



Knowledge grows

Yara Fertilizer Industry Handbook

December 2012



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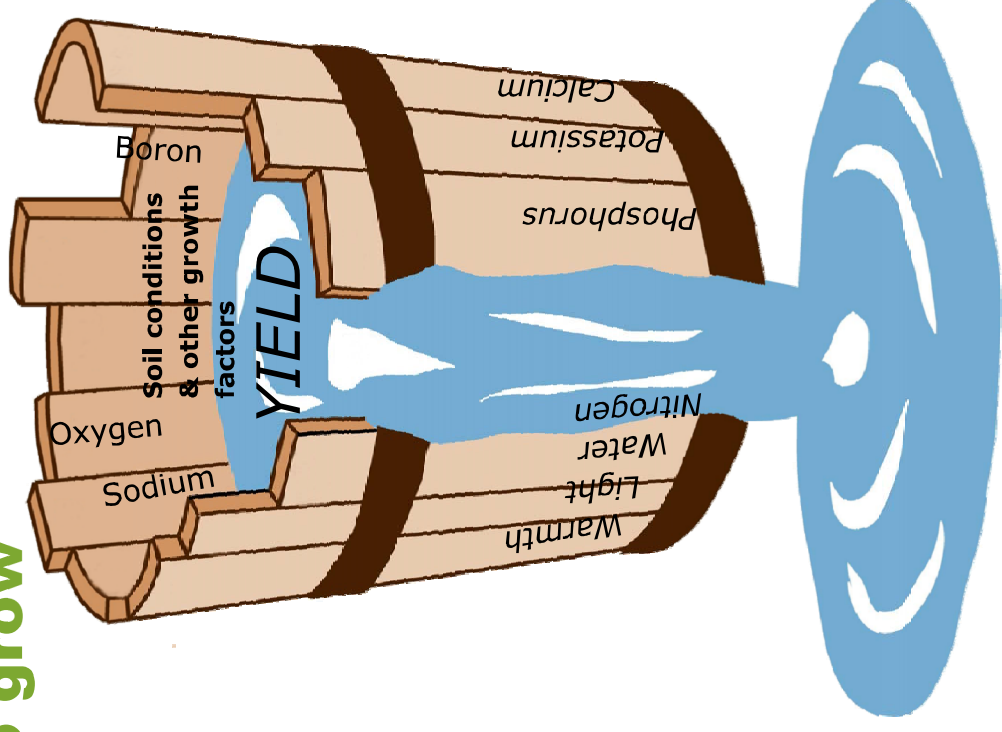


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What is fertilizer?

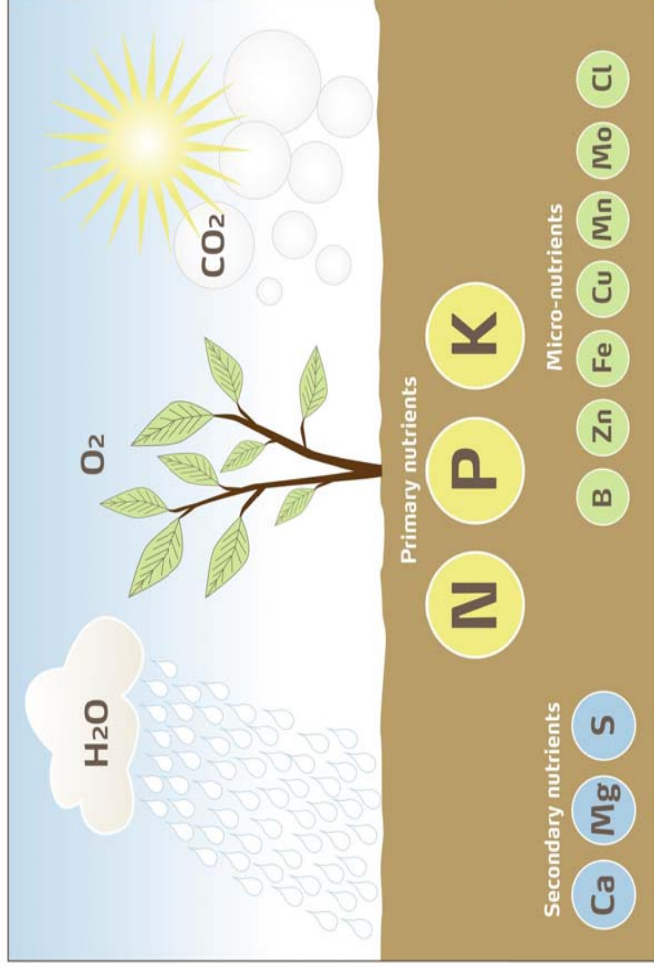
Plants need nutrients to grow

- Nutrient behavior
- Nutrients have specific and essential functions in plant metabolisms
 - They cannot replace each other, and lack of any one nutrient limits crop growth



What is fertilizer?

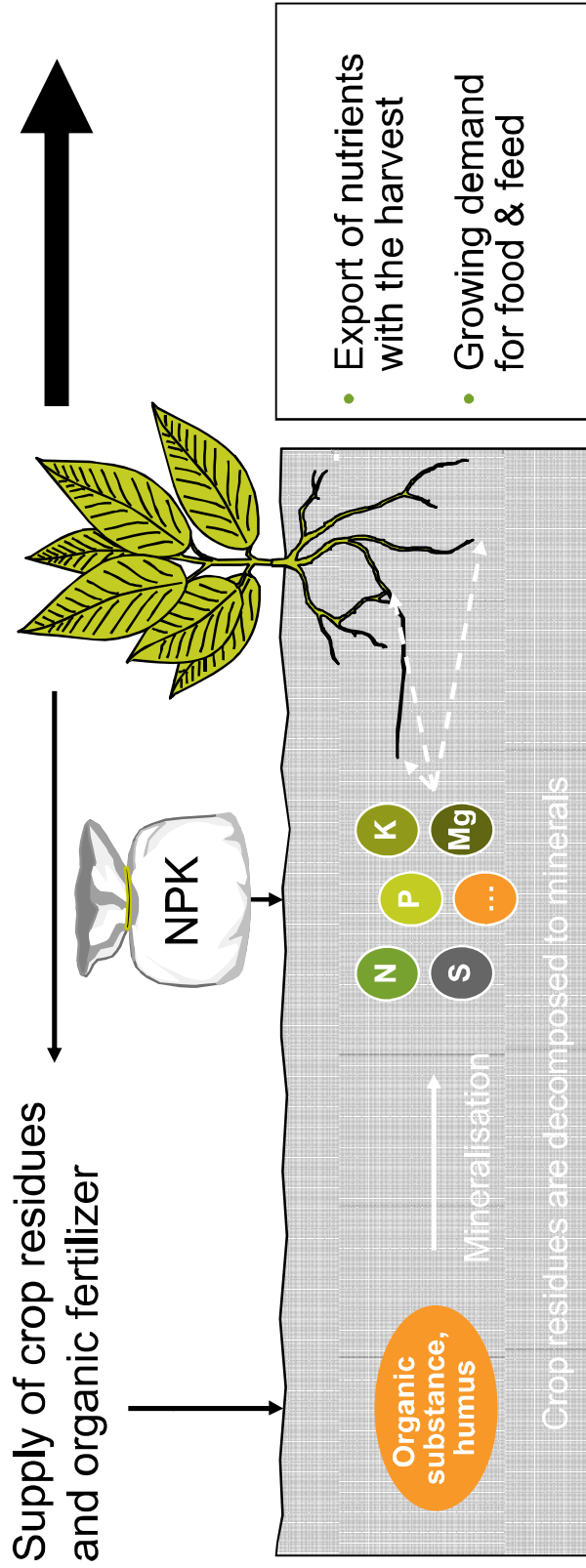
Primary, secondary and micro-nutrients



Nitrogen is the main driver of yield



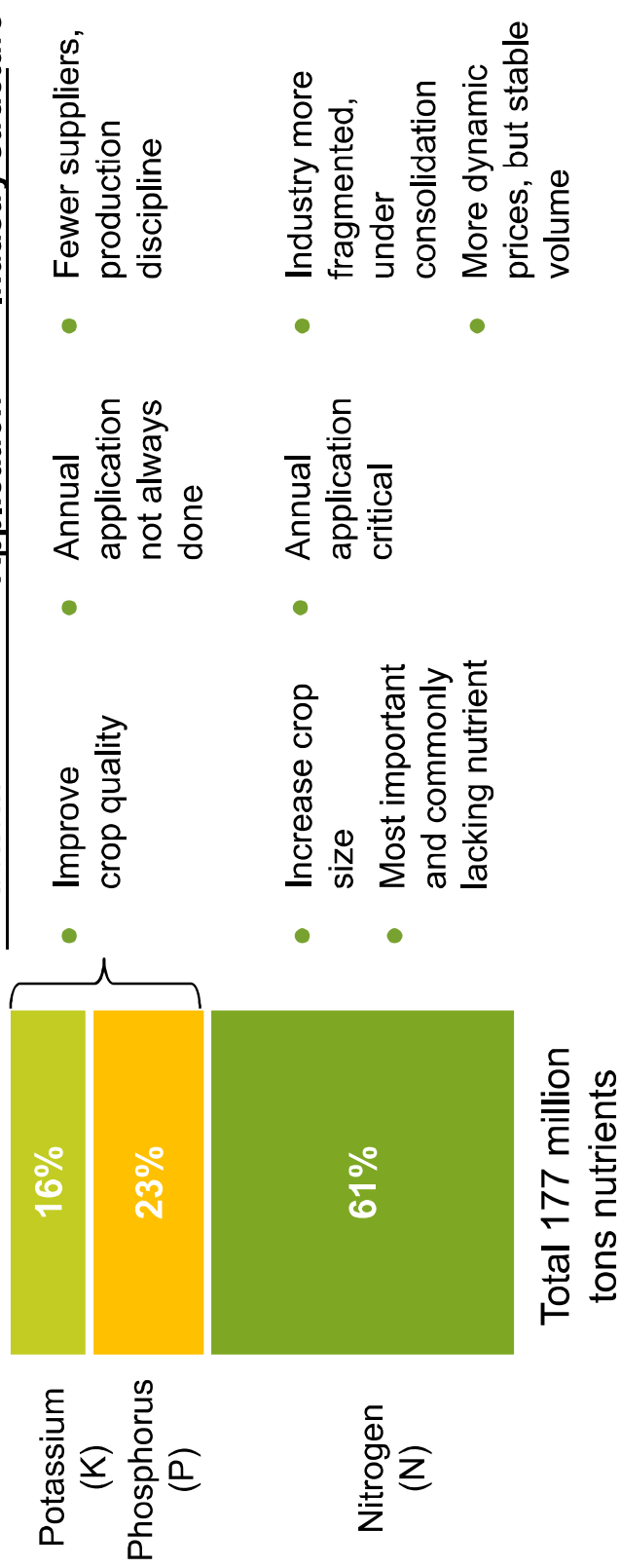
Why mineral fertilizer ?



Mineral fertilizers are necessary to replace those nutrients that have been removed from the field



Nitrogen – the most important nutrient



Source: IFA (season 2010/11)

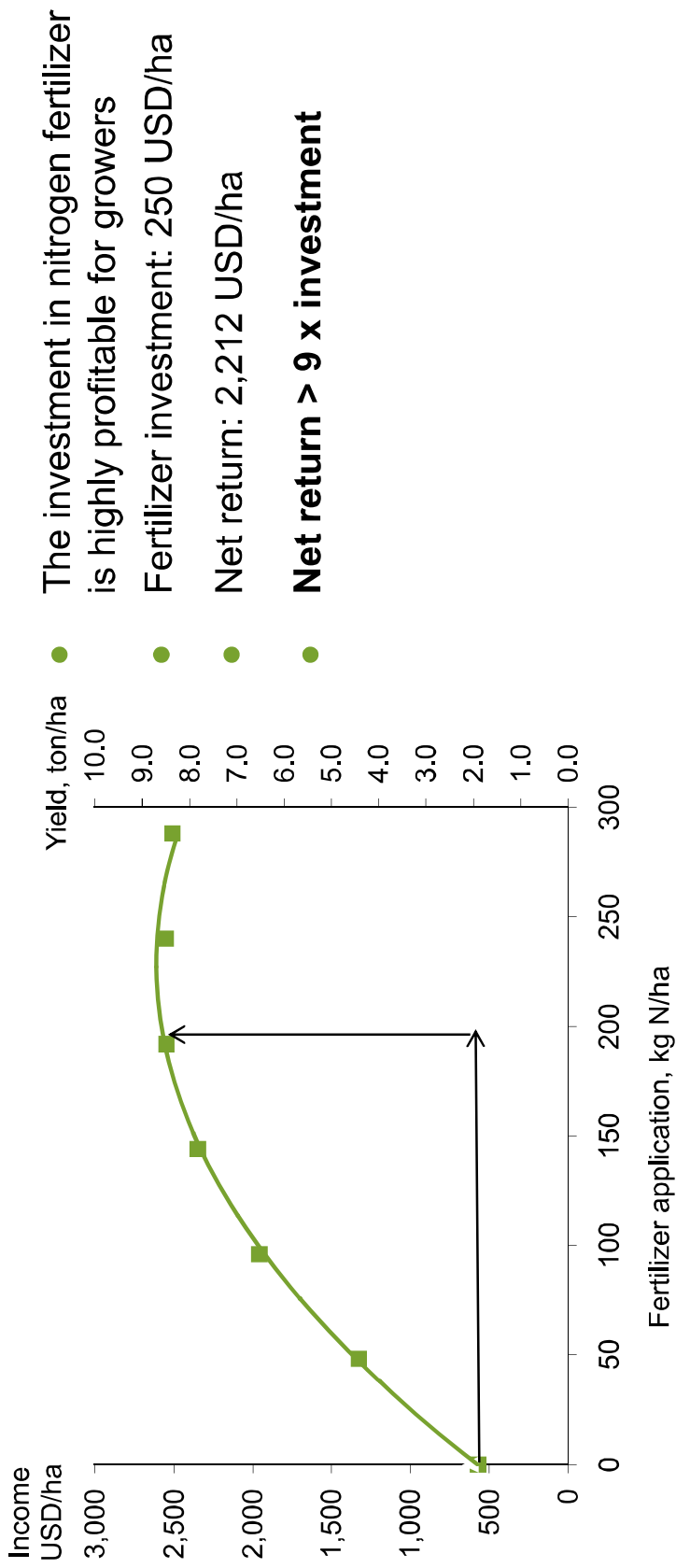


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Profitability of investment in mineral fertilizers

Yield response (monetary value) to N fertilizer rate



- The investment in nitrogen fertilizer is highly profitable for growers
- Fertilizer investment: 250 USD/ha
- Net return: 2,212 USD/ha
- **Net return > 9 x investment**

Source: Winter wheat yield data: Long term trial, Broadbalk, Rothamsted (since 1856).

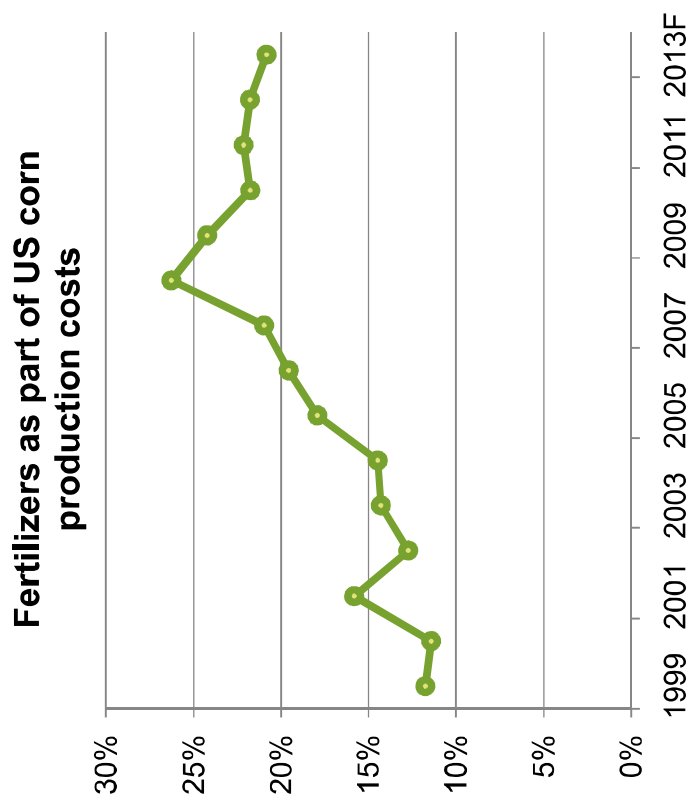
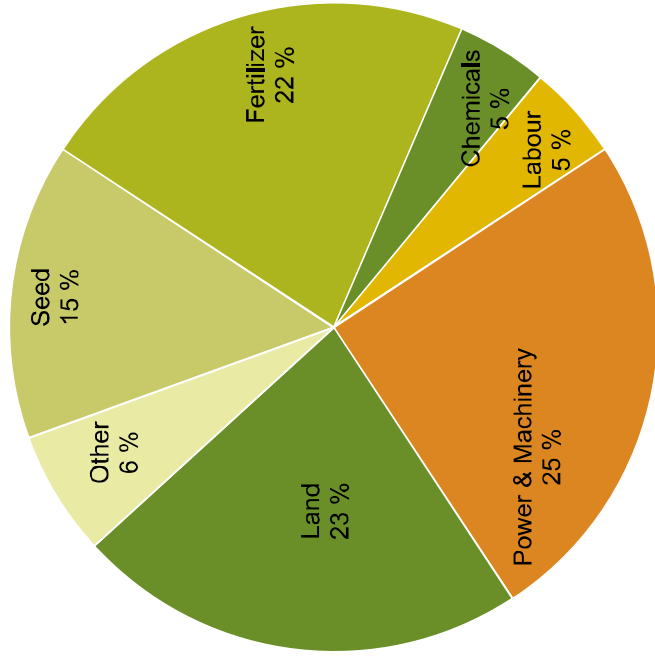


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Breakdown grain production costs

Example: 2012F average US corn production costs



Source: USDA (Cost-of-production forecasts May 2012)

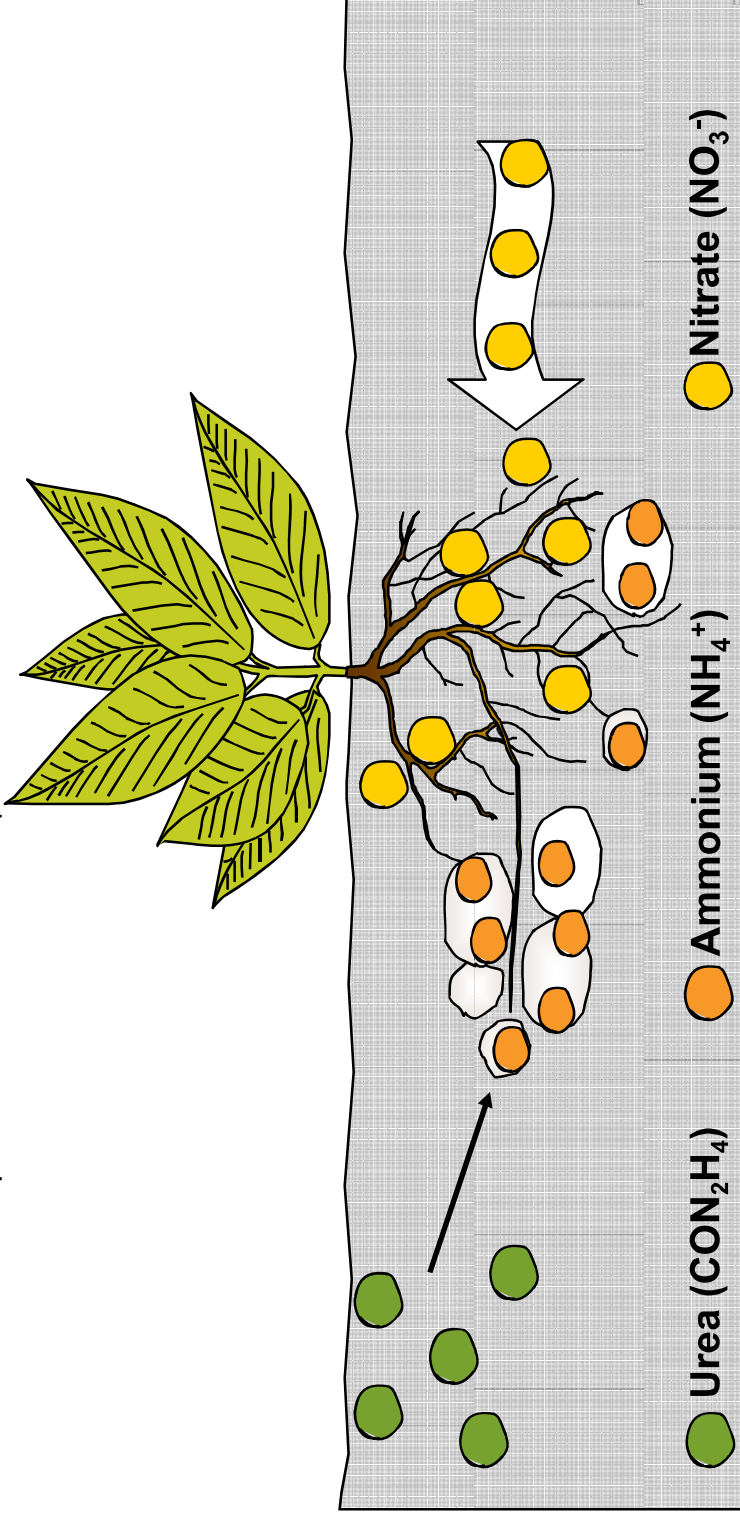


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Nitrates vs. urea

Nitrate is the most important fertilizer in Europe



Urea-N needs to be converted into ammonium-N before it is plant available.

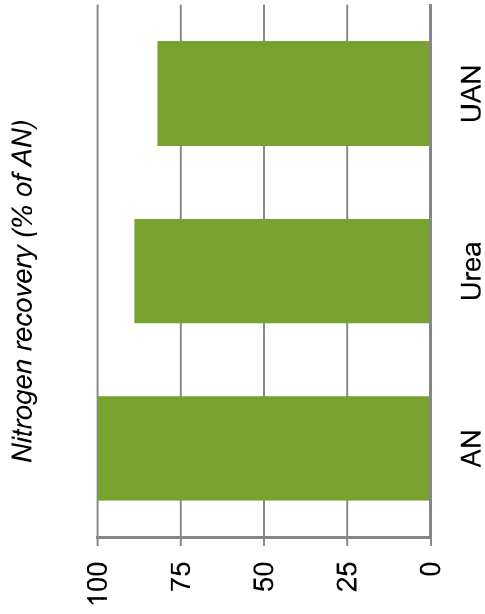
Ammonium-N is fixed onto clay minerals in the soil and therefore immobile. The plant roots have to grow actively towards the nutrient.

Nitrate-N is always dissolved in the soil water and is transported passively together with the water into the plant root. Thus, nitrate is rapidly effective.



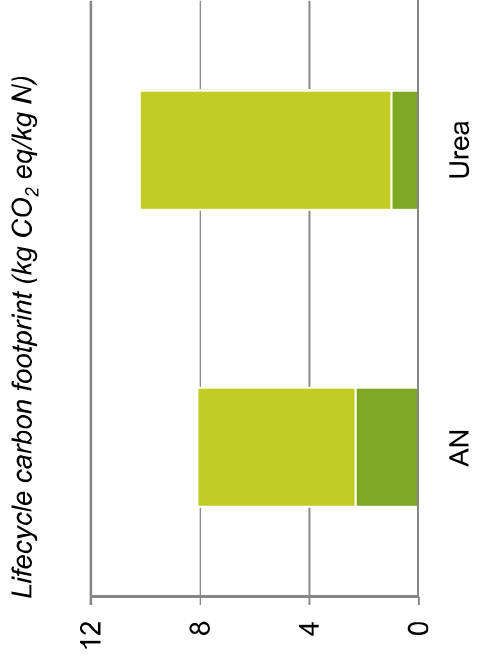
Nitrate-based fertilizers are superior to urea both agronomically and environmentally

The agronomical efficiency of nitrates is superior to urea



Urea requires up to 20% higher N application to achieve same cereal crop yield and quality as AN

The carbon footprint is lower than for Urea



Although urea is more CO₂ efficient in production, CO₂ emissions and ammonia volatilization on application more than offset for this

Source: DEFRA (2006), NT26 project report; Fertilizer Europe; 2EMEP/EEA air pollutant emission inventory guidebook (2007); Yara

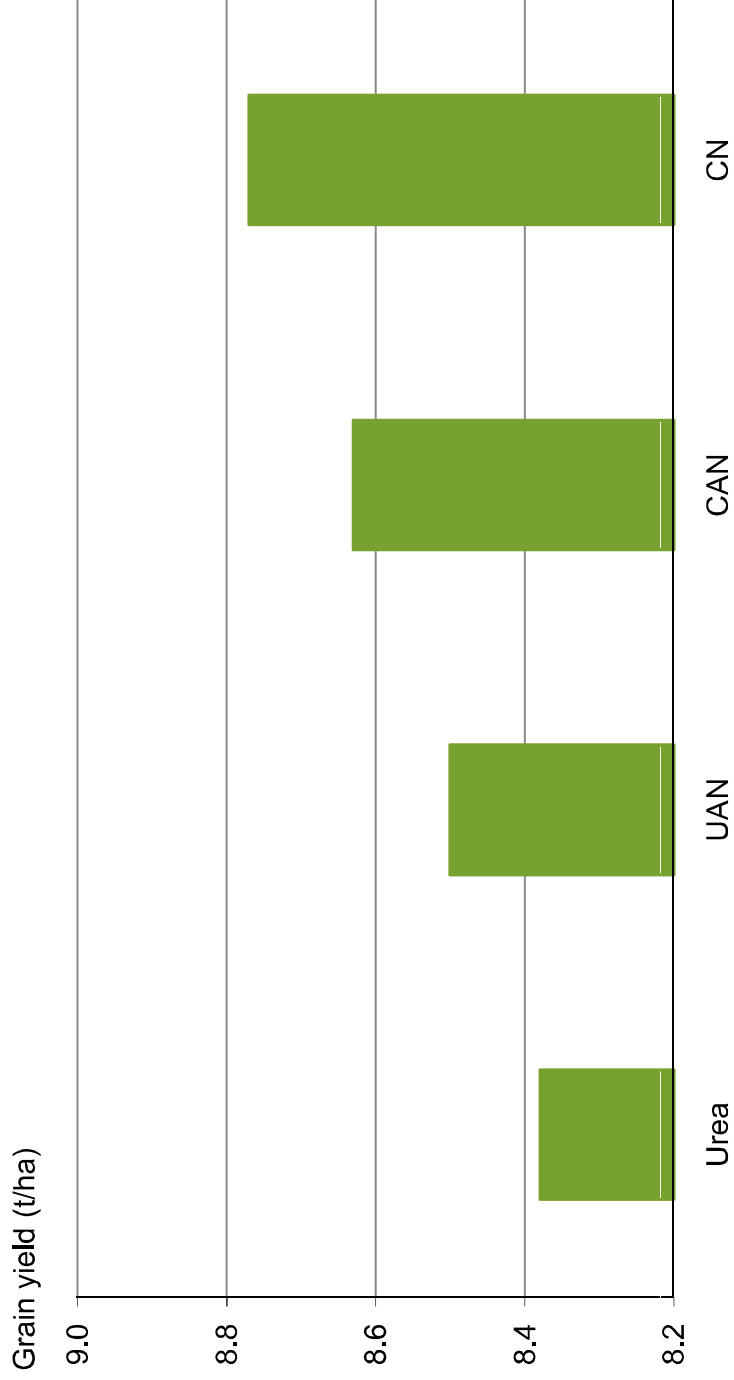


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Trial results in arable crops

Winter wheat trials in UK from 1994-98
Application rate of 160 kg of N/ha



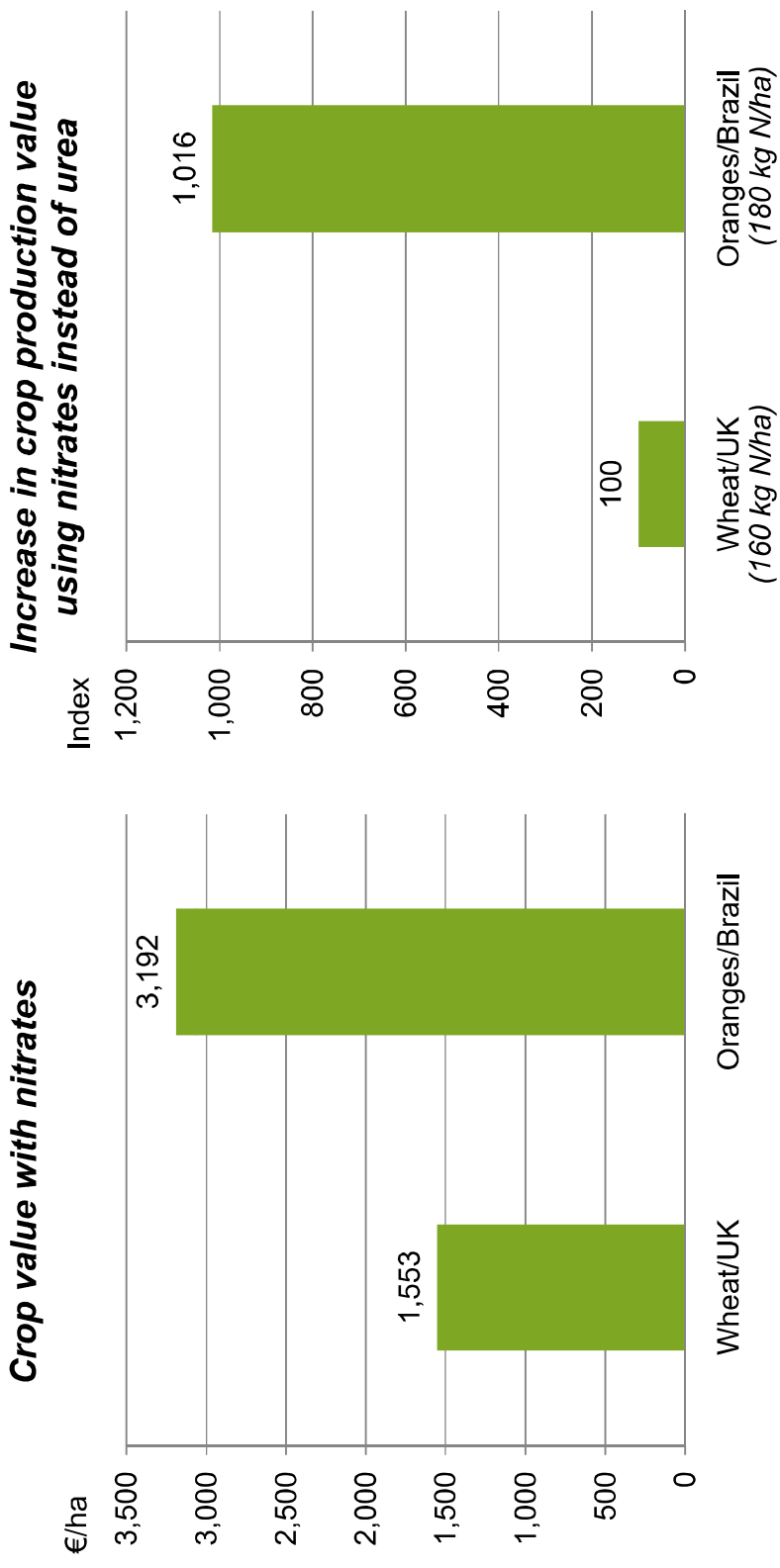
Source: Levington Agriculture, UK (1999)



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Nitrates' agronomic advantage has higher value for cash crops than for commodity crops

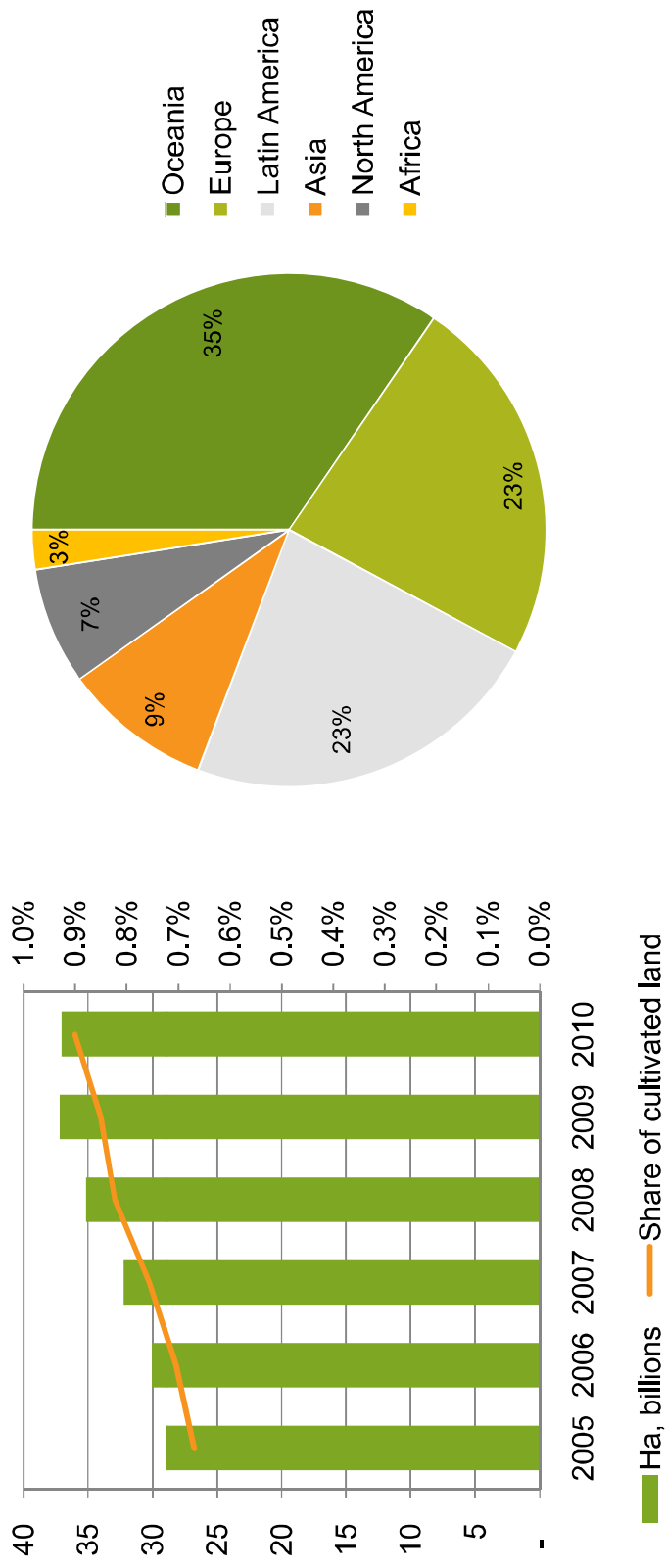


Fertilizer characteristics: Organic compared to mineral fertilizer

Characteristics	Organic fertilizer	Mineral fertilizer
Nutrient source	Crop residues and animal manures	Nitrogen from the air and minerals from the soil
Nutrient concentration	Low concentration	High concentration
Nutrient availability	Variable	Immediately available for the crop
Quality	Often inconsistent	Traceable and consistent



Organic farming represents only a marginal share of total cultivated land



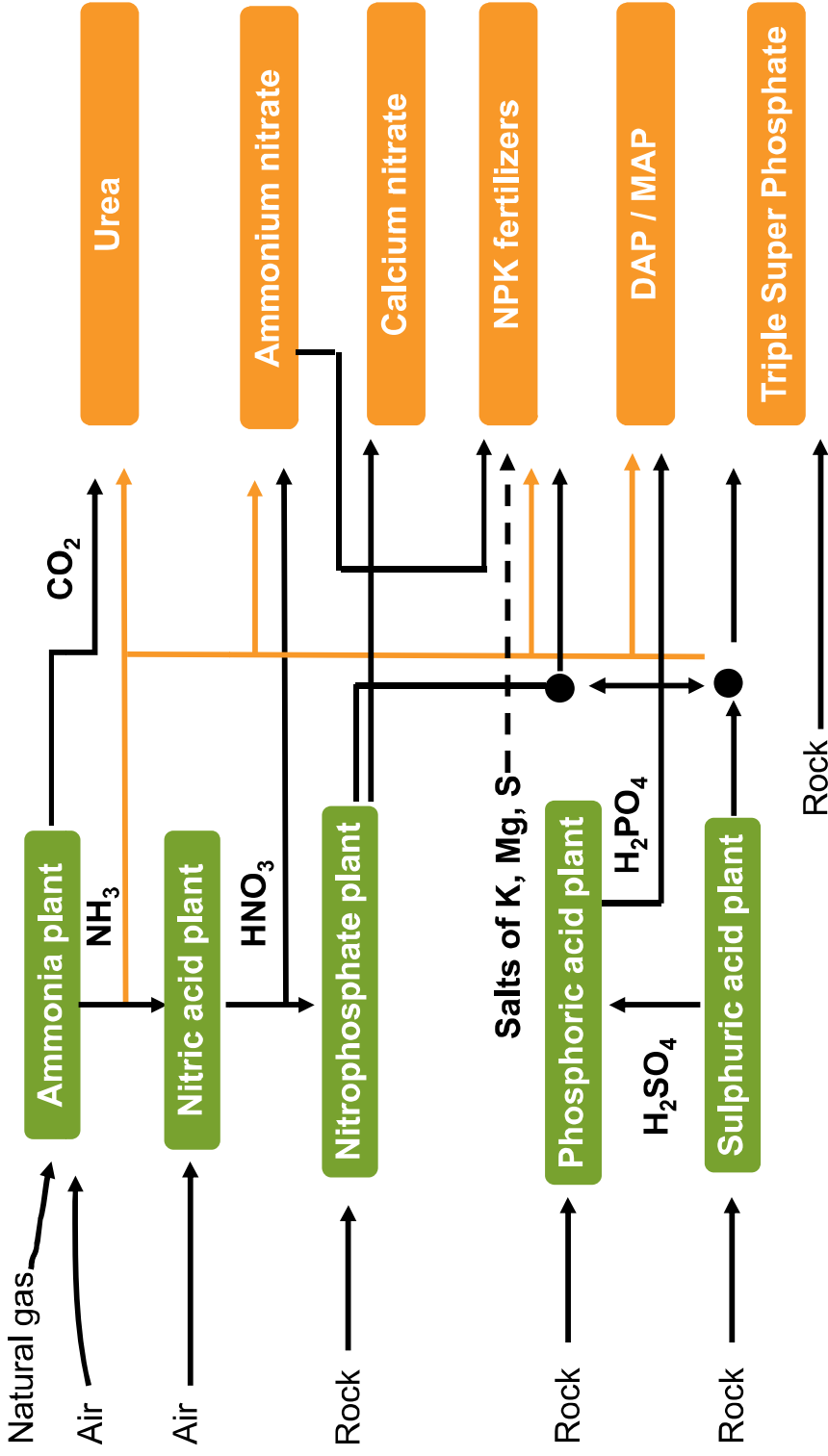
Source: Organic-world.net



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Fertilizer production routes



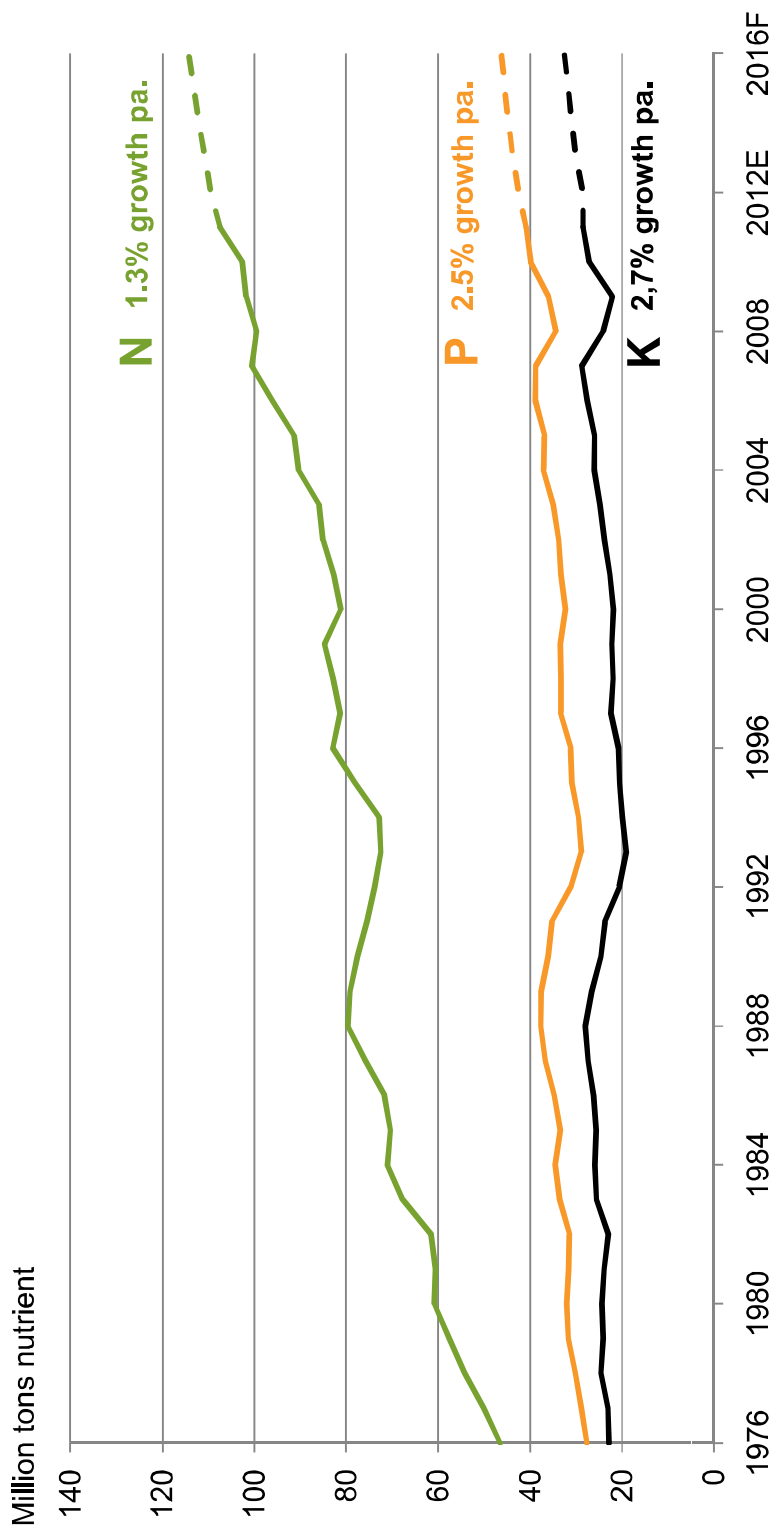


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The fertilizer industry



Consumption per nutrient



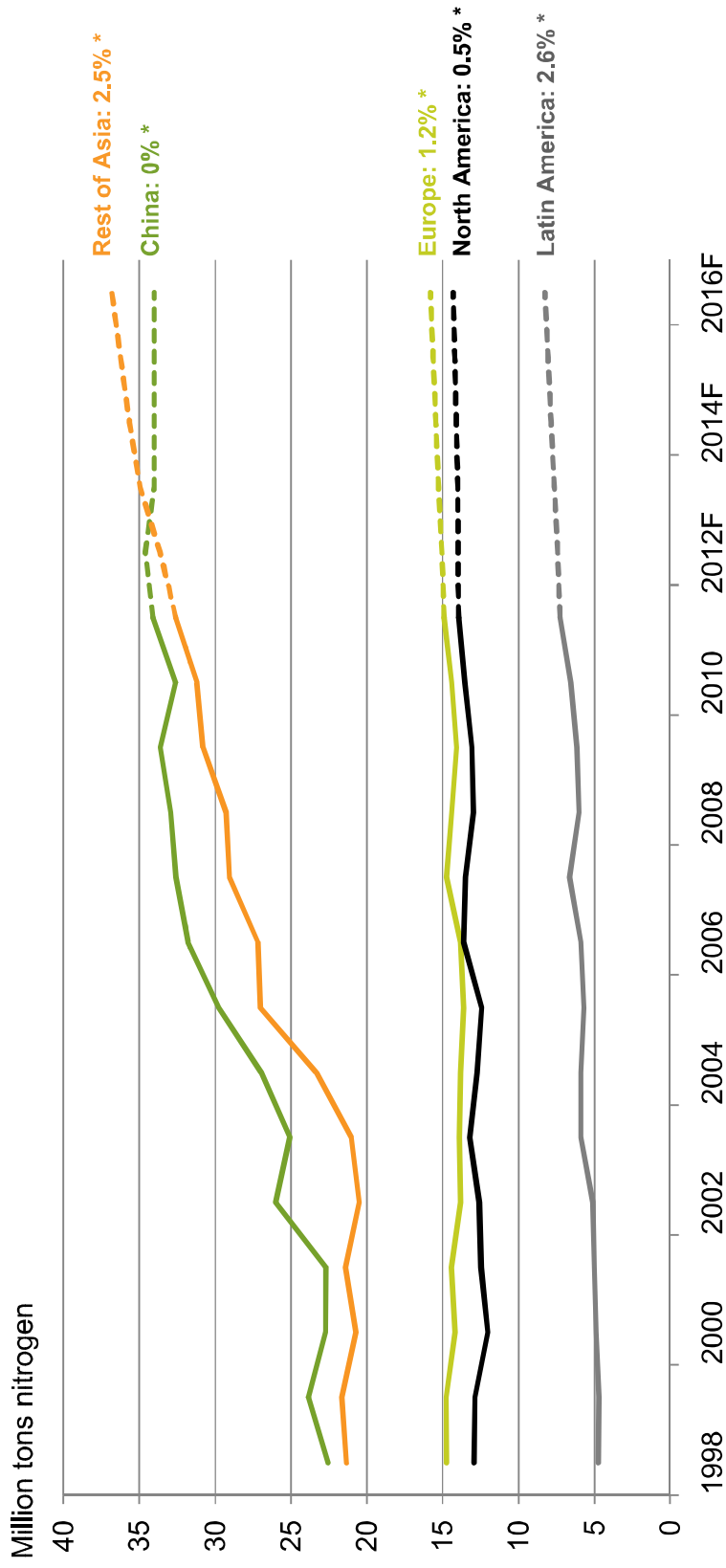
Source: IFA, June 2012



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Nitrogen consumption in key regions



Source: IFA, May 2011

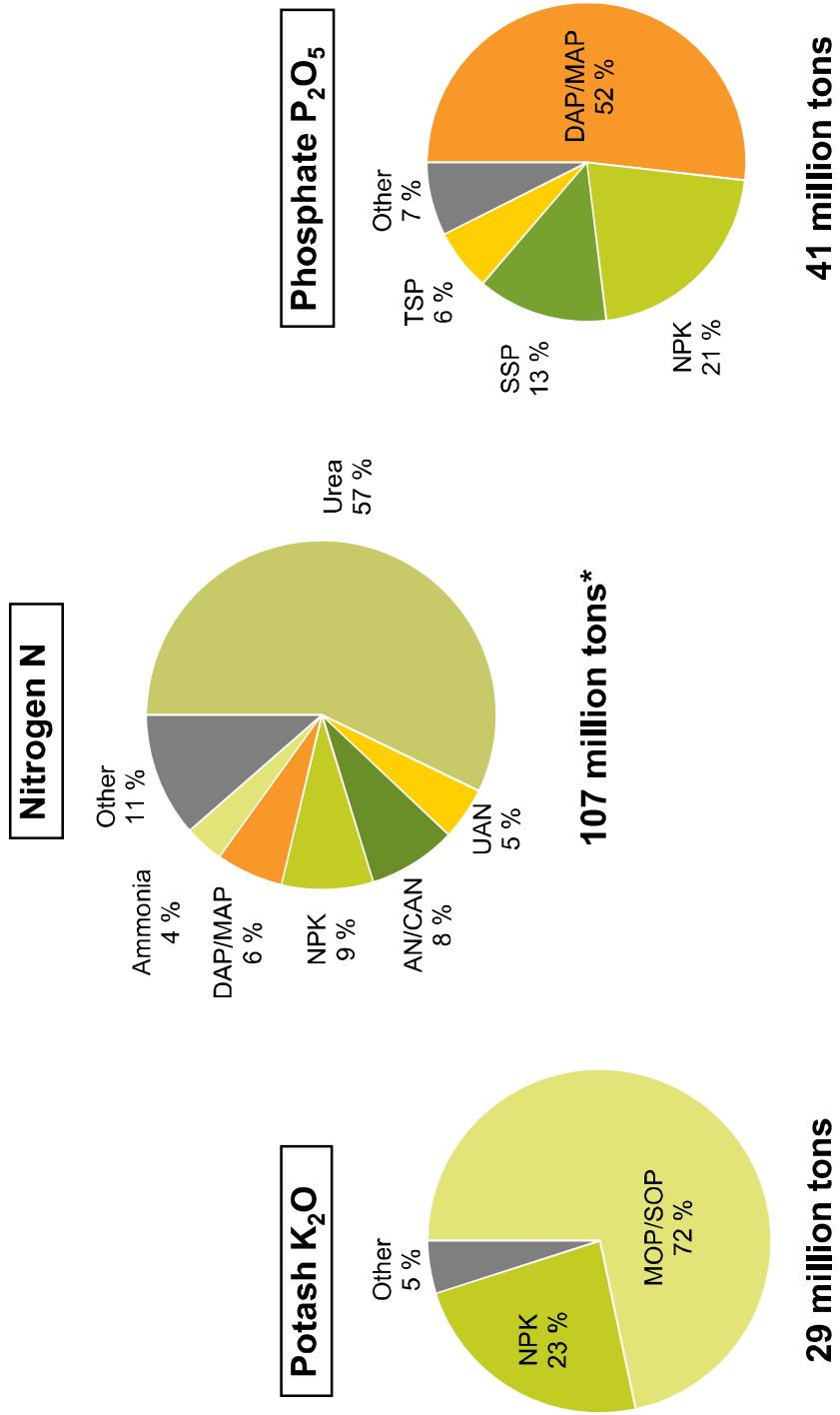
* CAGR 11-16



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Key global fertilizer products



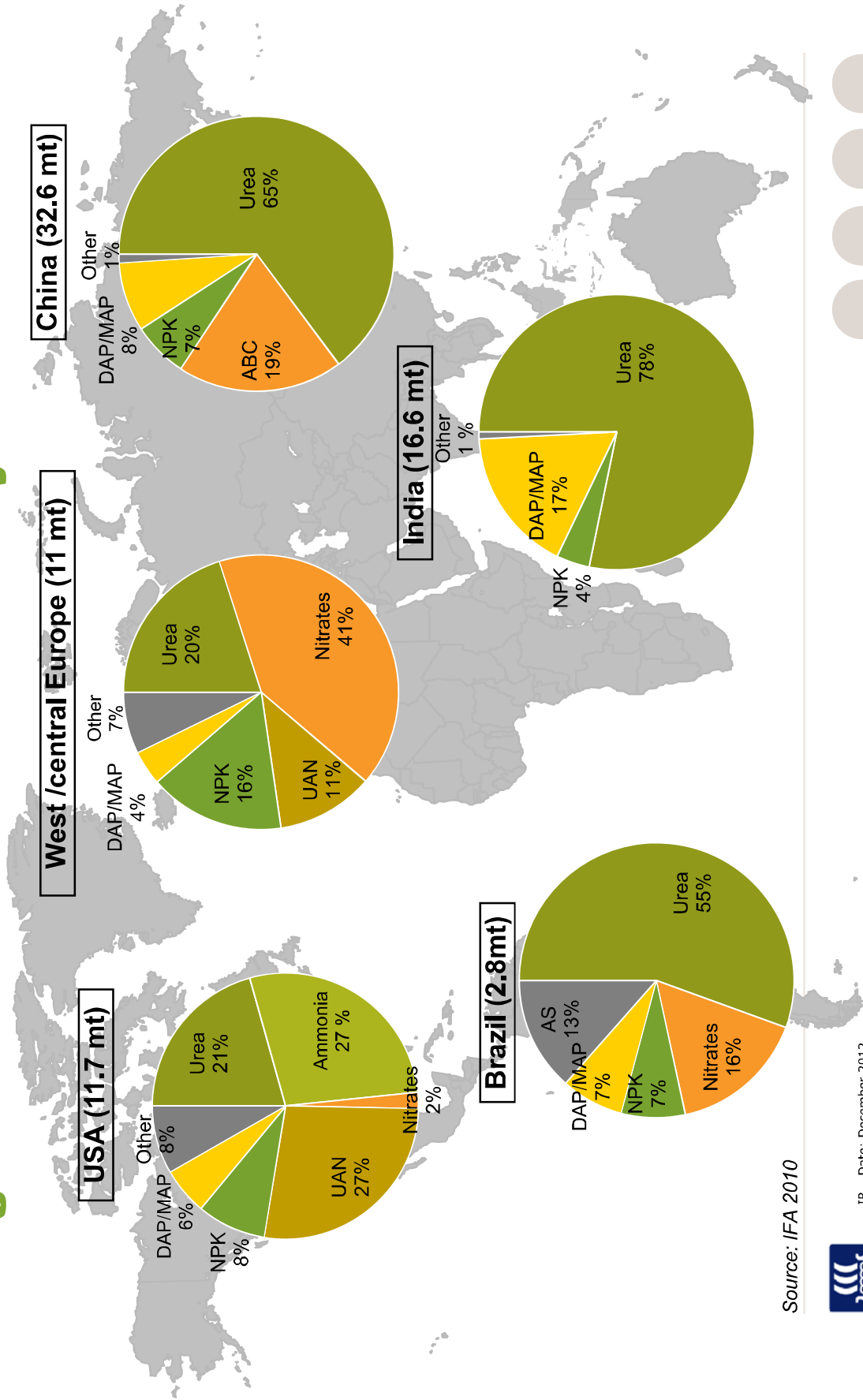
Source: IFA 2011 (nutrient totals) and 2008 (product split) * Does not include industrial nitrogen applications



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Nitrogen fertilizer demand – 5 key markets



Source: IFA 2010

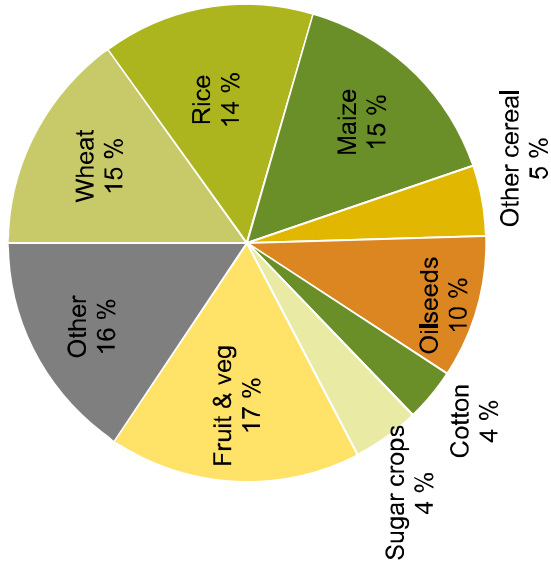


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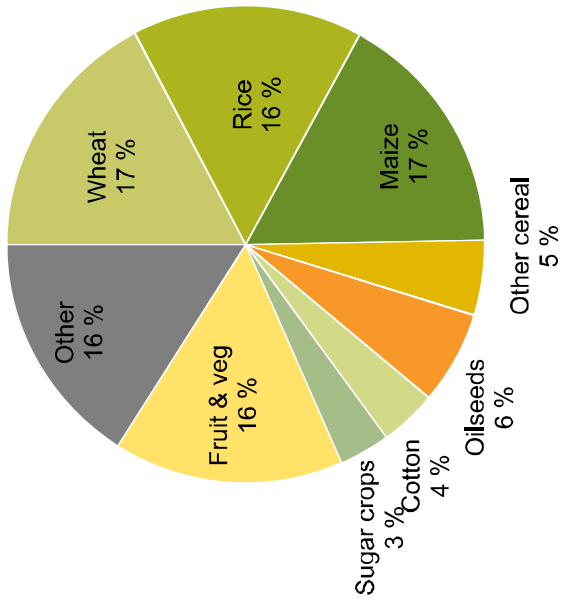


Nutrient application by crop

N + P + K



NITROGEN



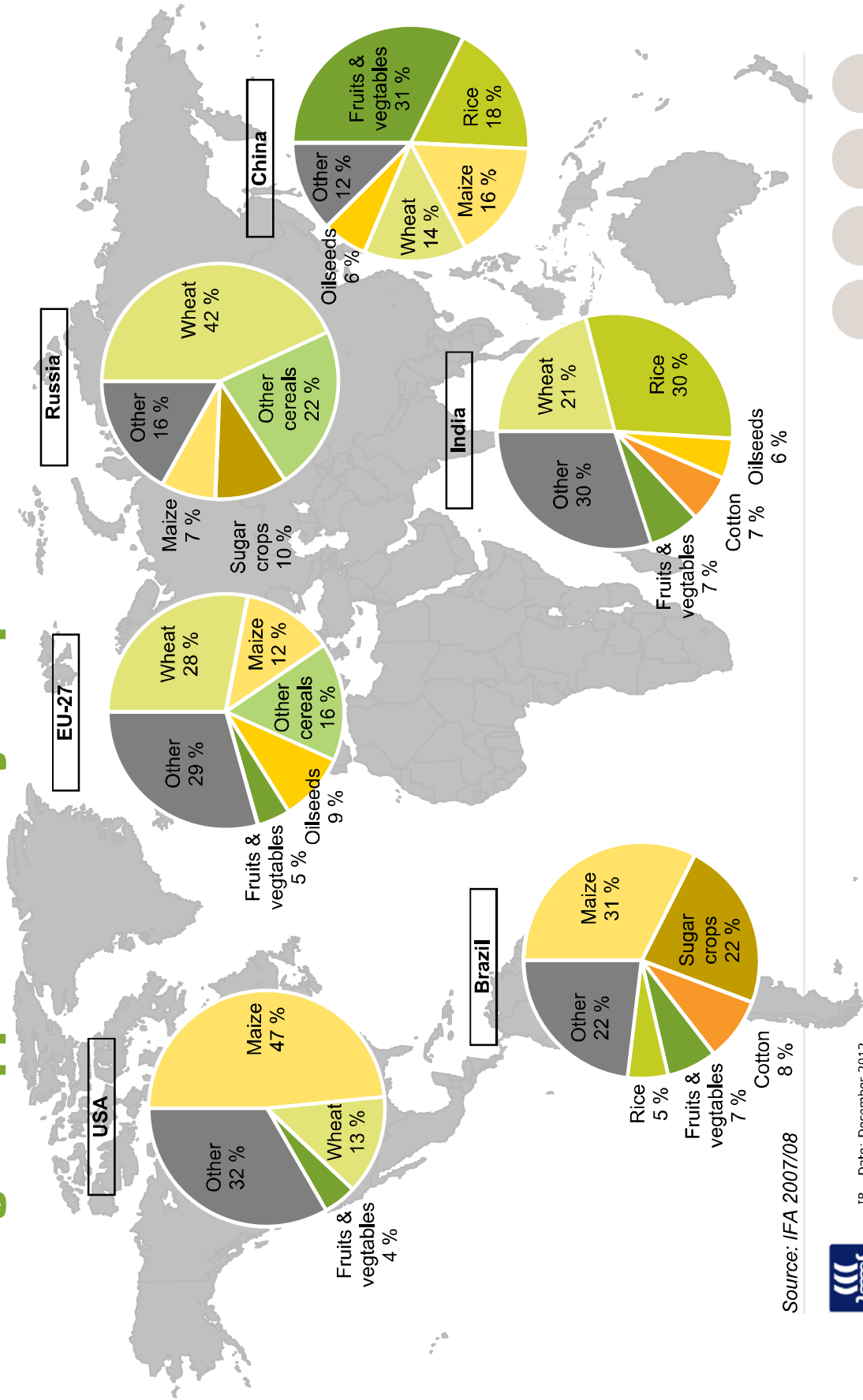
Source: IFA (2007/08)



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Nitrogen application by crop



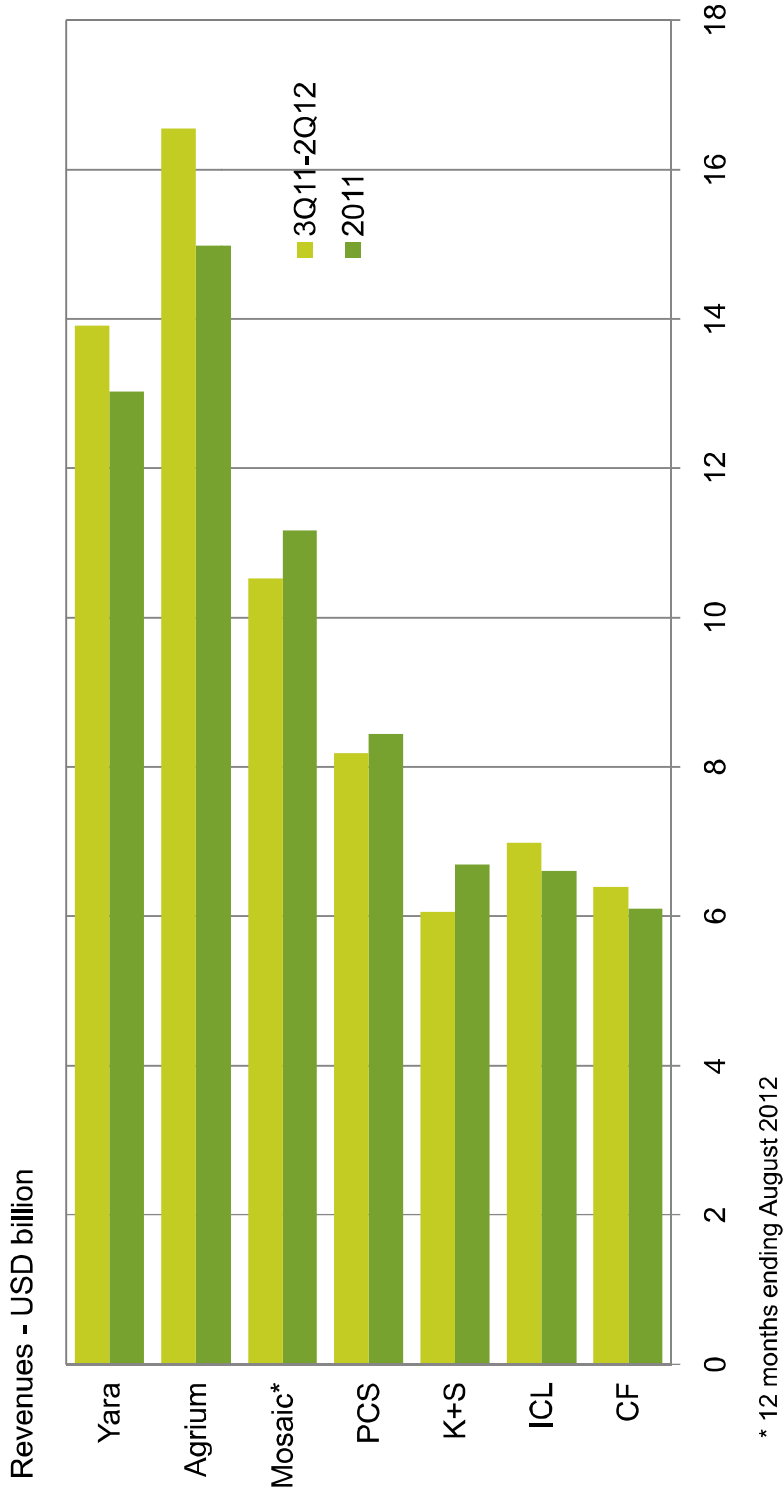
Source: IFA 2007/08



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Fertilizer company comparison



Source: Thomson Worldscope



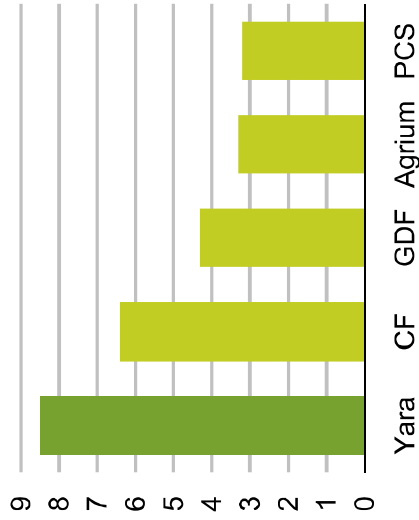
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Yara – the leader in nitrogen fertilizers

Global no 1 in ammonia

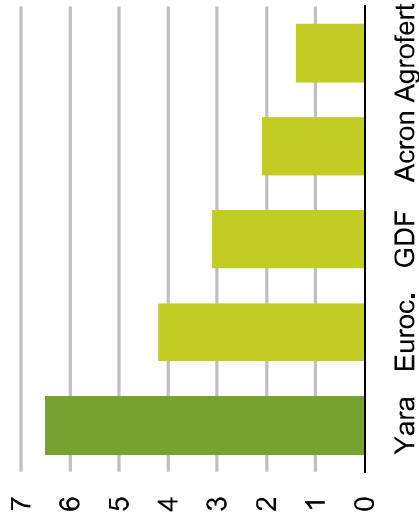
Production capacity* (mill t)



* Incl. companies' shares of JVs
Source: Yara & Fertecon

Global no 1 in nitrates

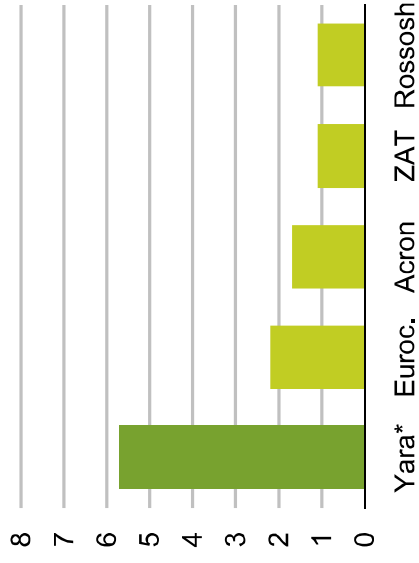
Production capacity* (mill t)



Source: Fertilizer Europe

Global no 1 in NPK complex fertilizer

Production capacity* (mill t)



Source: Fertilizer Europe

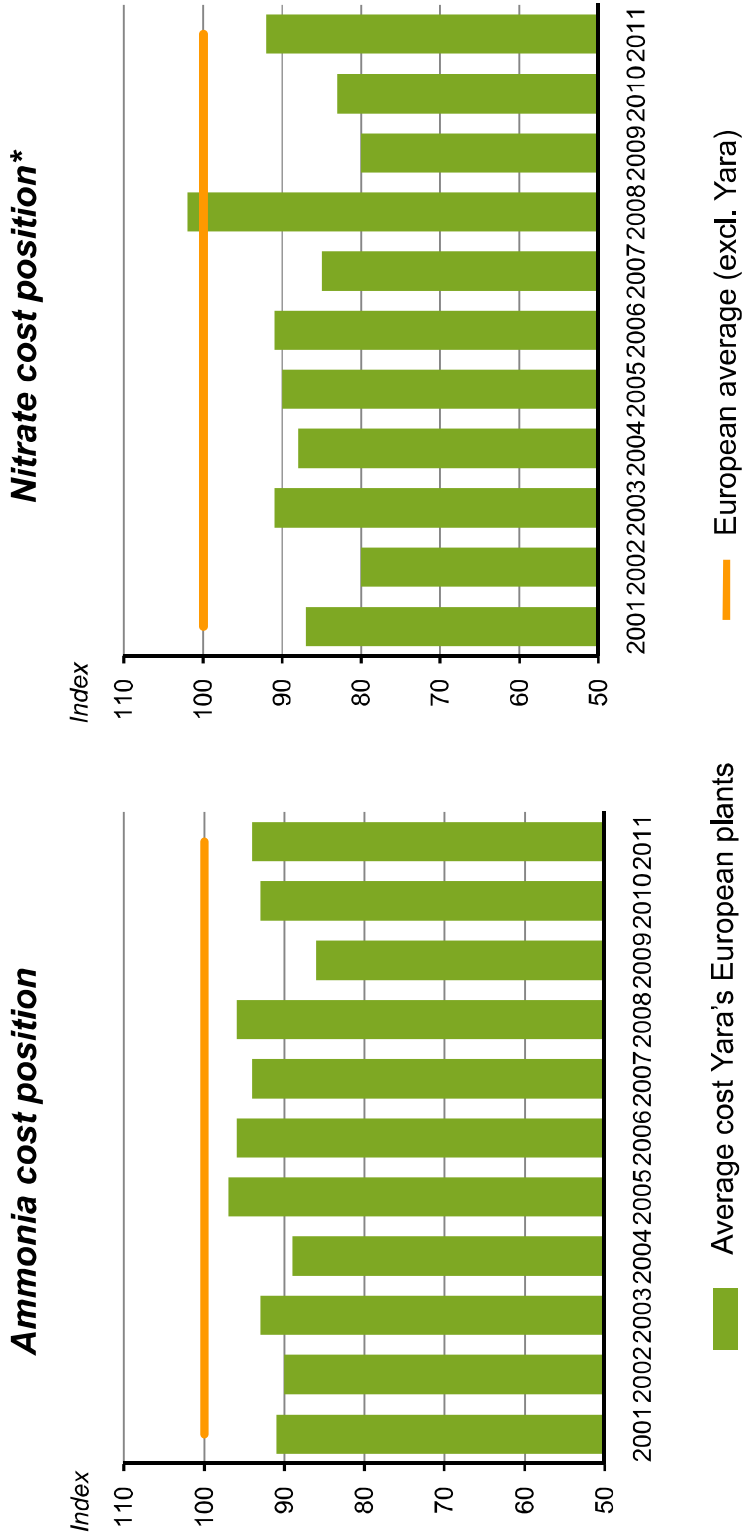


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Yara – the European cost leader

Production cost index: 100 = European EFMA average excl. Yara



Source: Fertilizer Europe



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Fertilizer industry dynamics



Potential industry concerns and associated mitigants

Weaknesses and risks	Mitigating factors
Over-investment at the top of the cycle	Rising construction costs and lead times, reduced state ownership
Weak players/lack of focus	Spin-offs from chemical/energy companies followed by consolidation
High cost of natural gas in Europe	Long-term trend of gas price convergence between regions, as pipeline and LNG investments increase liquidity
International trade restrictions	WTO accession
Regulatory regimes	Operational excellence
Terrorism, accidents, country, customer and currency risk	Increased management awareness of risk and better risk management



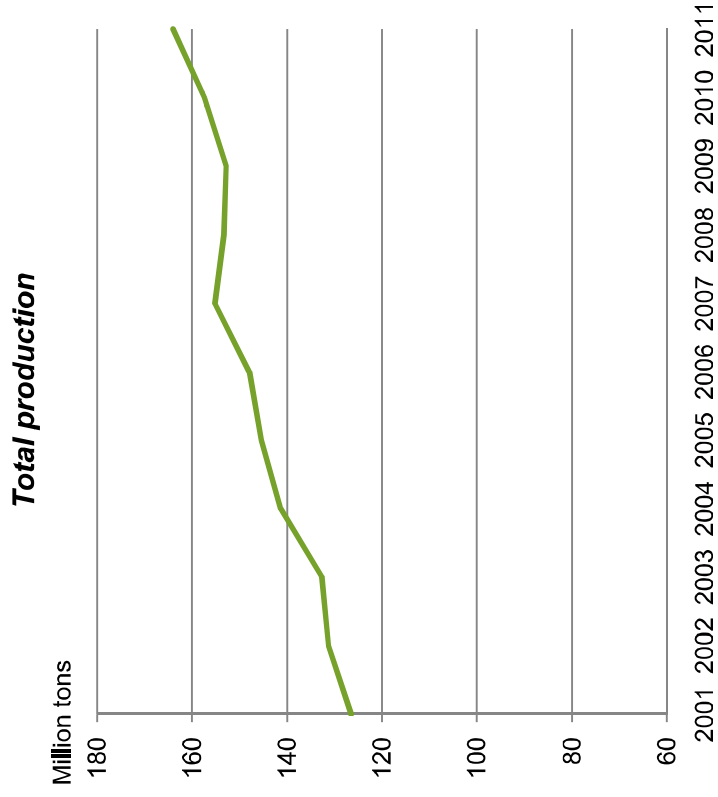


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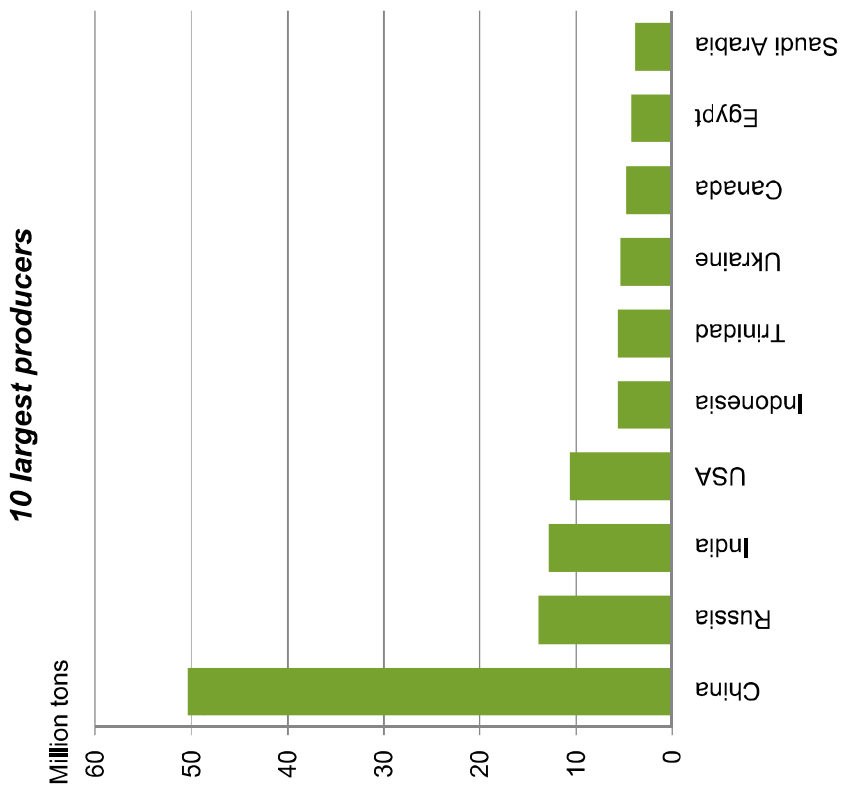
Ammonia



Ammonia production



2001-2011 trend growth rate = 2.6%/year



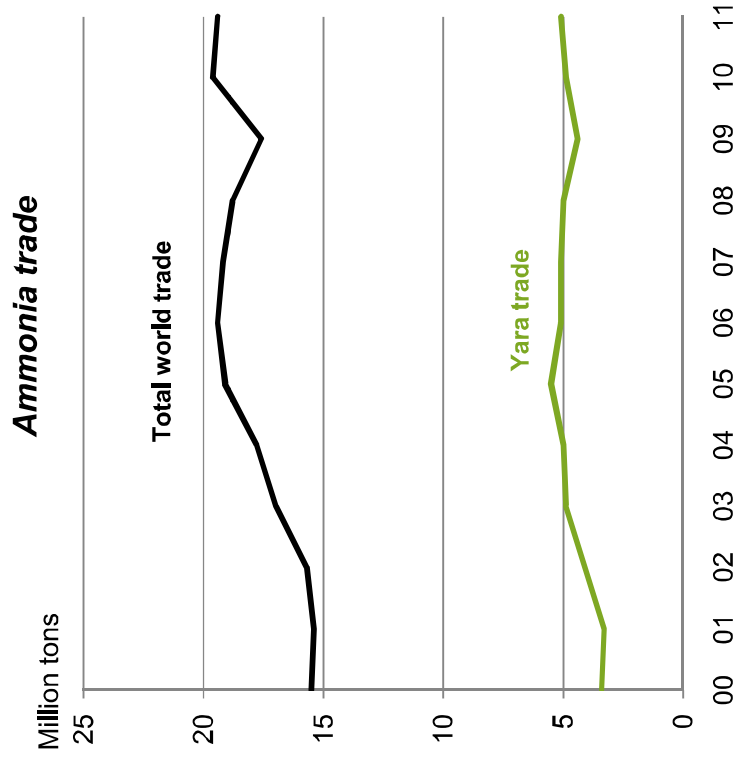
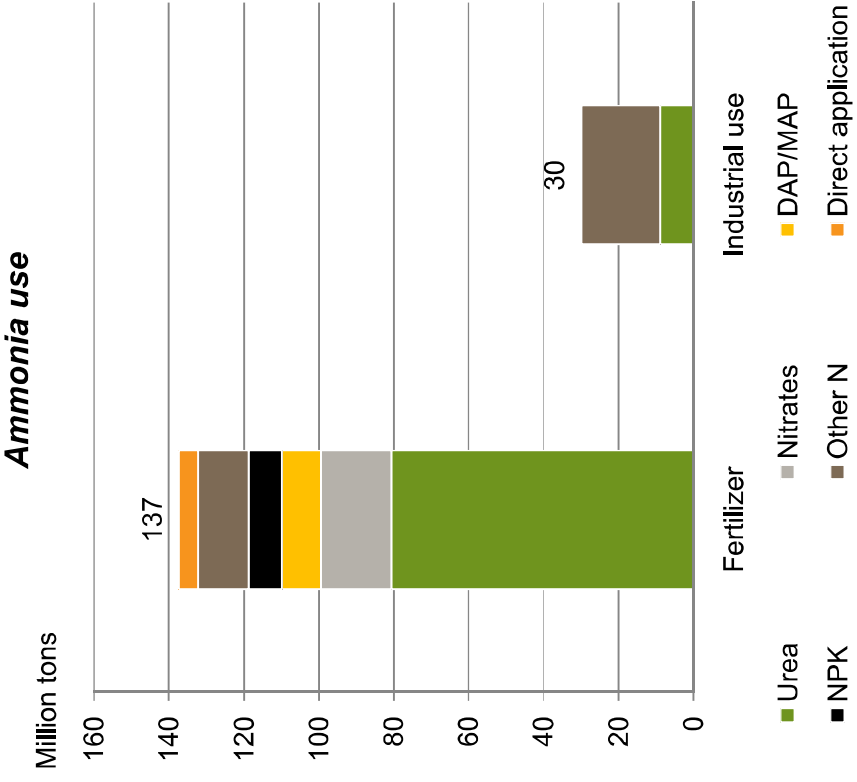
Source: IFA



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Most of the ammonia produced is upgraded to urea or other fertilizers



Source: Feritecon

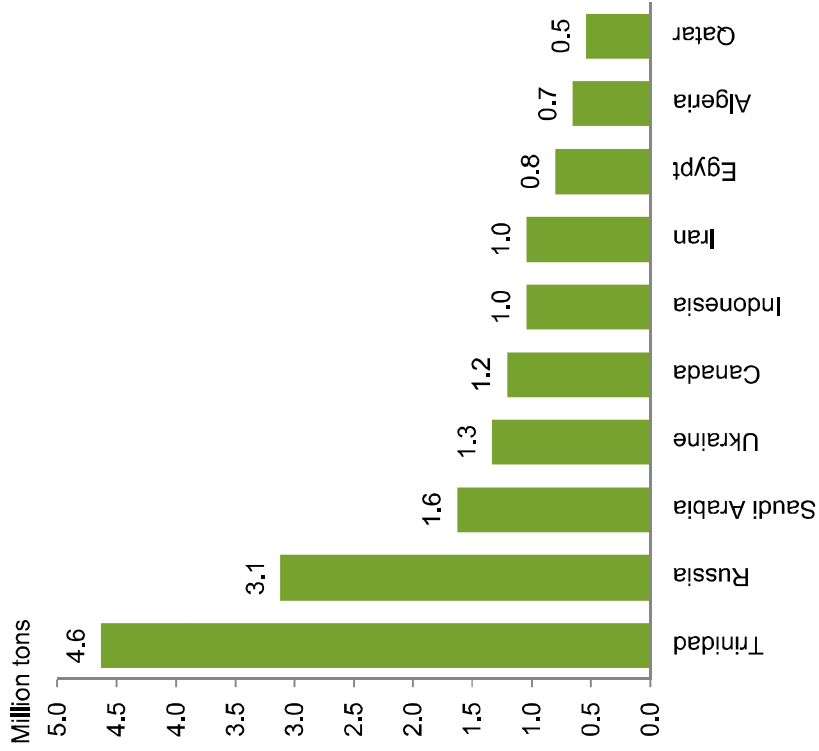


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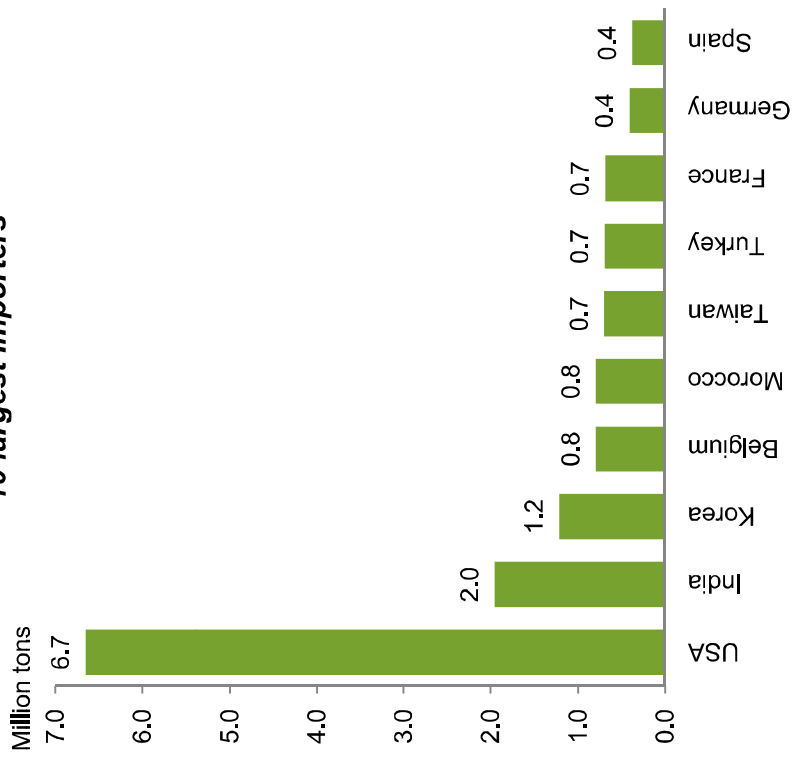


Global ammonia trade in 2011

10 largest exporters



10 largest importers



Source: IFA

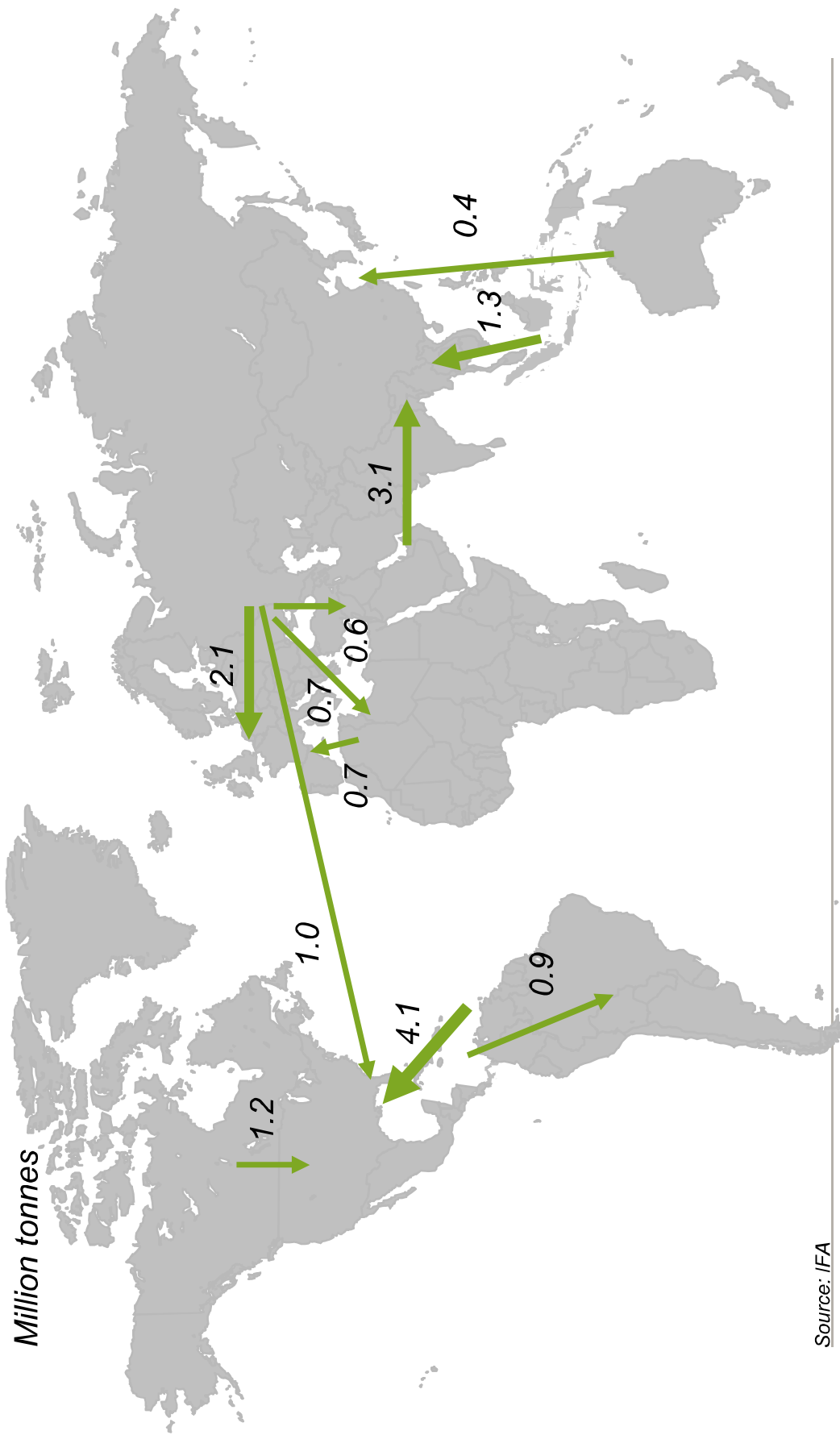


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Main ammonia trade flows 2011

Million tonnes



Source: IFA



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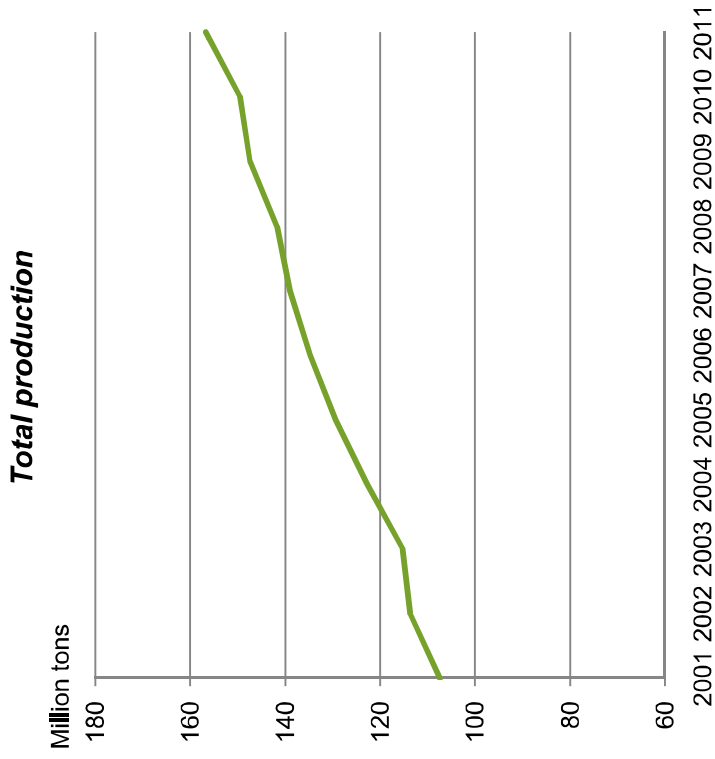




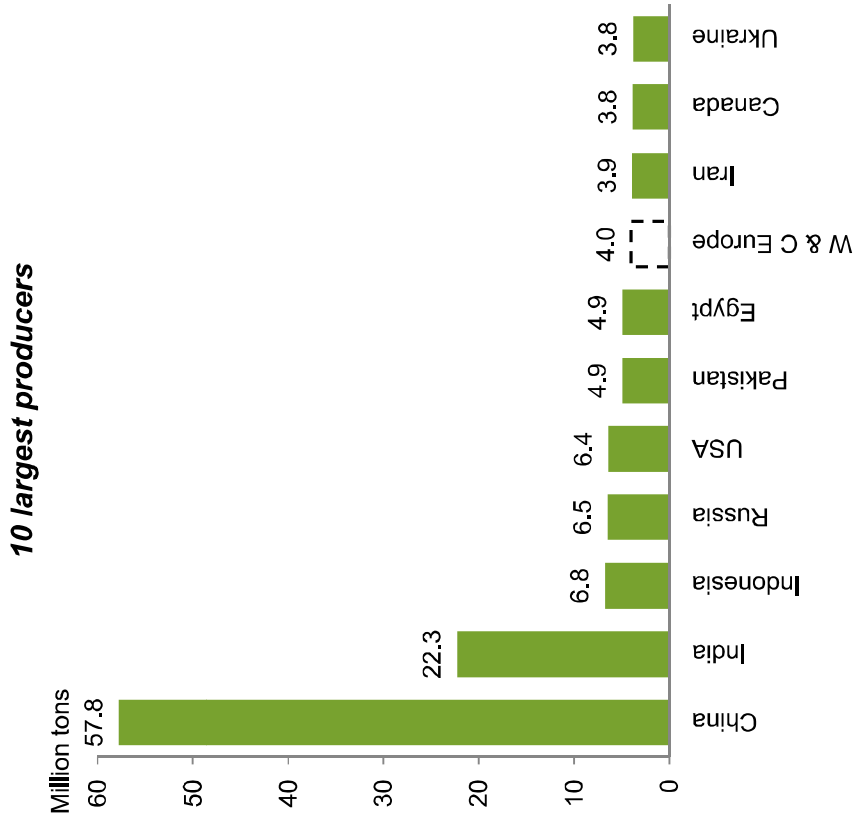
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Urea

Urea production in 2011



2001-2011 trend growth rate = 3.8% p.a.



Source: IFA

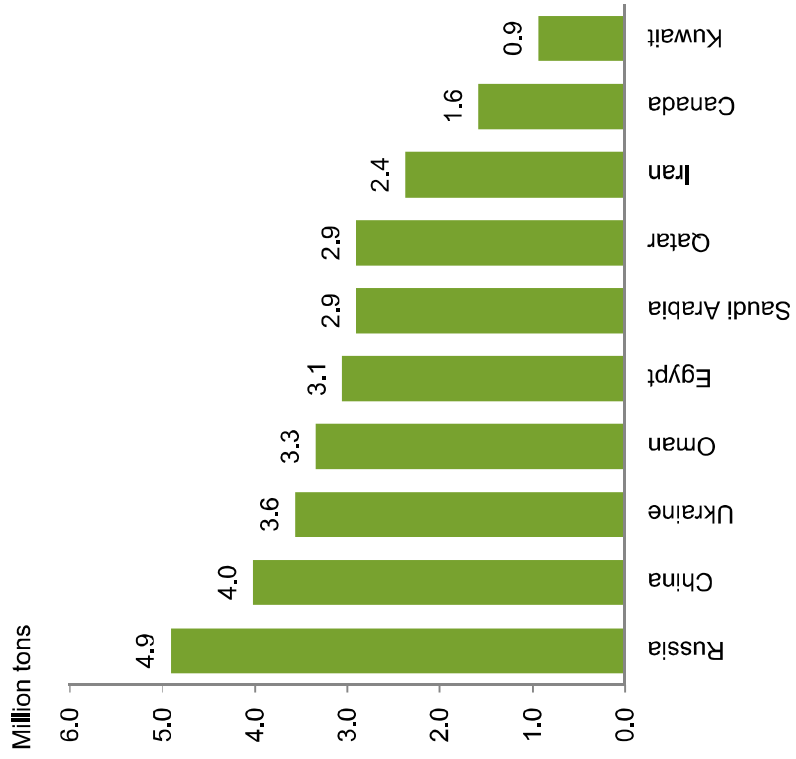


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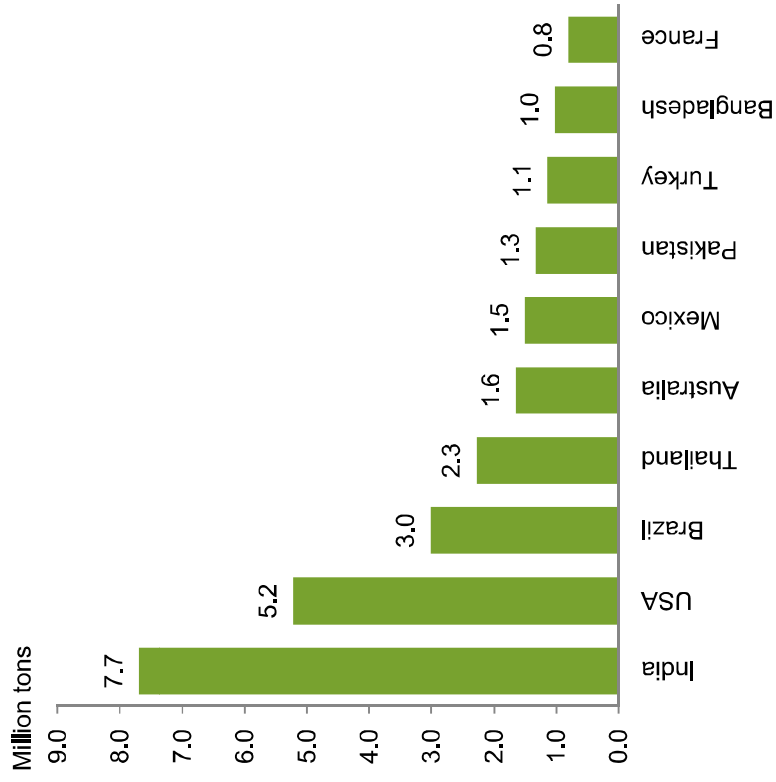


Global urea trade in 2011

10 largest exporters



10 largest importers



Source: IFA

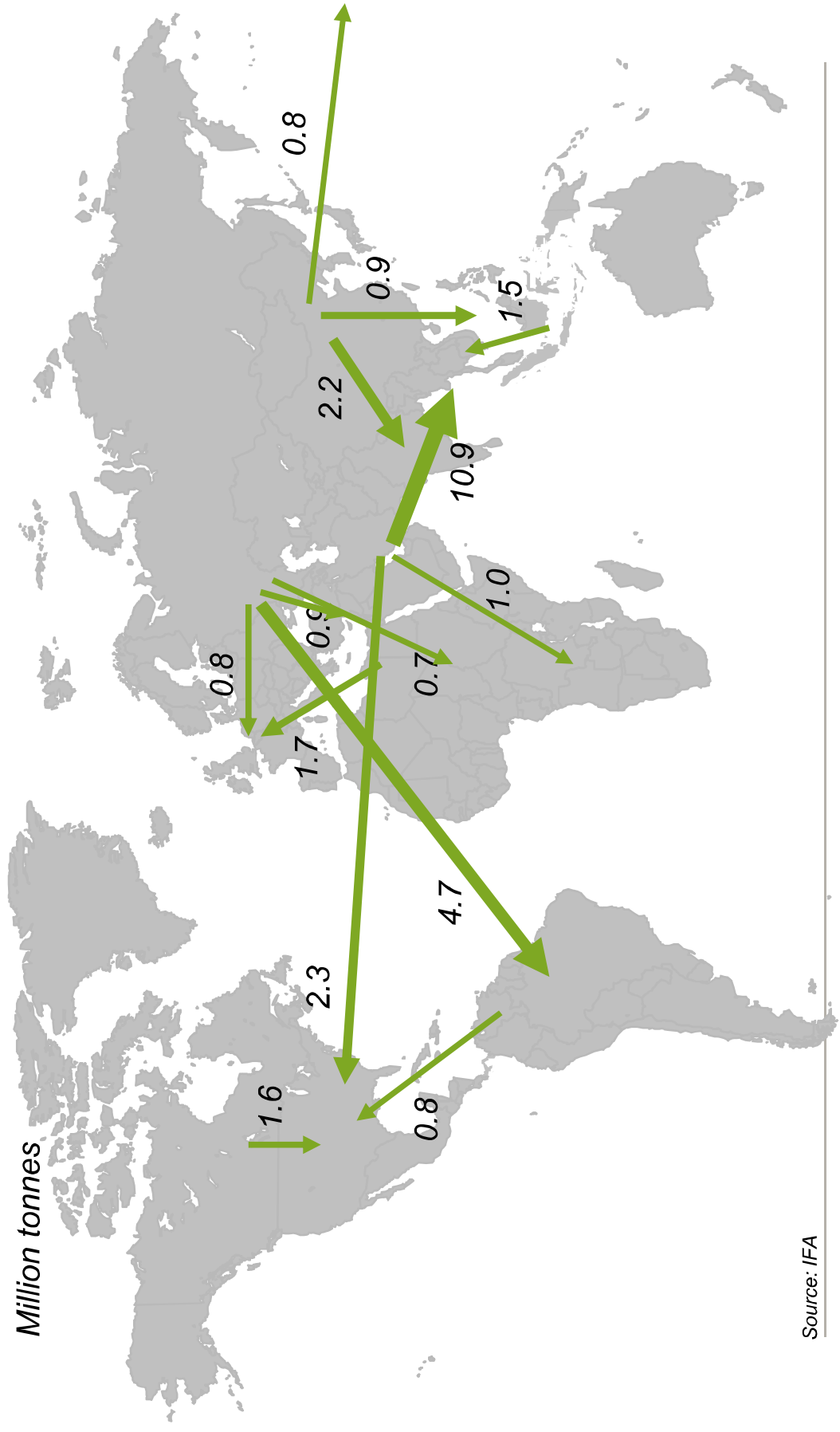


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Main urea trade flows 2011

Million tonnes



Source: IFA

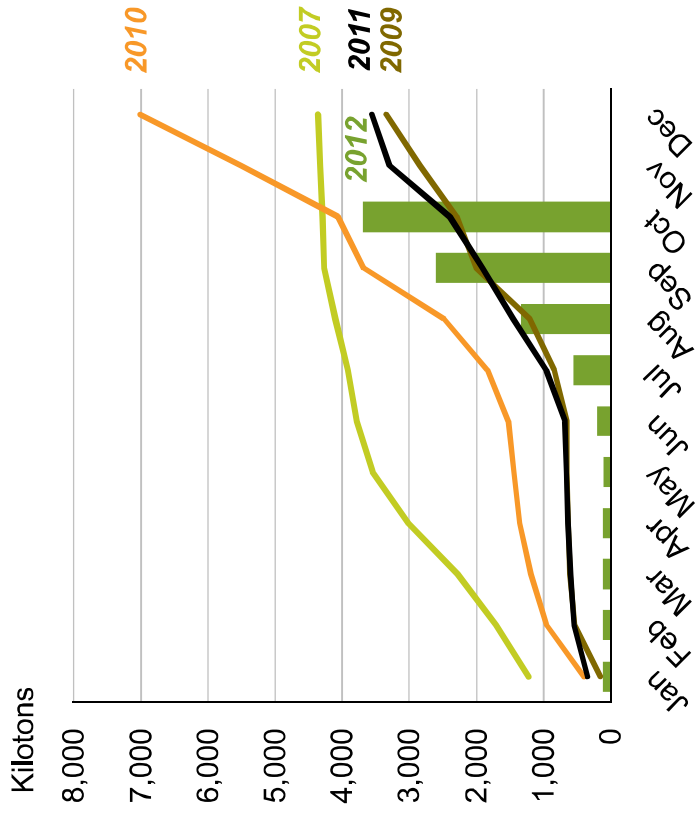


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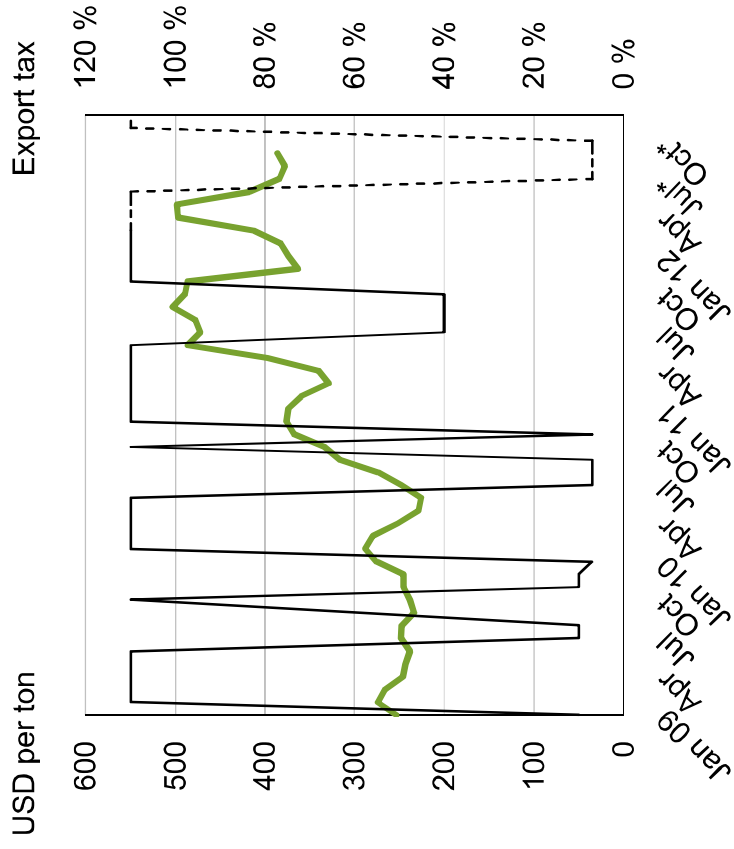


Short-term urea balance impacted by Chinese export taxes

Accumulated urea exports



Urea price and export tax



* Export tax during low tariff period depends on price level with 7% representing the minimum tax level

Source: BOABC

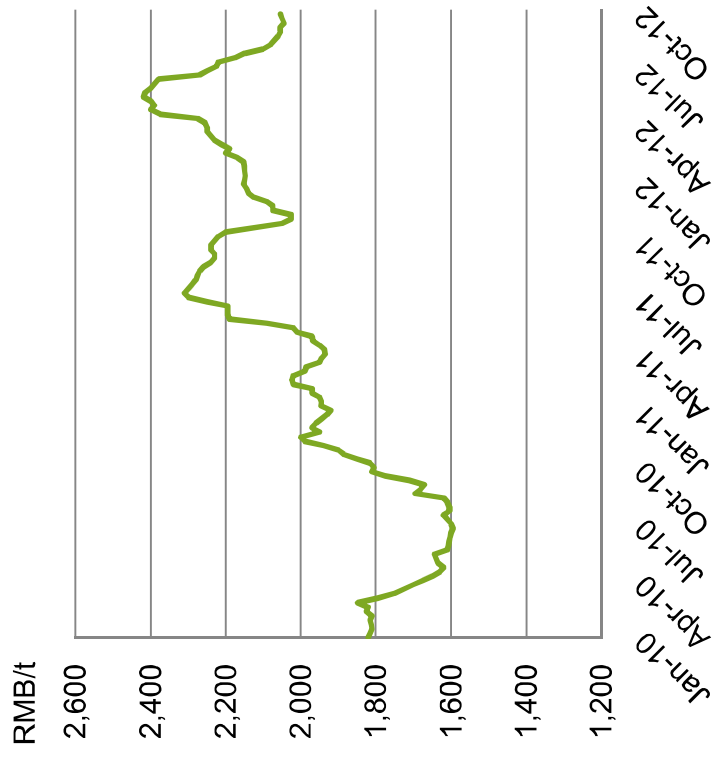


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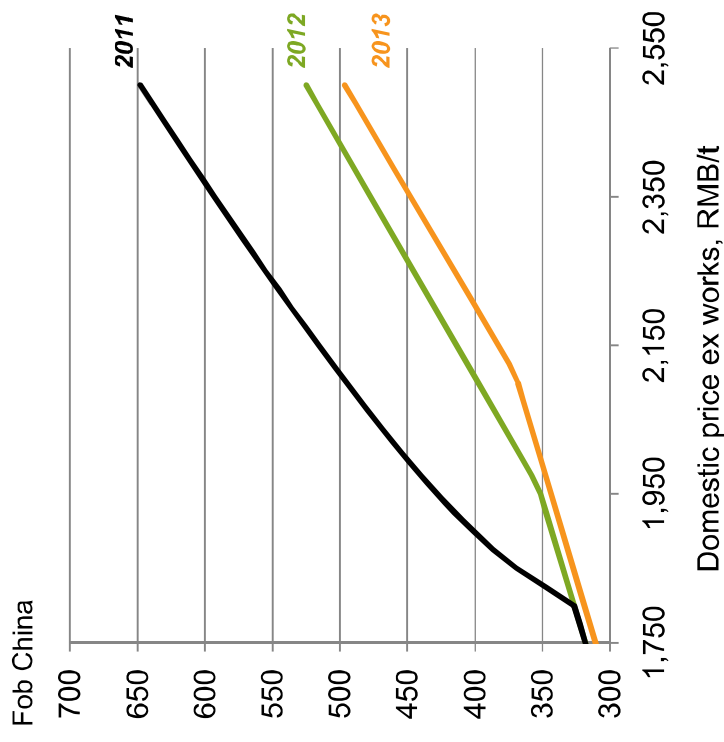


Chinese domestic urea price and export tax set the export floor price

Chinese domestic urea price



Chinese export tax 1 Jul – 1 Nov



Source: China Fertilizer Market Week



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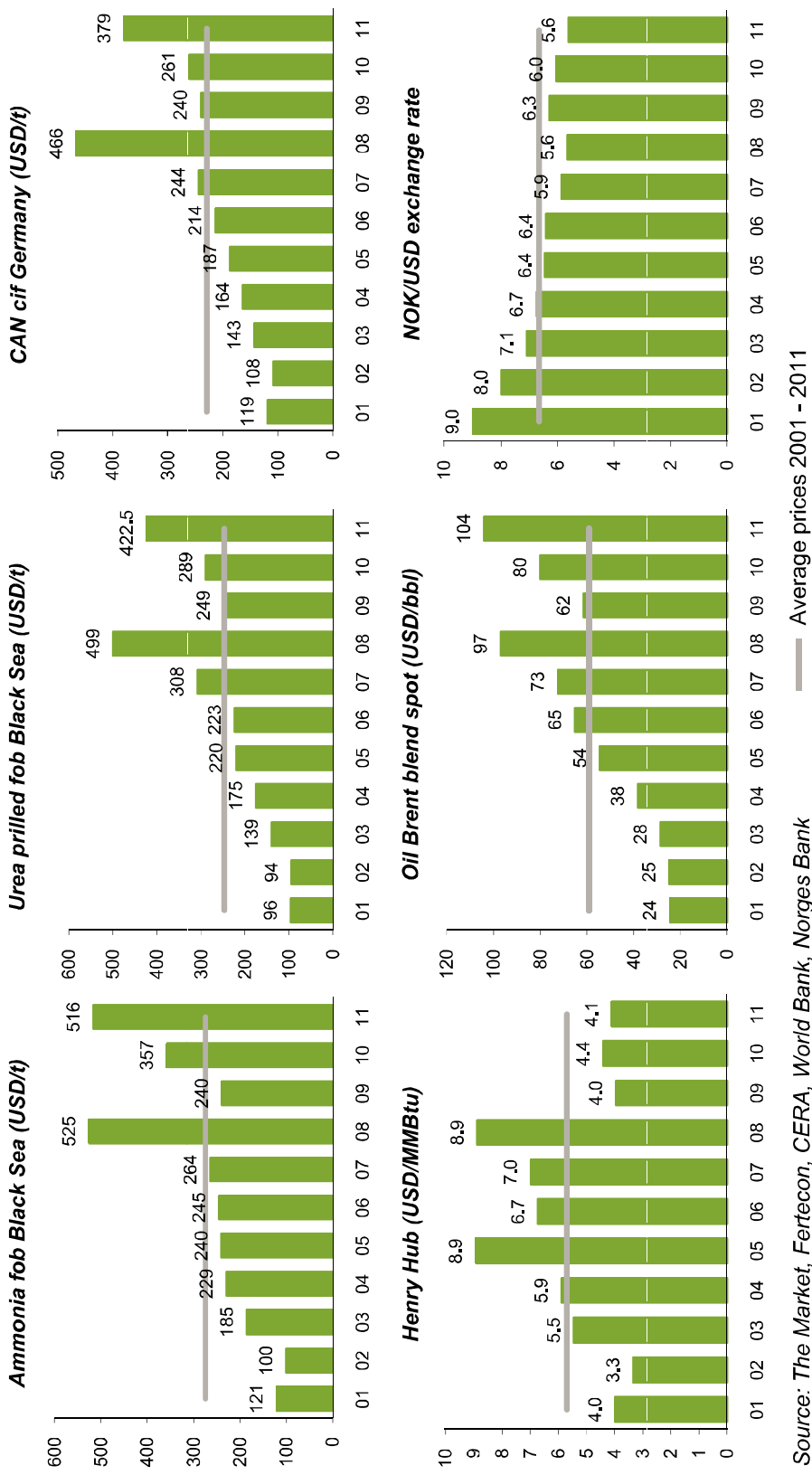




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Industry value drivers

Key value drivers



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Nitrogen fertilizer value drivers

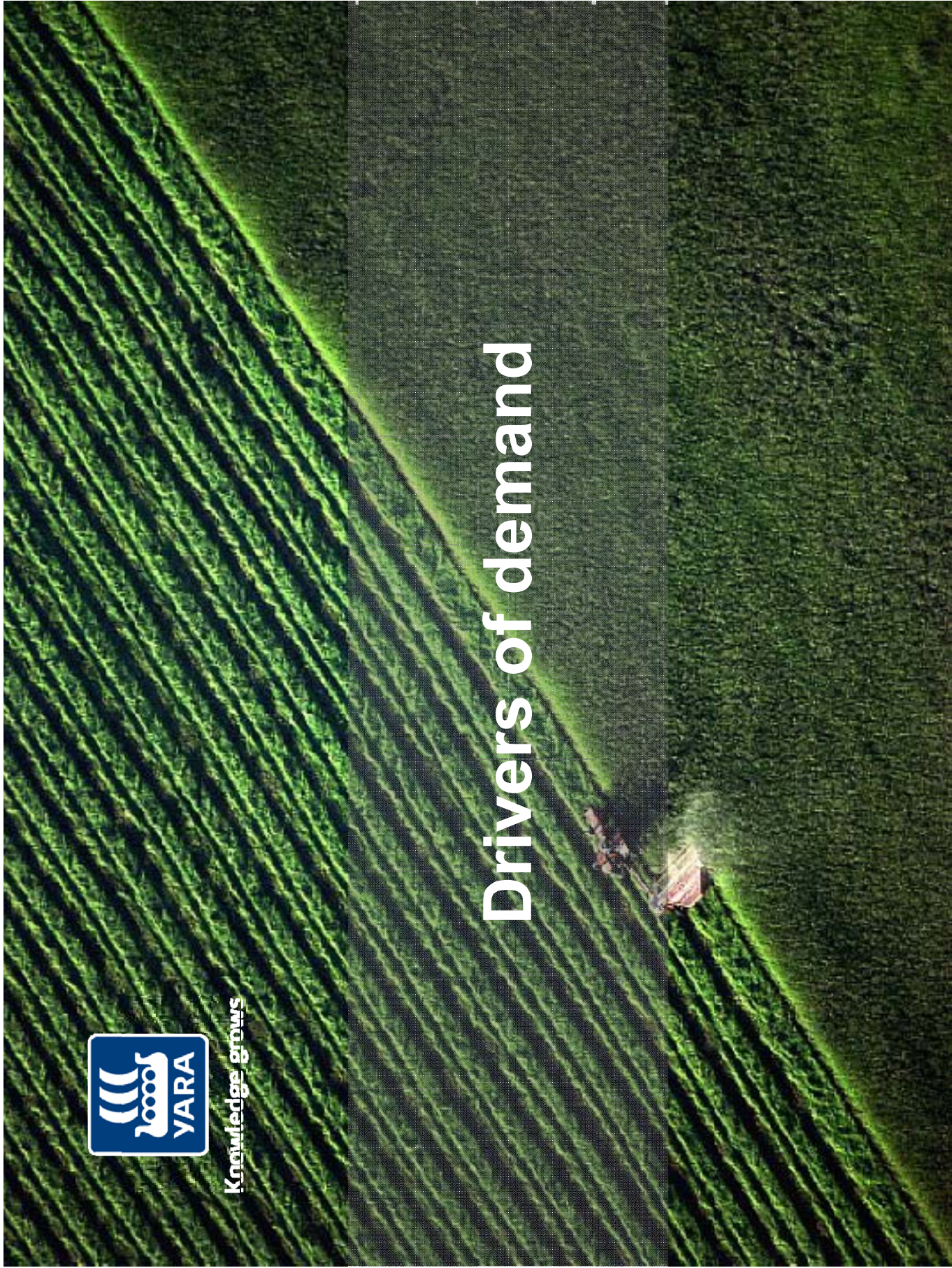
Drivers		Effect on
Revenue drivers	European / Ukrainian gas prices and Chinese coal prices	→ Supply-driven price for urea
	Grain inventories/prices	→ Urea demand
	New urea capacity vs. closures	→ Urea supply
	Global urea demand vs. supply	→ Urea price (above floor)
	Urea price	→ Most other nitrogen fertilizer prices
Cost drivers	Market segmentation	→ Value-added margins
	Oil product prices and LNG development	→ Gas cost in Europe
	Manning and maintenance	→ Fixed cost
	Productivity and economies of scale	→ Unit cost





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Drivers of demand

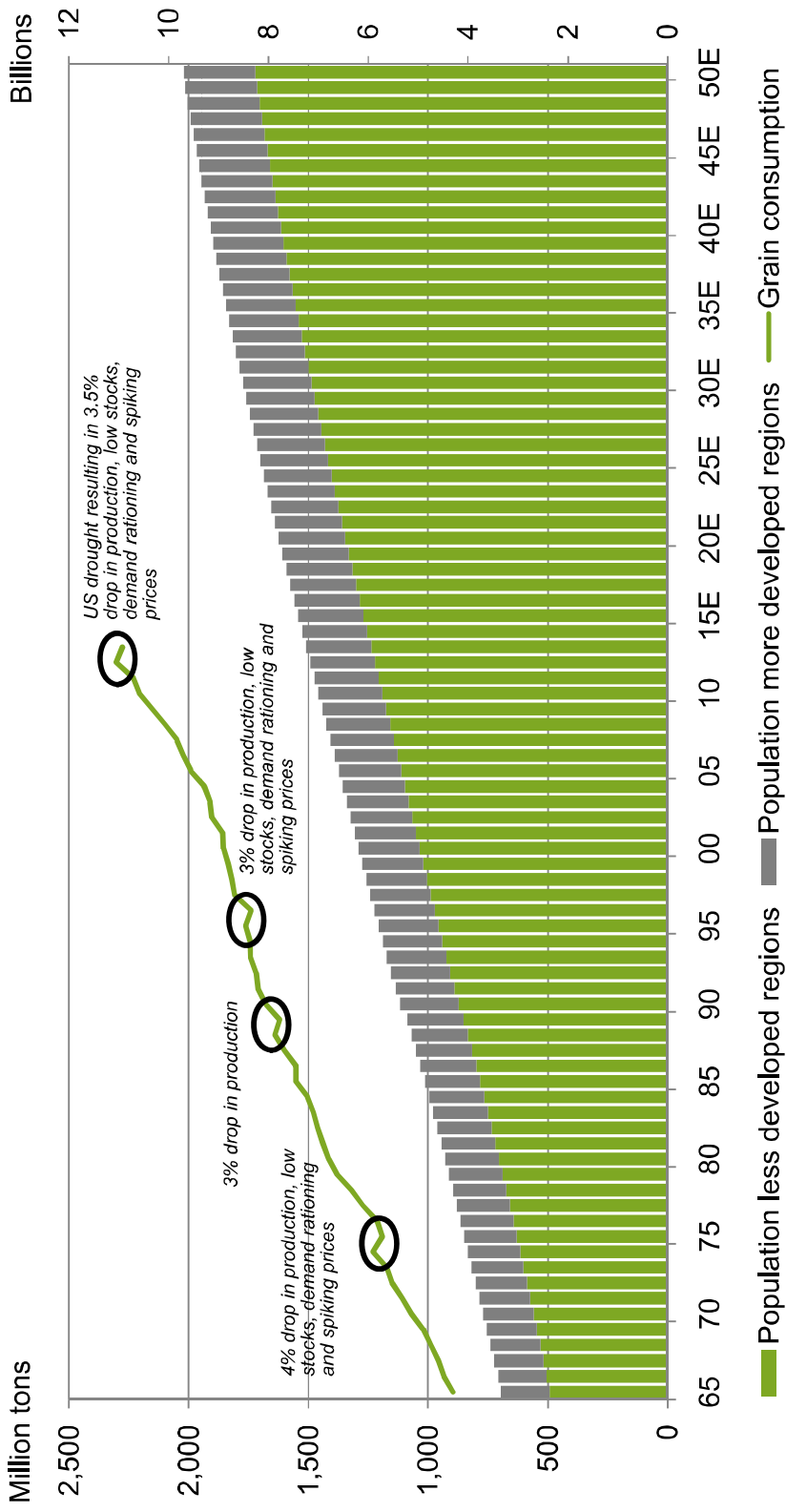


Drivers of nitrogen consumption growth

- **Fertilizer consumption**
 - Population growth
 - Economic growth (improved diets)
 - More meat consumption in developing countries
 - More protein-rich diets
 - More fruit and vegetables
 - Reduce hunger
 - Biofuels
- **Industrial consumption**
 - Economic growth
 - Environmental limits (e.g. reduction of NOx emissions)



Grain consumption growth stronger than population growth



Source: US Department of Agriculture, United Nations



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