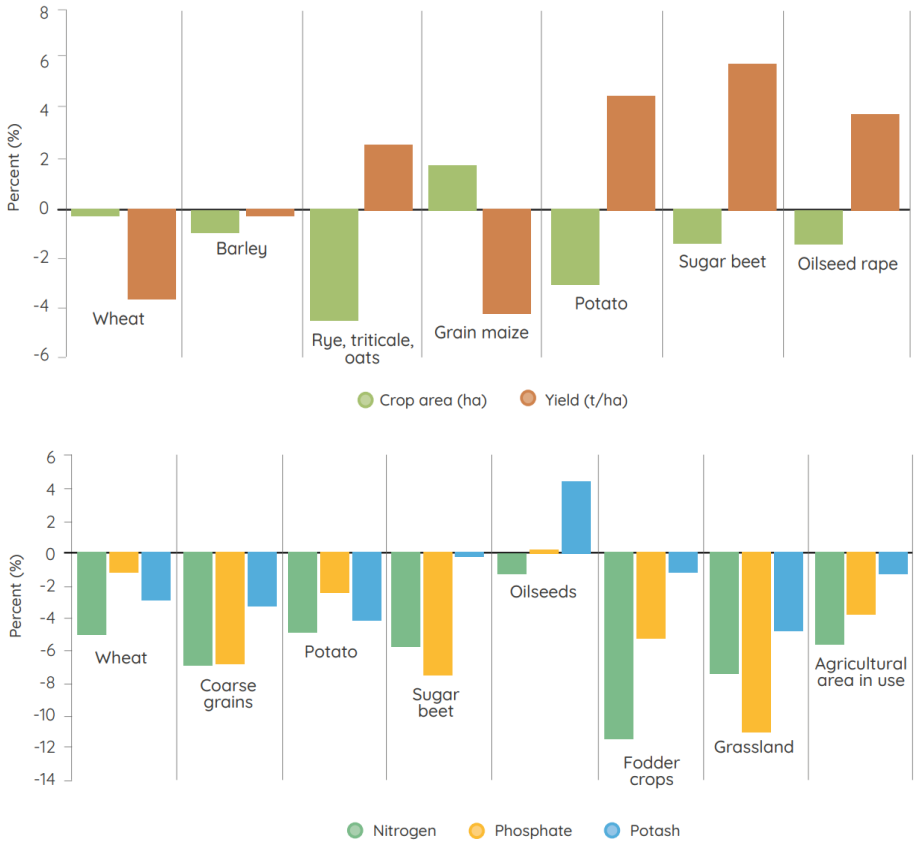
By end of decade a suite of EU policies projected to reduce fertilizer use across crops as wheat and maize yields drop

EU fertilizer allocation by activity (2022)



Source: Fertilizer Europe (2023)

Projected area, yield, and fertilizer use changes by crop (2021-31)



Source: Fertilizer Europe (2022)

Heterogeneity in agricultural production across Europe will lead to differential effects from CBAM

Observations from EU agriculture:

1) Fertilizer price: income and substitution effects will differ by crop and country

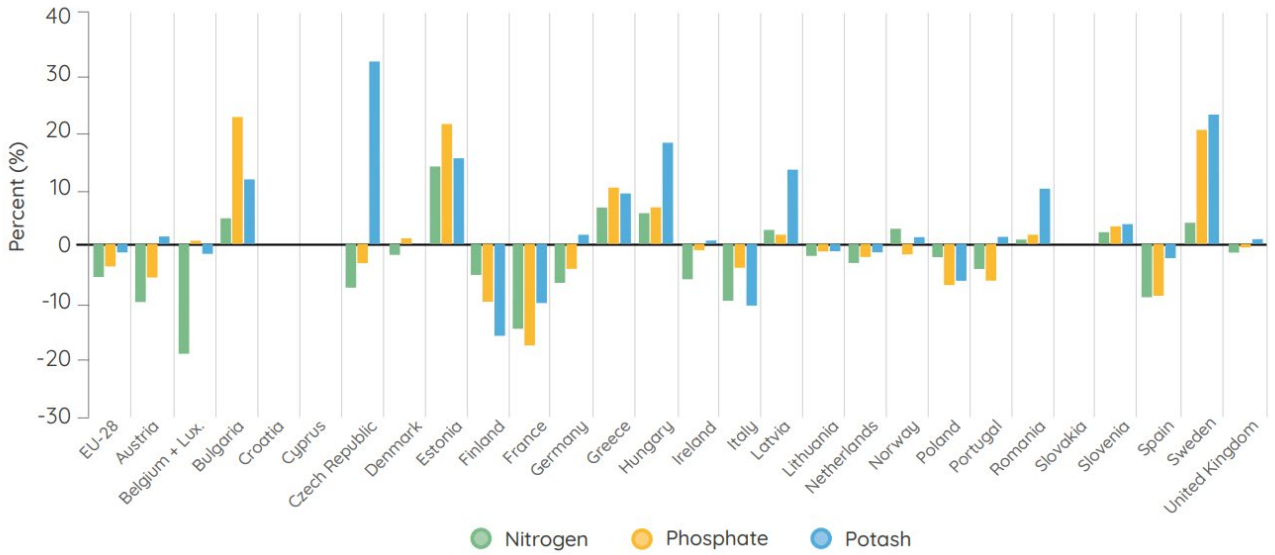
2) Farms located in Eastern EU countries are more diverse (size, cap), sensitive to CBAM

3) Fertilizer use is correlated with farm type

4) Relative to P and K, the EU produces and imports more N, which has highest EI & cost

5) Fertilizer imports vary across EU Members, Western shift to organic nutrients, vs. Eastern retains mineral/synthetic products

Projected synthetic fertilizer use changes by EU member (2021-31)



Source: Fertilizer Europe (2022)

Global fertilizer production, exports shares and greenhouse gas emissions

Top 5 producer countries generate large share of global fertilizer

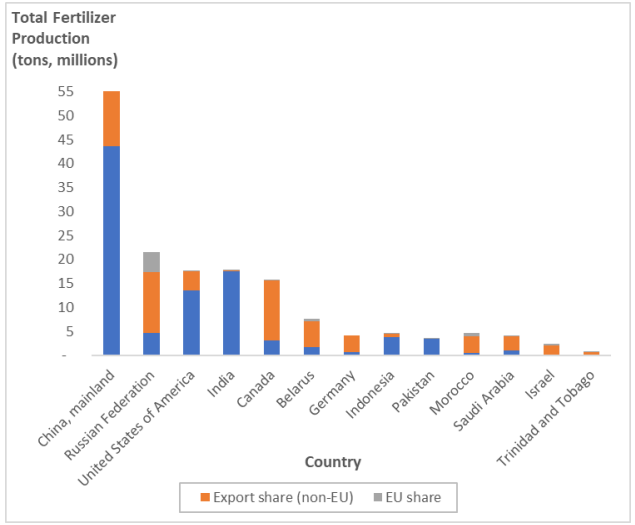
- Export shares driven by endowments
  - N: fossil fuel driven (China, U.S., India)
  - P: Morrocco & Russia
  - K: Russia, Belarus, & Canada

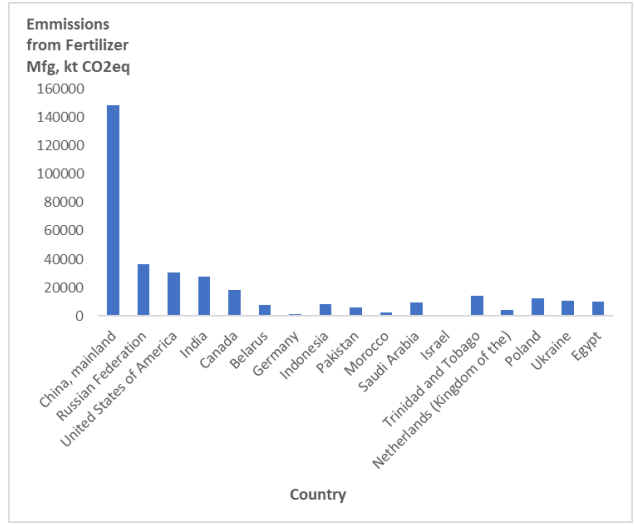
Russia is largest global supplier, incl. EU

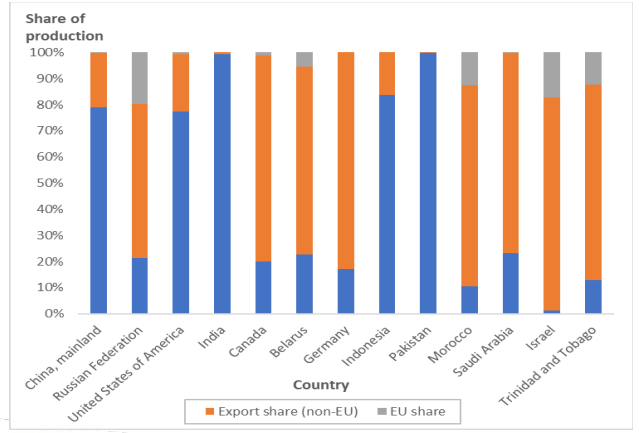
GHG emissions mirrors fert. production

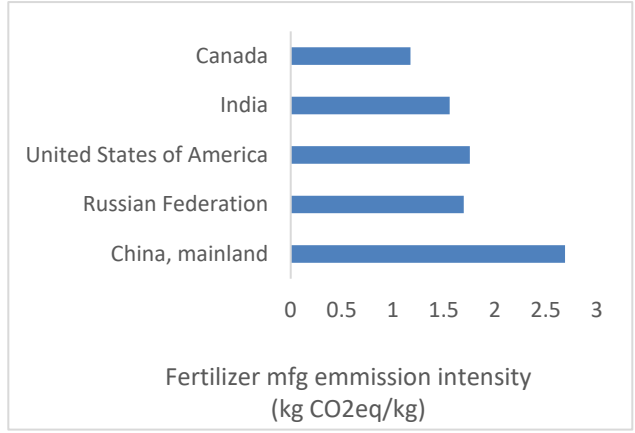
GHG intensity based on multiple factors:

- Technology; feed stocks; product mix (IPCC, 2006)



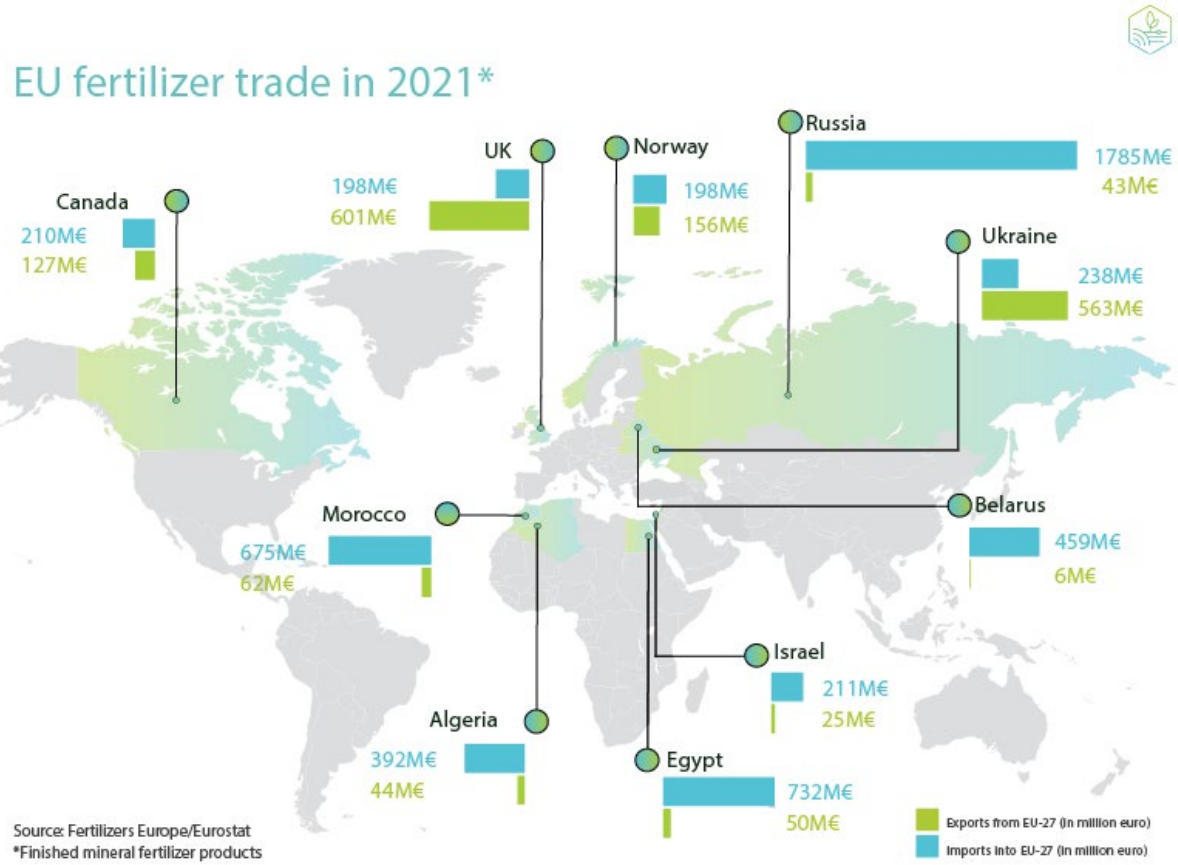






Source: Authors' calculations based on data from Trade Data Monitor (2023) and FAOSTAT (2023).

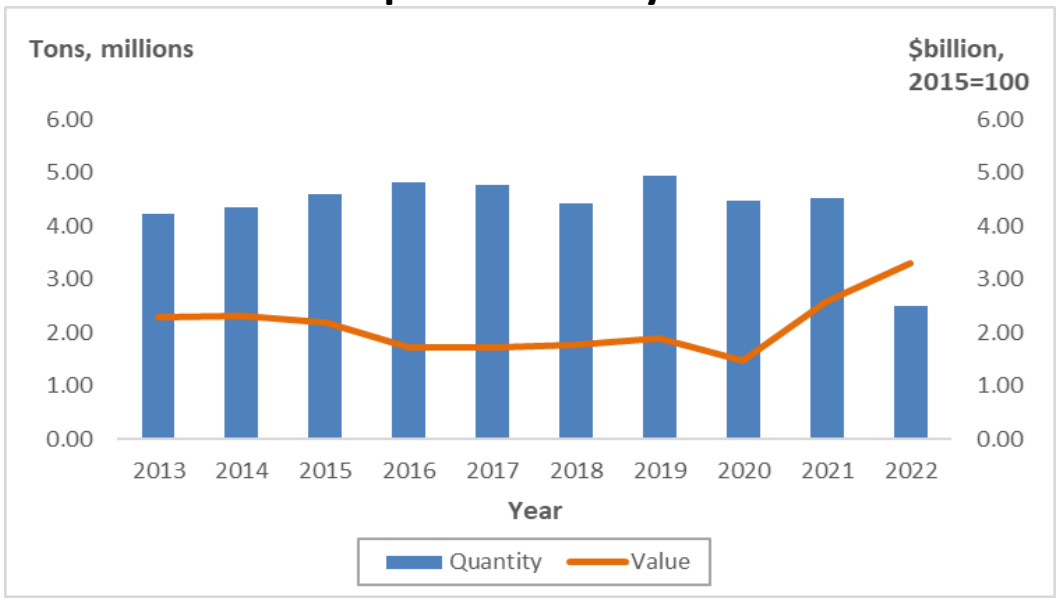
EU imports from Russia 2021—22 increased in value despite decreased volume under high fertilizer prices



Source: Fertilizer Europe (2023) based on data from Eurostat

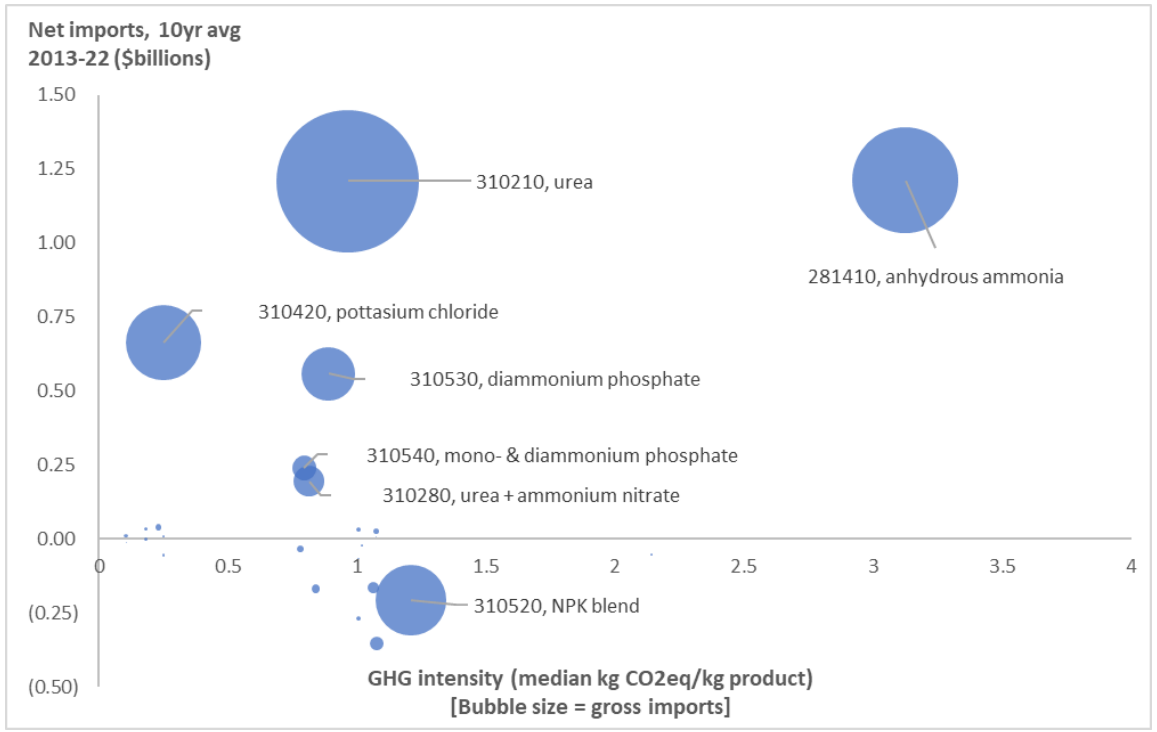
- COVID-related supply chain crisis and high natural gas price (2021)
- EU reduced production (2021—22)
- Russia's invasion of Ukraine (March 2022)

Russia fertilizer exports to EU by value and volume

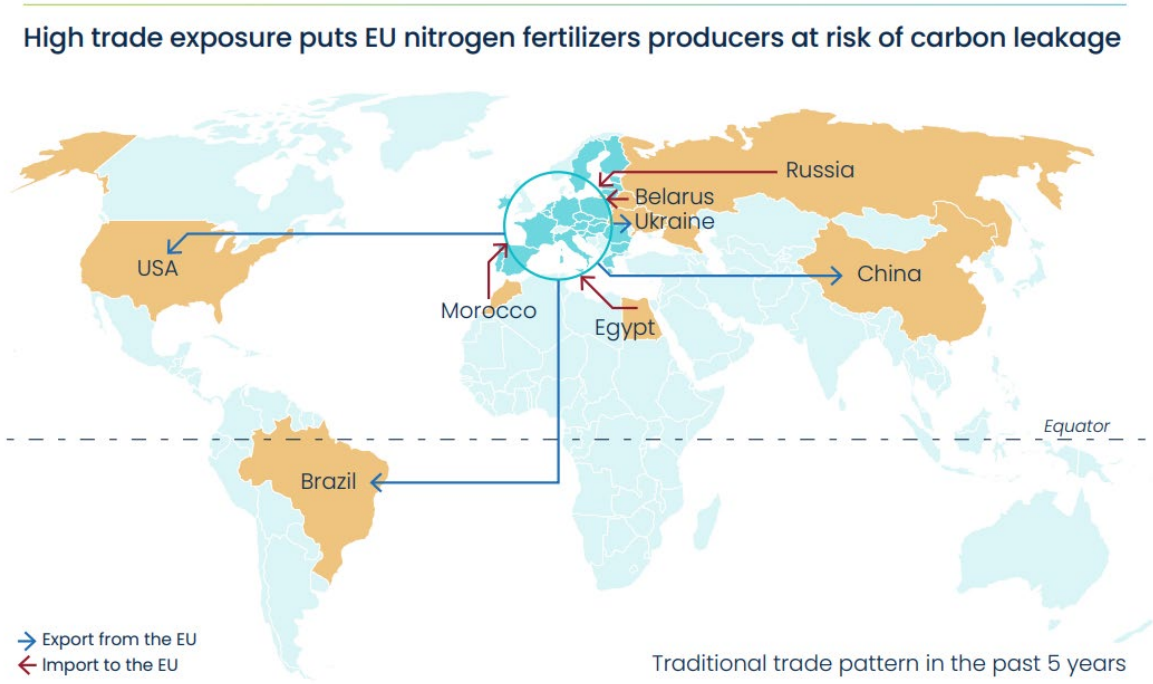


Source: Authors' calculations based on data from Trade Data Monitor (2023) and FAOSTAT (2023)

Trade and emissions breakdown by product shows dominance of N via Ammonia and Urea



Source: Authors' calculations based on data from Trade Data Monitor (2023) and Tubiello (2021).



Source: Fertilizer Europe (2023) based on data from Eurostat (2023)

EU fertilizer production under Emissions Trading Scheme expected to cost over half a billion dollars annually

- EU fertilizer production - nitrogen & blend
- ~50 fertilizer plants in Europe

ETS cost for the European fertilizer industry

	Ammonia	Nitric Acid	Total
ETS CO_2 emissions	30.6 million tonnes	4.3 million tonnes	
ETS CO_2 free allowances	24.0 million tonnes	4.6 million tonnes	
ETS CO_2 emissions to be paid	6.6 million tonnes	-0.3 million tonnes	
Cost of ETS CO_2 emissions	€530 million*	-€24 million*	**€506 million**

The European fertilizer industry pays around €500 million in ETS costs yearly for its ammonia and nitric acid production.

**Cost based on average price of €80/tonne CO_2*

Source: Fertilizer Europe (2023)

Map of fertilizer plants in Europe Source: Fertilizer Europe (2023)

EU fertilizer import breakdown by top 5 products and exporters covers about 85 percent of CBAM

Fertilizer product (HS-6 code) Percent: 10yr avg. & 2022	Value 10yr (2022)	Top 5 Exporters to EU 10yr (2022)				
Urea	World	Egypt	Russia	Algeria	Oman	Turkm.
(310210)	$1.714	32%	18%	18%	3%	2%
10yr: 23.7%; 2022: 33.3%	($5.271)	(32%)	(20%)	(20%)	(7%)	(3%)
Anhydrous ammonia (AA)	World	Algeria	Russia	T&T	Egypt	U.S.
(281410)	$1.274	33%	33%	13%	3%	2%
10yr: 17.6%; 2022: 21.1%	($3.335)	(33%)	(17%)	(20%)	(6%)	(5%)
Potassium chloride (KCL)	World	Russia	Belarus	Canada	Israel	Jordan
(310420)	$0.907	28%	27%	19%	10%	4%
10yr: 12.5%; 2022: 8.2%	($1.306)	(11%)	(3%)	(51%)	(15%)	(13%)
NPK blend	World	Russia	Norway	U.K.	Morocco	Serbia
(310520)	$0.855	48%	18%	5%	4%	4%
10yr: 11.8%; 2022: 8.3%	($1.308)	(44%)	(26%)	(4%)	(9%)	(9%)
Diammonium phosphate	World	Morocco	Russia	Tunisia	Egypt	Turkey
(310530)	$0.643	50%	24%	12%	4%	4%
10yr: 8.9%; 2022: 4.5%	($0.714)	(54%)	(23%)	(9%)	(5%)	(4%)

Source: Authors' calculations based on data from Trade Data Monitor (2023).

Fertilizer in CBAM and ETS framework affects agri-food sector, highlighting importance of nitrogen and imports from Russia

Key introductory takeaways:

- EU reliance on Russia imports
  - Observed shifts in 2022
- Sensitivity to CBAM varies by product and region
  - Wheat and maize
  - Livestock feed prices
  - Central-Eastern Members greater import reliance

Next presentations and steps:

- Translating CBAM and ETS into food prices, trade and welfare effects via CGE modeling
- Effective mitigation (e.g., Devarajan et al.)
- Vertical market integration effects (e.g., Sheldon and McCorriston)
- Fertilizer partial elasticities of production and substitution for EU and by Member State
- EU policy and WTO, consideration of compliance (e.g., Martin)
- CBAM extended to agri-food industry (e.g., Ivanic and Beckman)

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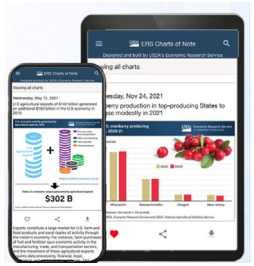

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ANNEX: Promising paths to mitigate possible CBAM and ETS related yield reductions include replacing synthetic with organic fertilizers enhanced plant breeding and agronomic practices

Organic fertilizer:

- Western members' higher rates

New genomic technologies (NGTs):

- CRISPR and gene editing policy
- GMOs: animal feeds and biofuels

No-till production systems:

- Crop rotations, green manure, etc.

Precision agriculture:

- Remote sensing
- Robotics and

R&D investment:

- CBAM + ETS = ~$1billion annual tax?