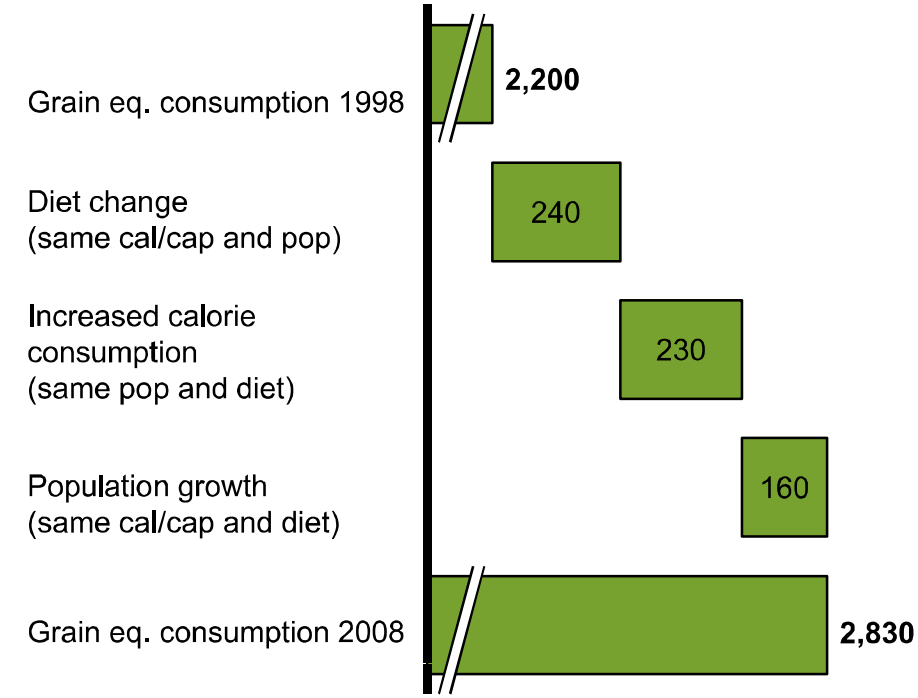
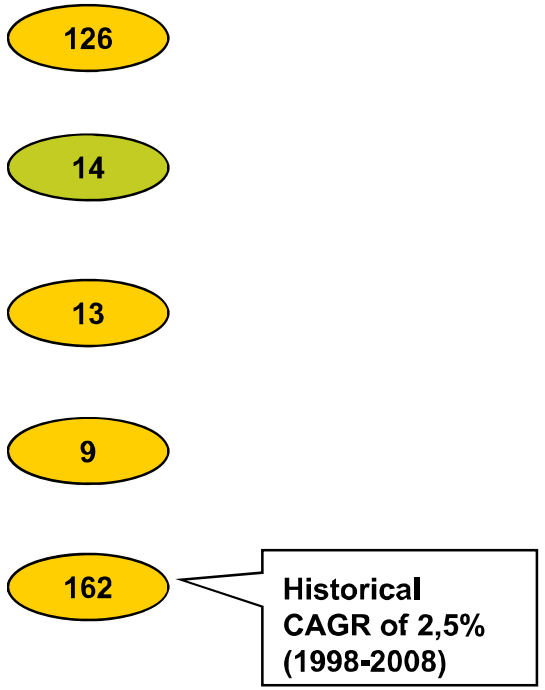
Diet change the most important factor for growth in food consumption

Impact on food consumption 1998-2008
Million tons grain equivalent*



Fertilizer consumption for food crop**
Million tons nutrients

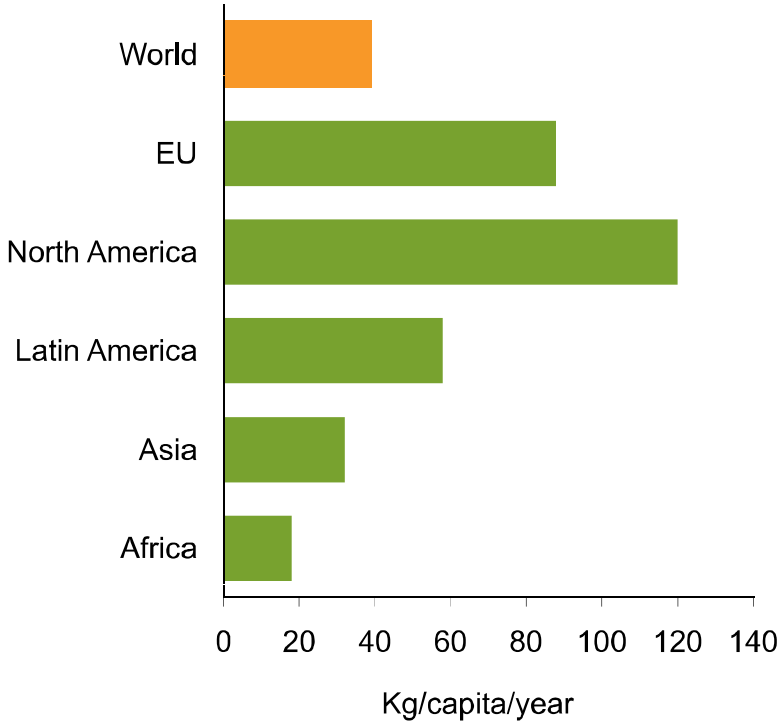


* Assumed 500 kcal/kg grain, 600 kcal/kg meat, meat/grain production factor of 3
** N, P and K demand. Average effective yield delivered to consumers of 2 ton cereal/ha; 120 kg fertilizer/ha

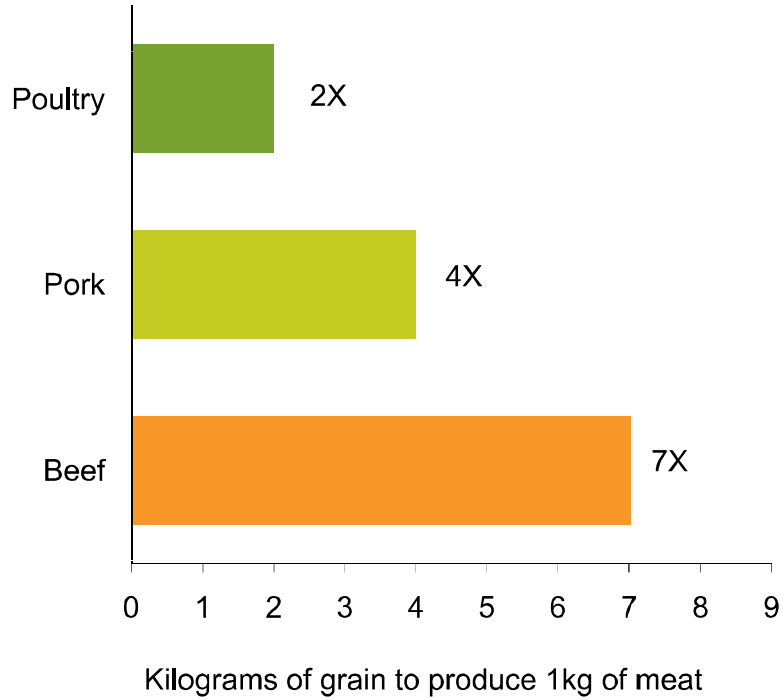
Source: McKinsey & Company

Higher meat consumption requires more feed grain

Significant potential for increasing meat consumption in emerging countries

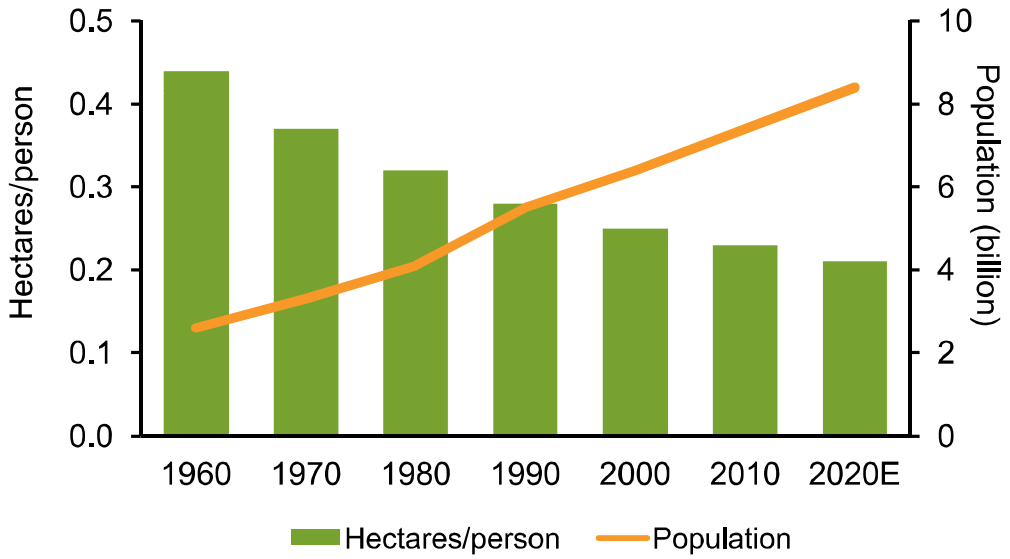


Feed grain multipliers for meat production



Source: FAO

Increasing population and reduced land available for food production per capita

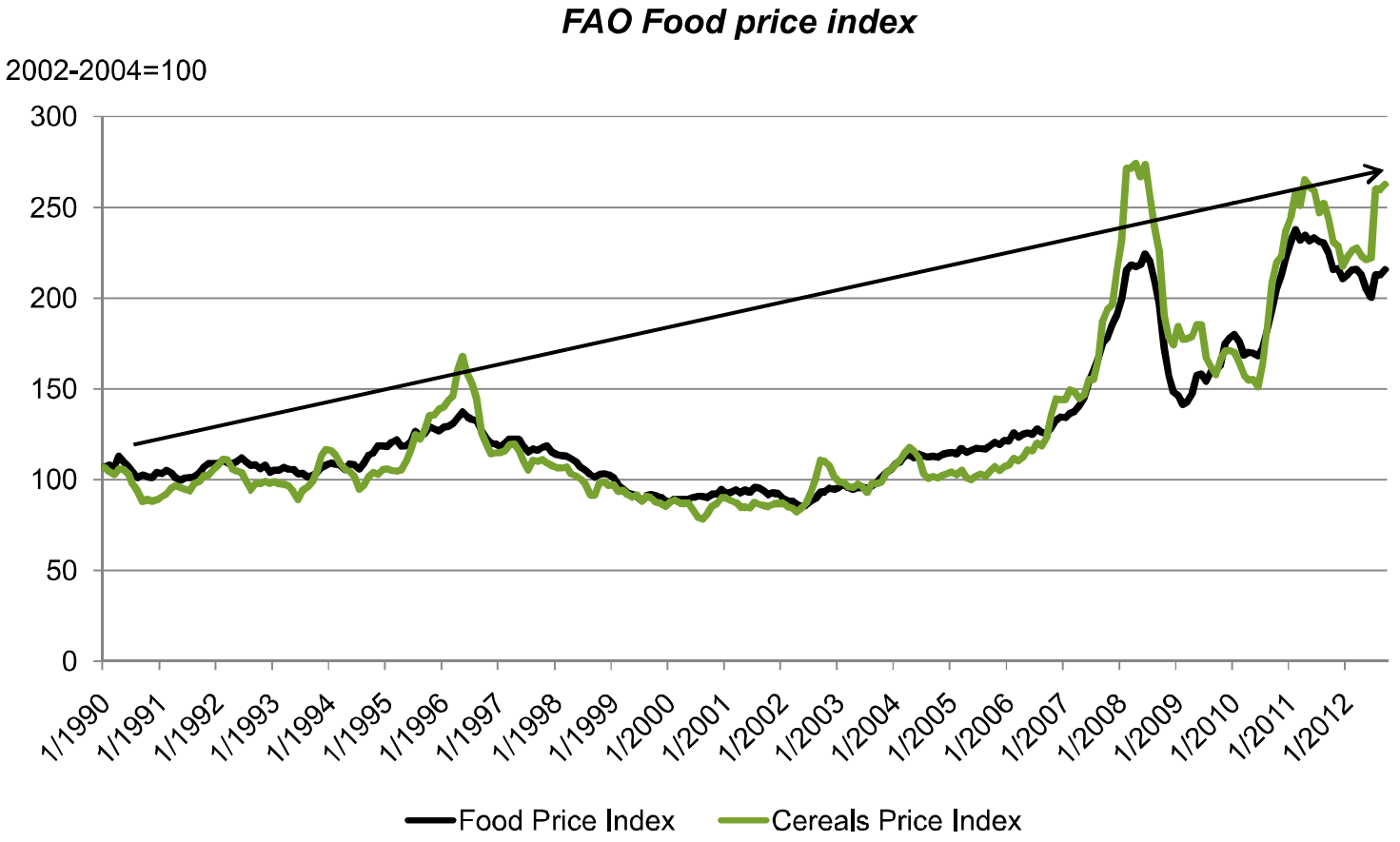


- Very limited potential to increase farmable land
- Improved living standards increase protein consumption per person, requiring more grain for animal feed

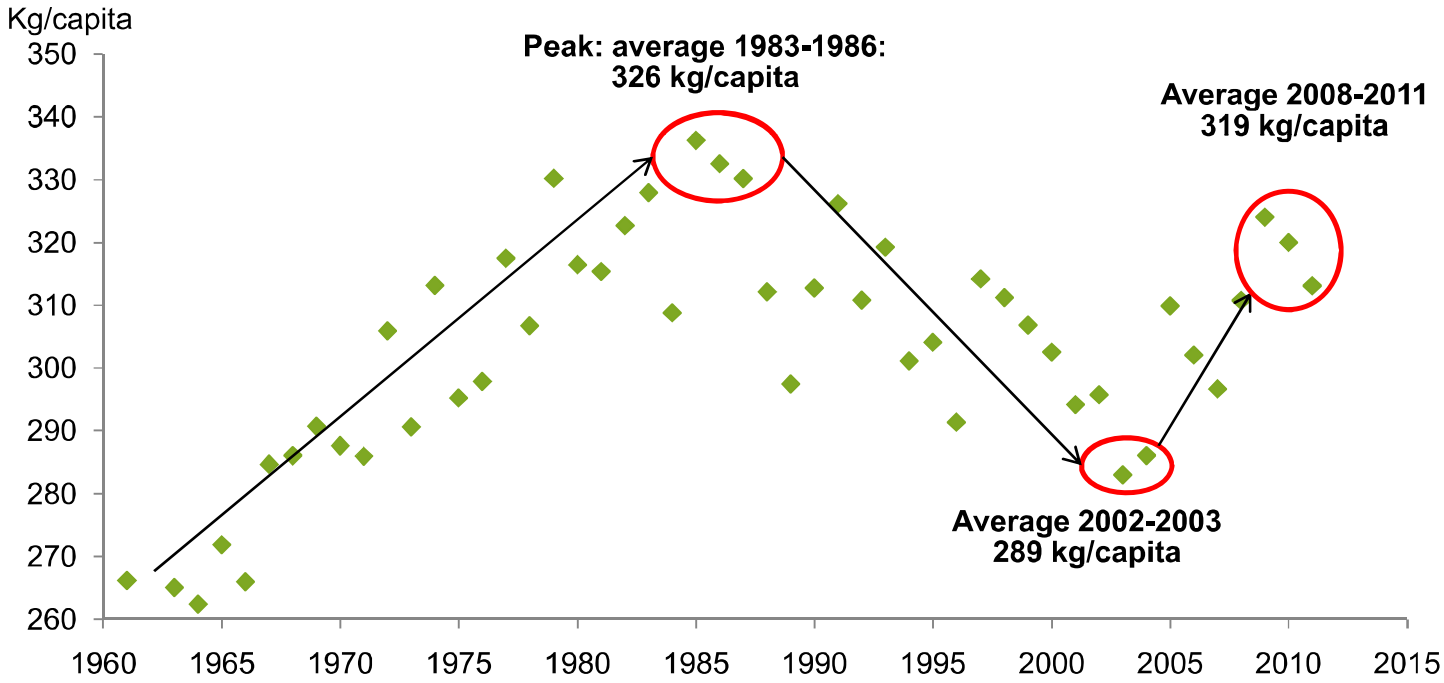
The only solution is to increase agricultural productivity

Source: IFA, Worldmarkets.com

Long-term grain price development underlines productivity challenge



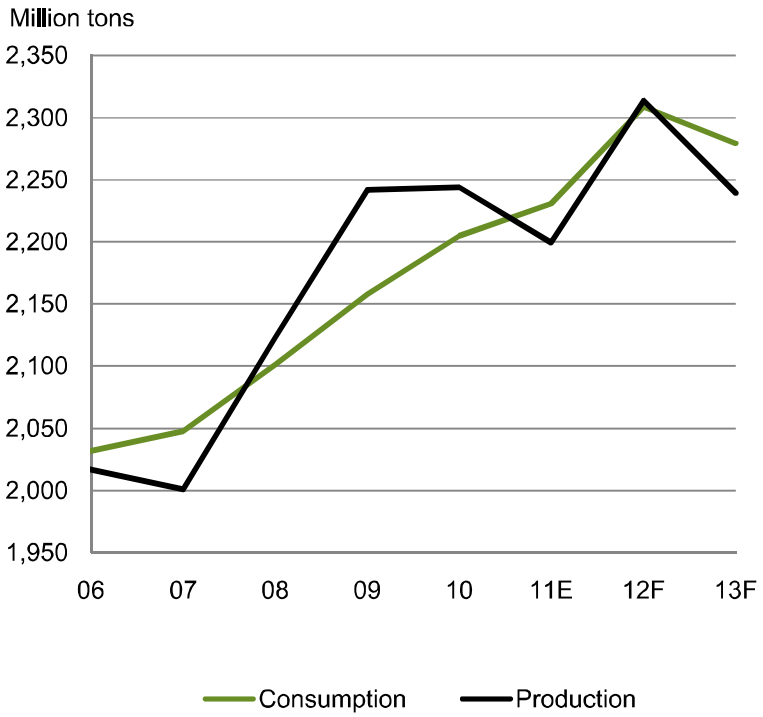
Production per capita has improved but remains lower today than in the 80s



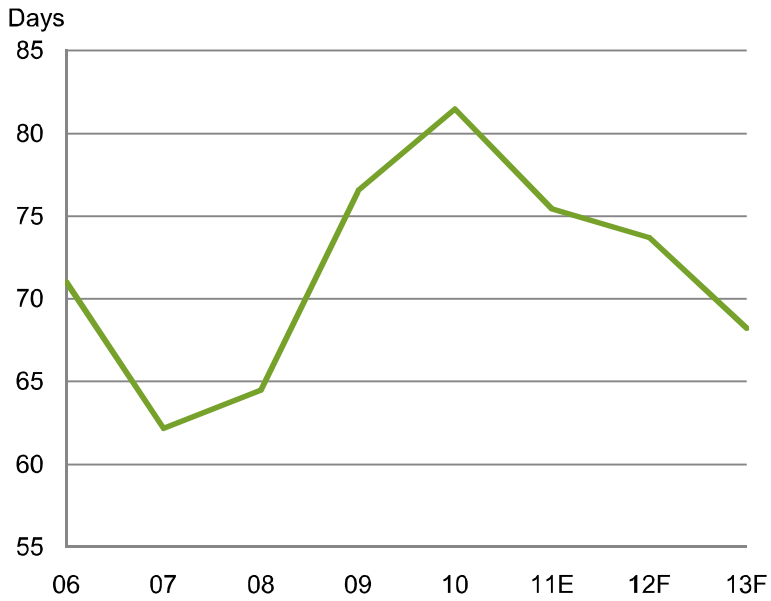
Source: USDA (cereal production) and UN (population)

Vulnerable to supply shocks with stocks at low levels

Grain production and consumption



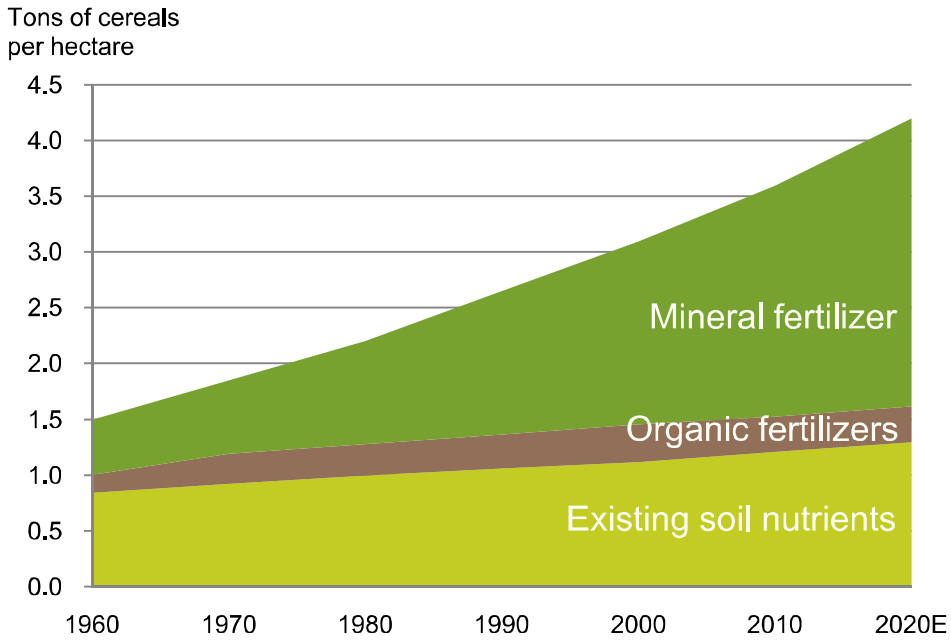
Days of consumption in stocks



Source: USDA, December 2012

Mineral fertilizer essential to sustain future yield increases

1 tonne of grain requires ~25kg nitrogen

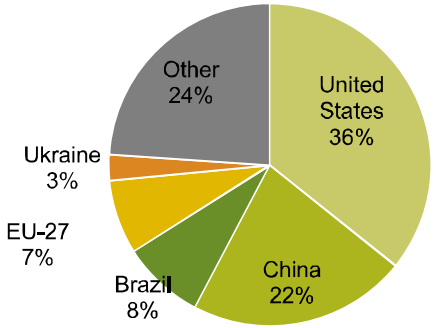


- Increased production of mineral fertilizers necessary to meet future nutrient demand
- Limited potential for recycling organic material
- Nutrient reserves in the soil do not increase

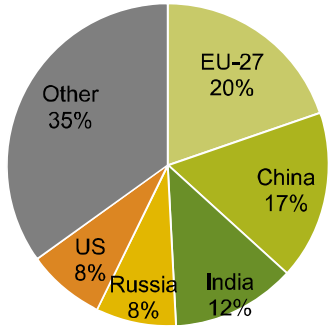
Source: FAO, Worldmarkets.com, Yara

Key crops by producing country

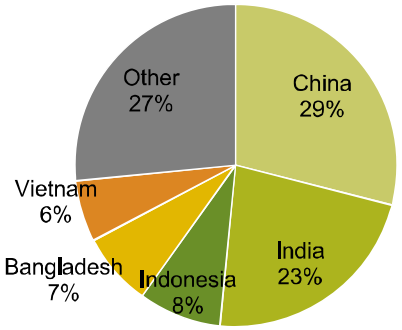
Maize-global production 877 mt



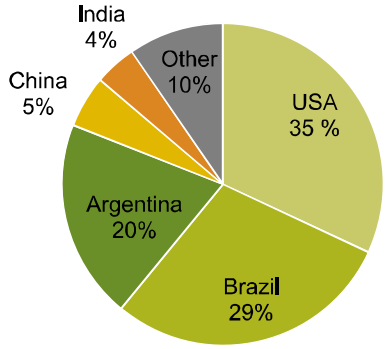
Wheat-global production 696 mt



Rice-global production 693 mt



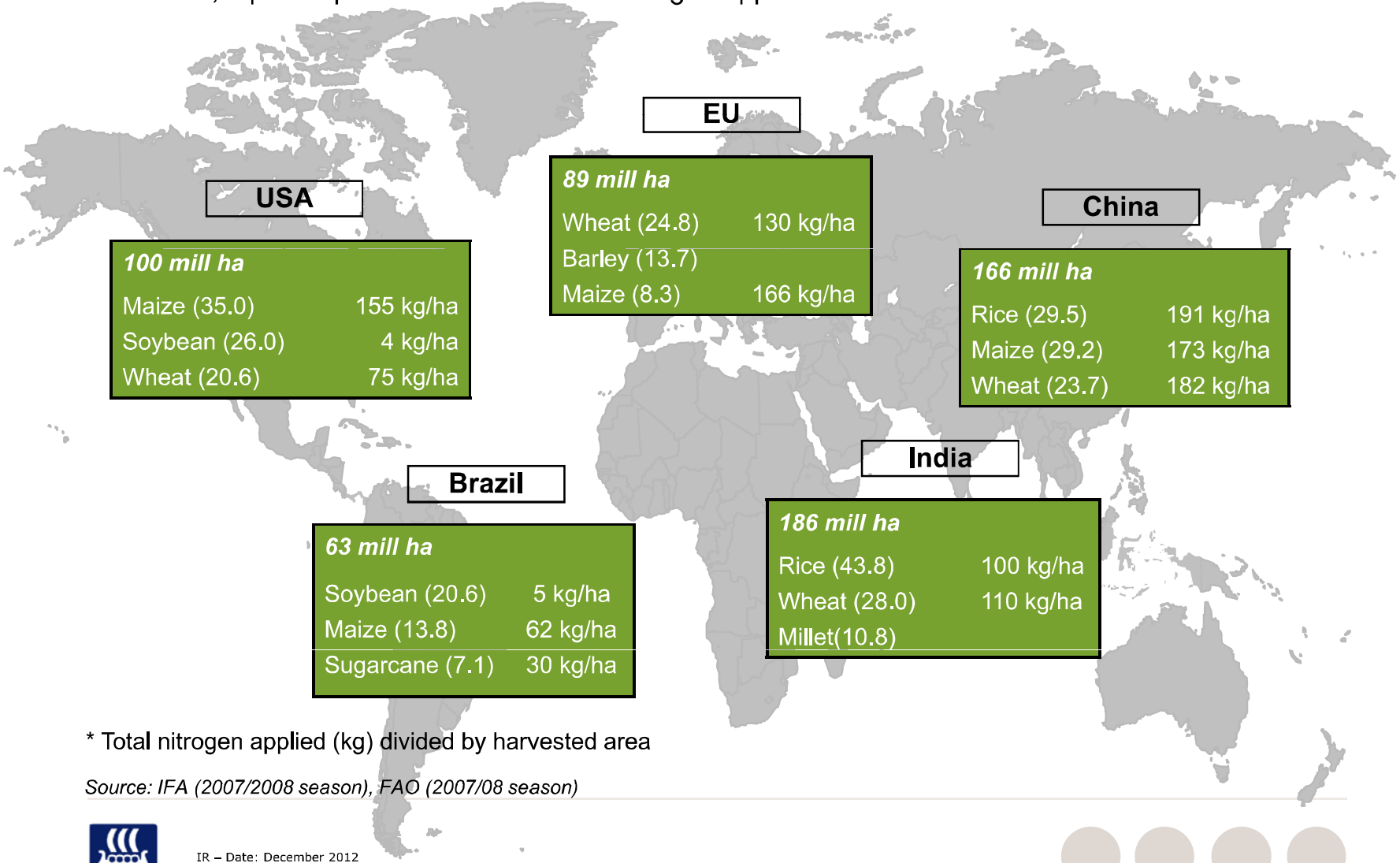
Soybeans-global production 259 mt



Source: USDA, 2011/12 season

Agricultural profile – key regions

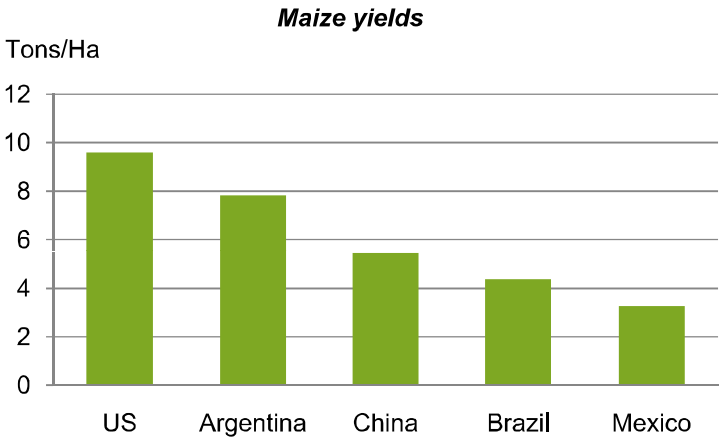
Arable land, top 3 crops area harvested and nitrogen application*

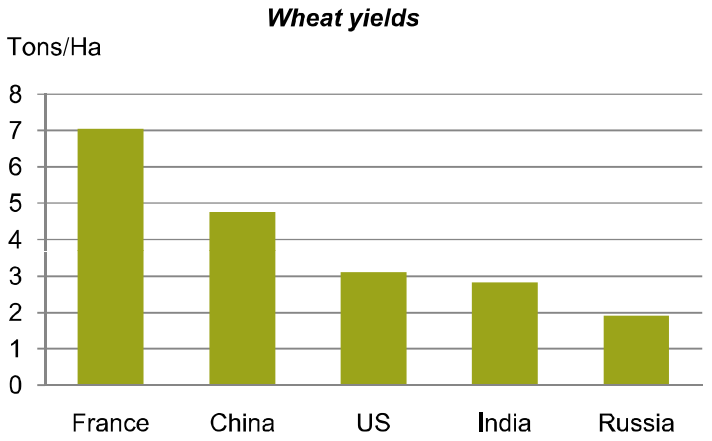


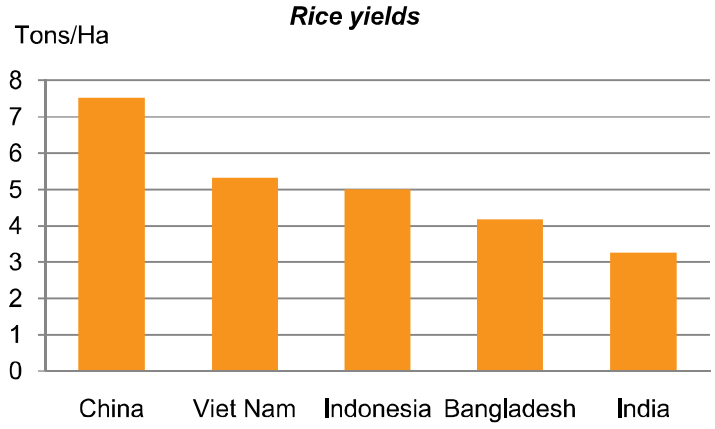
* Total nitrogen applied (kg) divided by harvested area

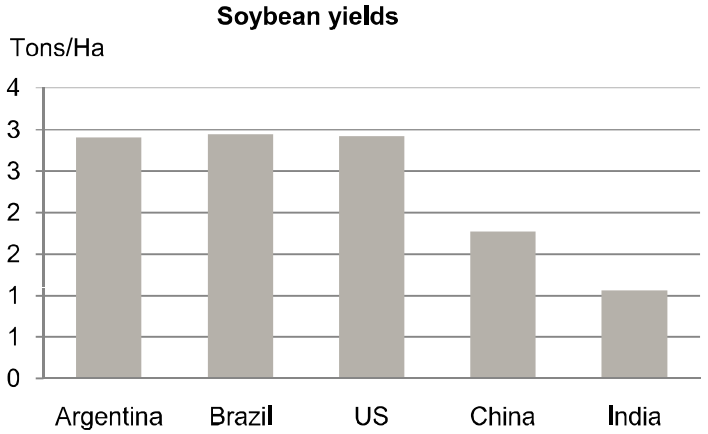
Source: IFA (2007/2008 season), FAO (2007/08 season)

Large variations in yields across regions



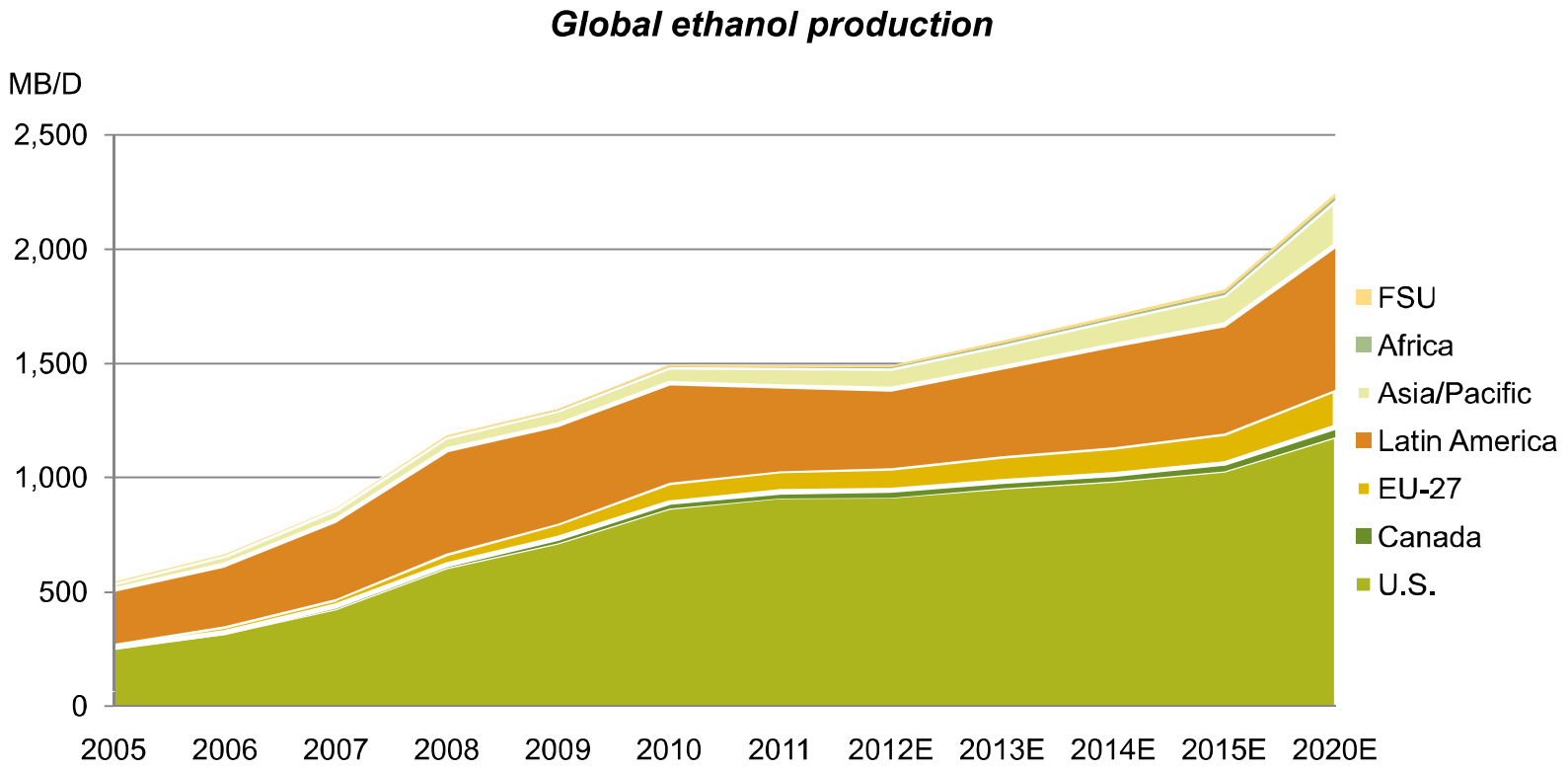






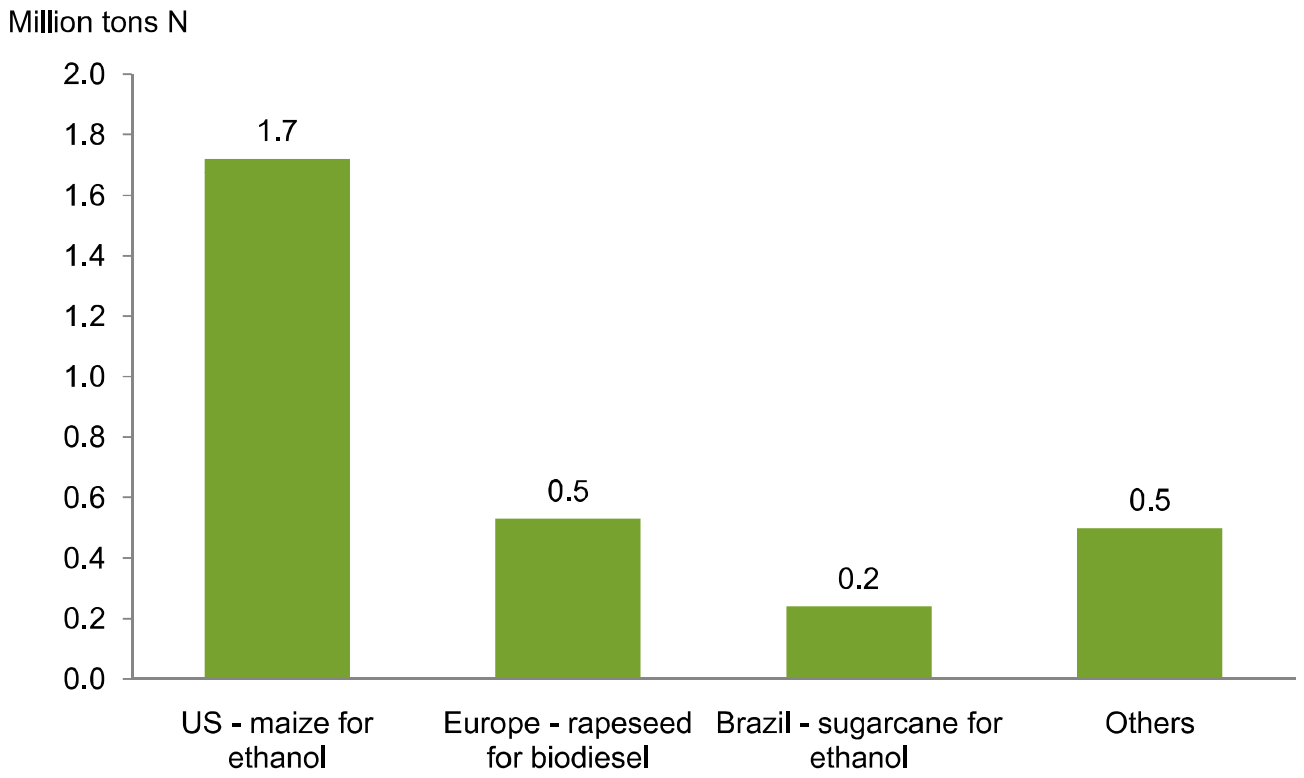
Source: FAOSTAT. 2010

Biofuels: high-level outlook



Source: PIRA, July 2012

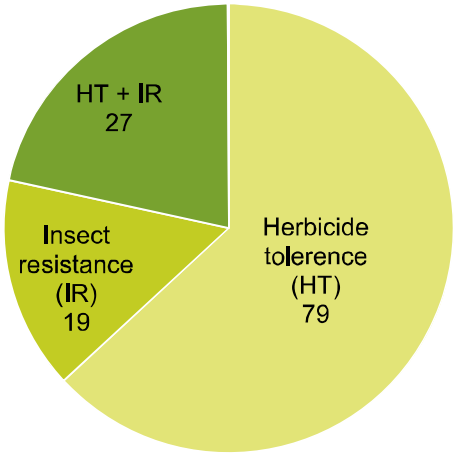
N-fertilizer consumption from biofuels production



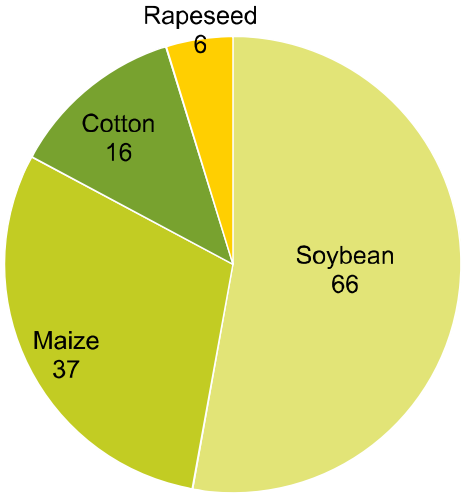
Source: IFA

The effect on fertilizer consumption of genetically modified crops

Cropped area by trait, Million hectares



Cropped area by crop, Million hectares



Source: ISAAA

Fertilizer reduces carbon footprint from farming

Fertilizer - an efficient solar energy catalyst

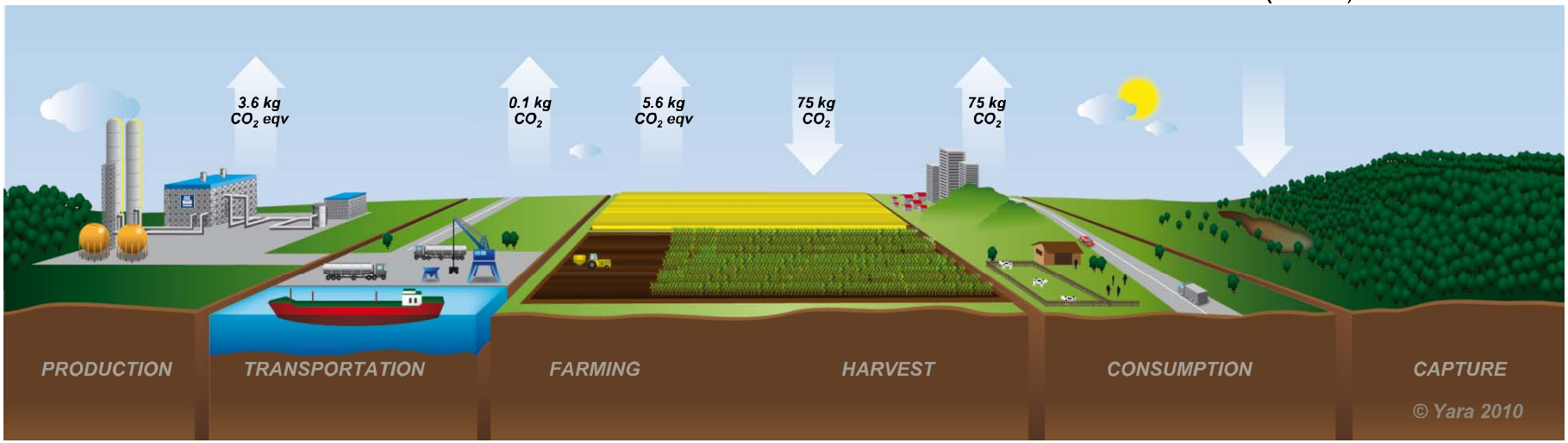
- Production marginal part of carbon footprint - efficient application more important
- Huge positive effects of fertilizer use by lower land use

Production

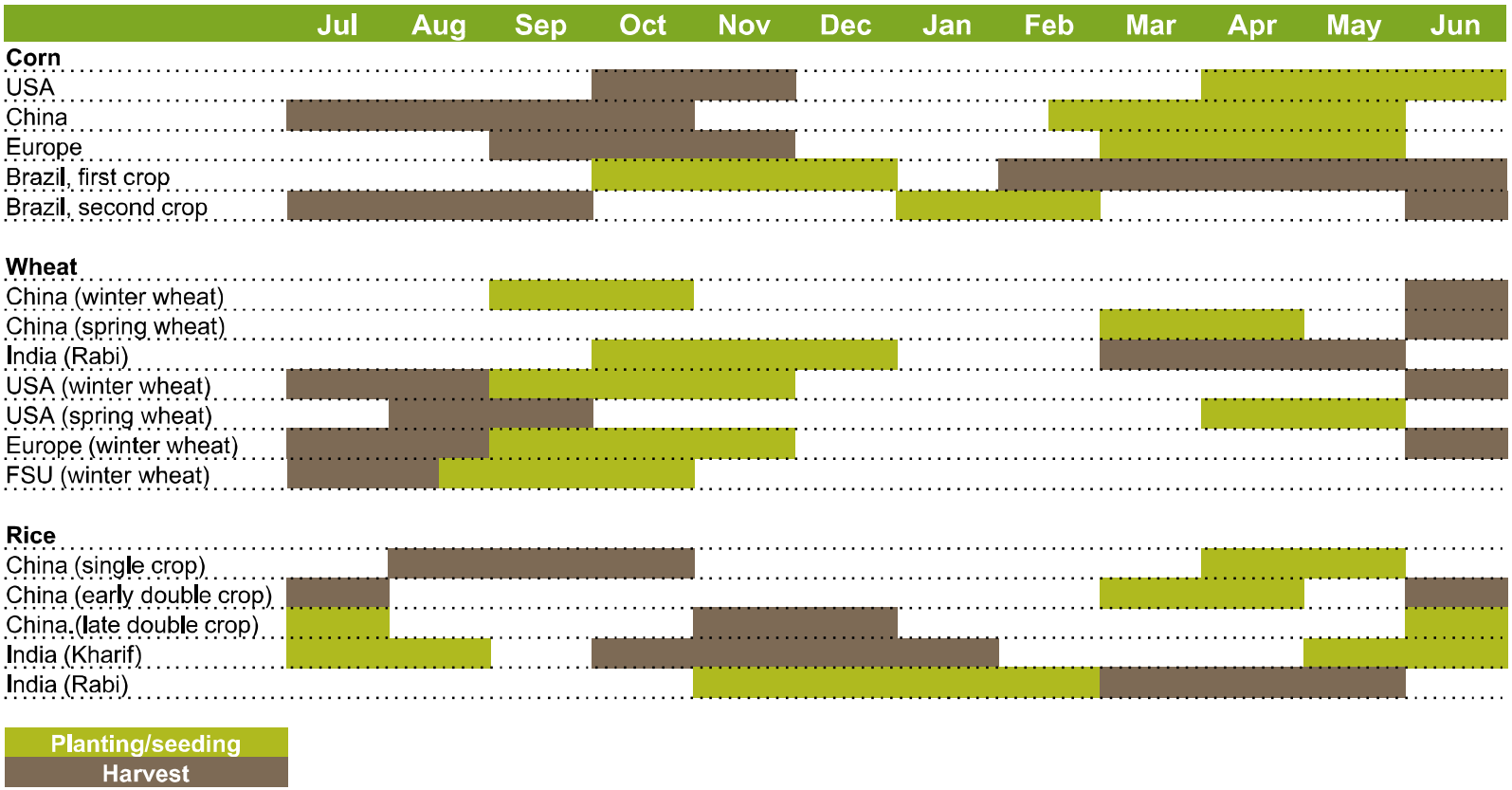
- Yara's production more energy-efficient than competitor average
- Yara developed N_2O catalyst

Application

- Nitrates better than urea
- Precision farming (N-tester etc.)
- Balanced fertilization (NPK)



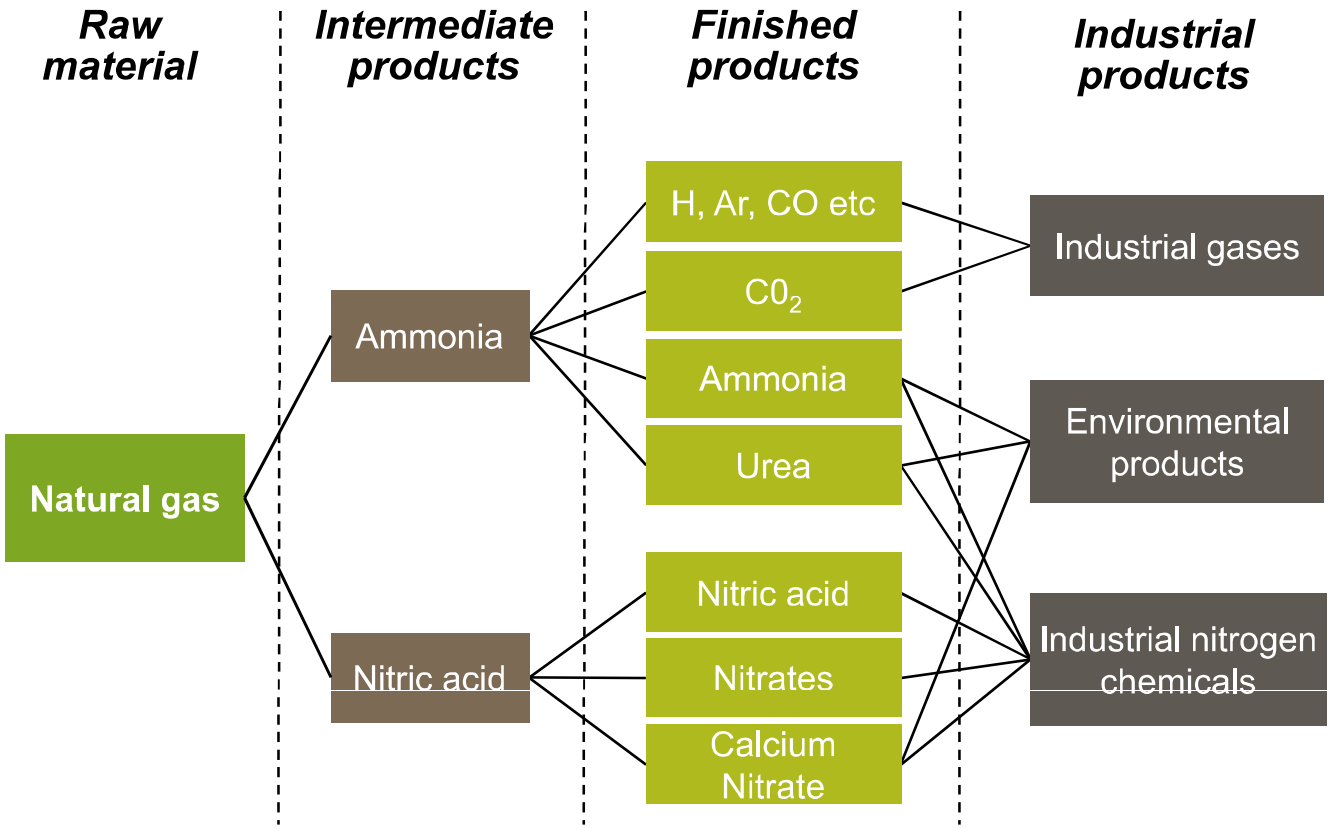
Seasonality in fertilizer consumption



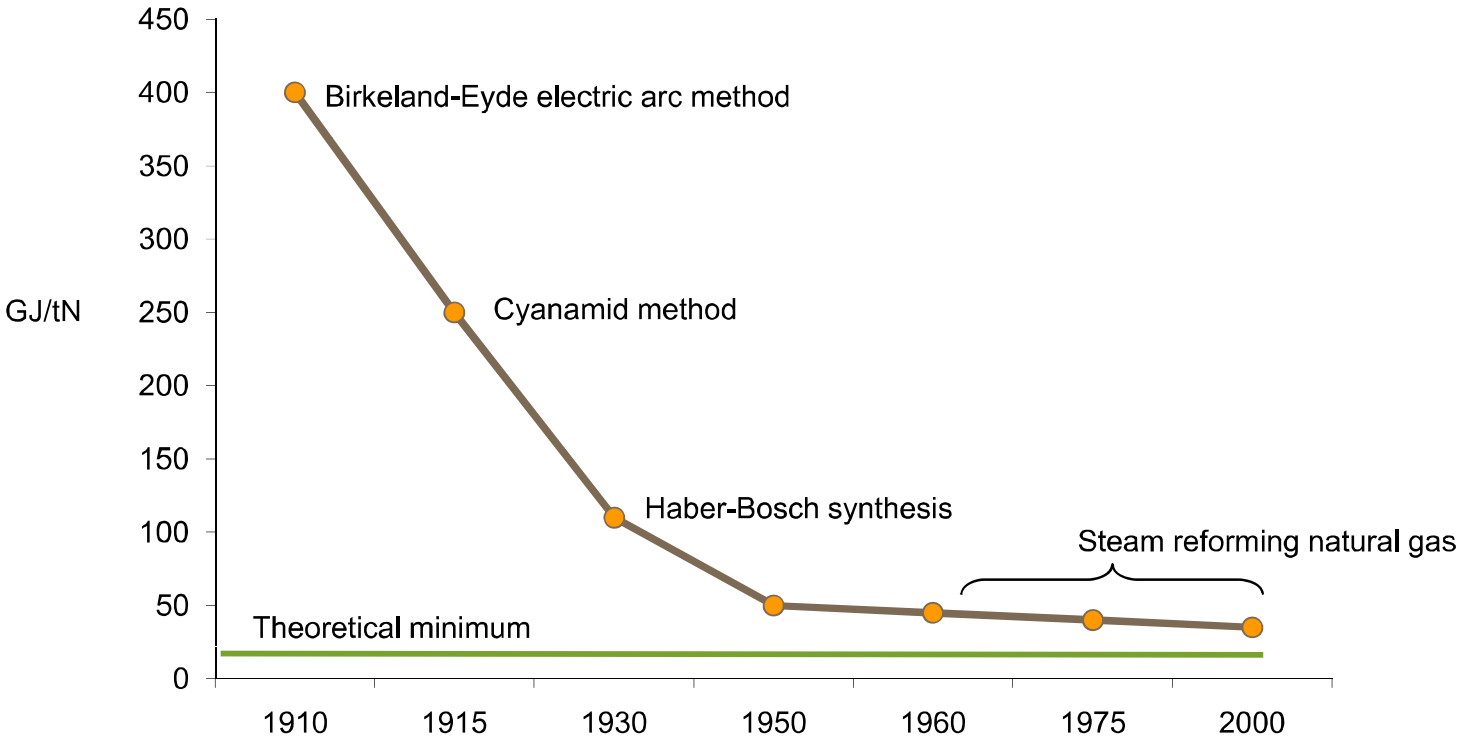
Source: USDA

Drivers of supply

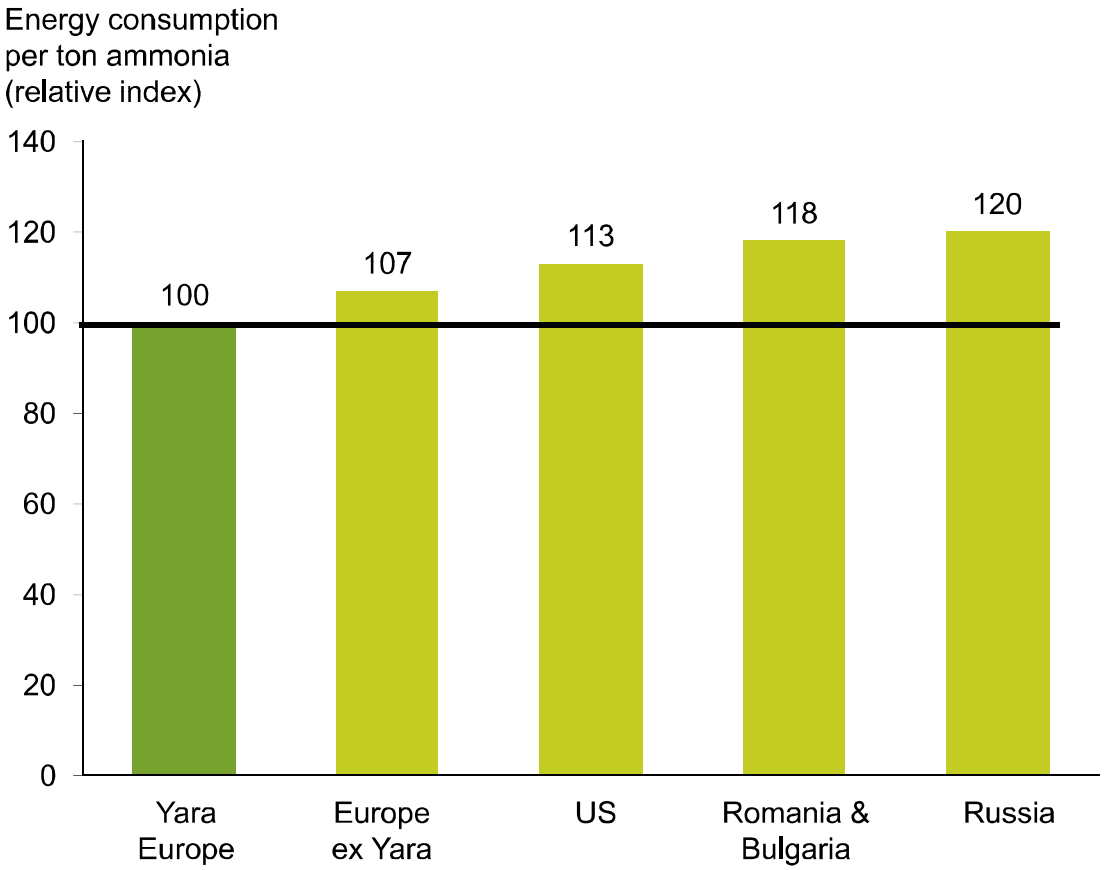
Nitrogen value chain



Nitrogen technology developments



Energy consumption in ammonia production



China's coal-fired ammonia plants use 70% more energy and emit 2.5 times more CO_2

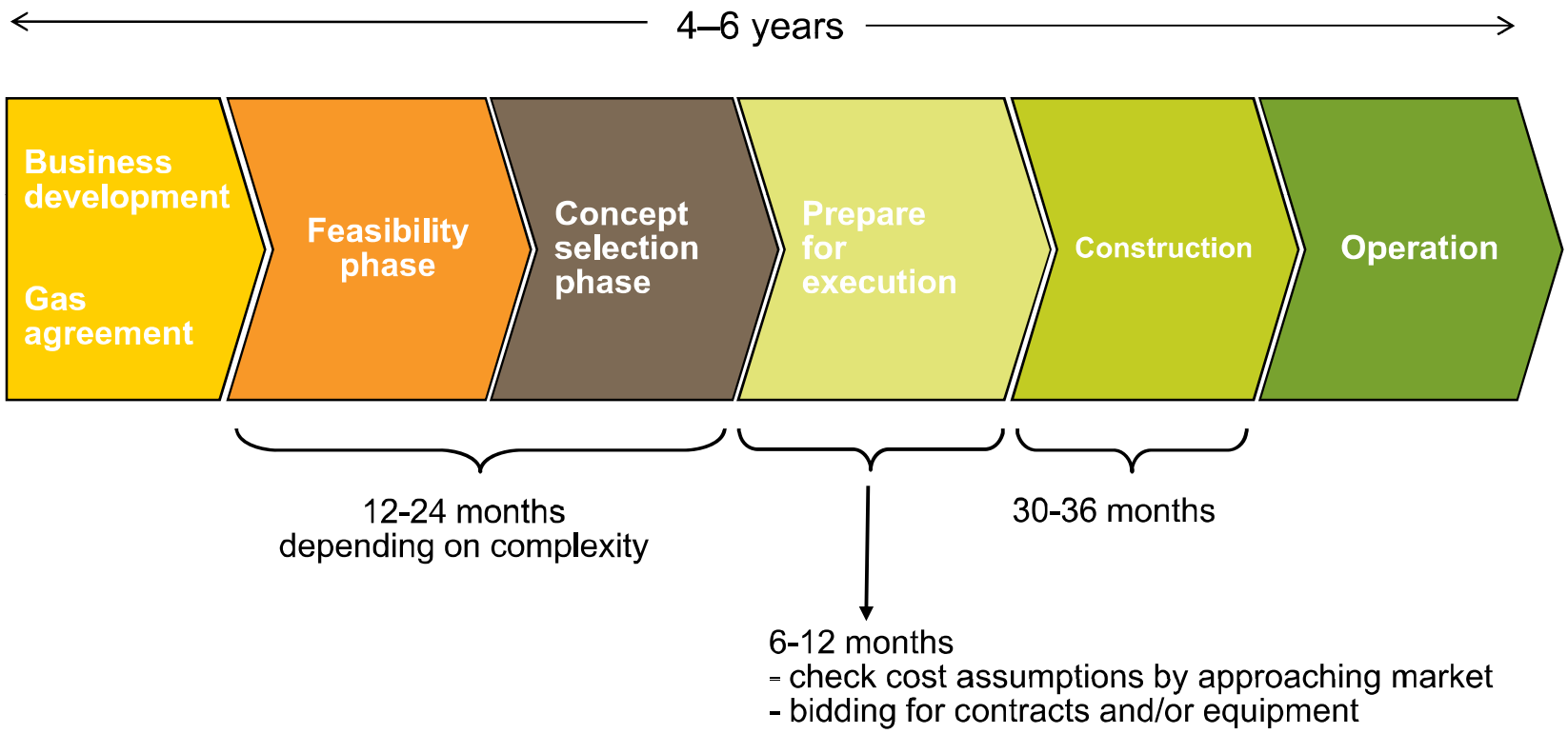
Source: Fertilizer Europe (2008)

Projected nitrogen capacity additions outside China in line with historical consumption growth

Year	Driving regions		Urea capacity growth relative to nitrogen capacity	
	World	**Excluding China**	**World**	**Excluding China**
2011	China 36% Pakistan 24%	Pakistan 37% Iran 18%	1.2% (1.3%)	1.2% (1.3%)
2012	China 60% Qatar 14%	Qatar 34% Vietnam 20%	3.5% (4.1%)	2.2% (2.1%)
2013	China 63% Algeria 14%	Algeria 38% UAE 18%	4.4% (2.7%)	2.6% (3.1%)
2014	China 45% Egypt 13%	Egypt 25% Algeria 16%	1.7% (1.0%)	1.5% (1.2%)
2015	China 42% Saudi Arabia 9%	Saudi Arabia 15% Brazil 14%	2.6% (1.2%)	2.5% (1.9%)
Gross annual addition 2011-2015				**~2.0%**
Assumed annual closures				~0.5%
Net annual addition 2011-2015				**~1.5%**
Trend consumption growth from 2001			**2.5%**	**2.1%**

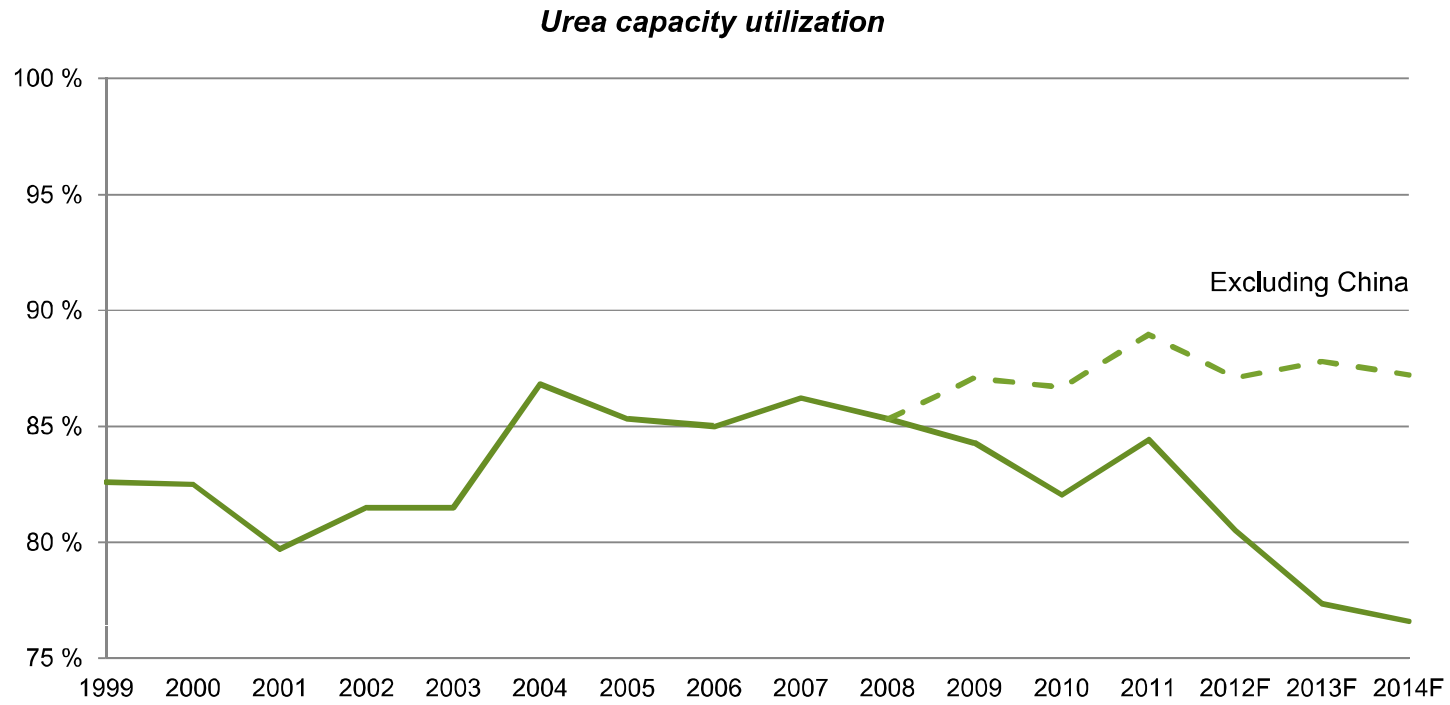
Source: Fertecon urea update October 2012. Consumption data source is IFA. Previous update in brackets.

5 year typical construction time for nitrogen fertilizer projects*



* Ammonia and urea plant example

Global nitrogen capacity utilization

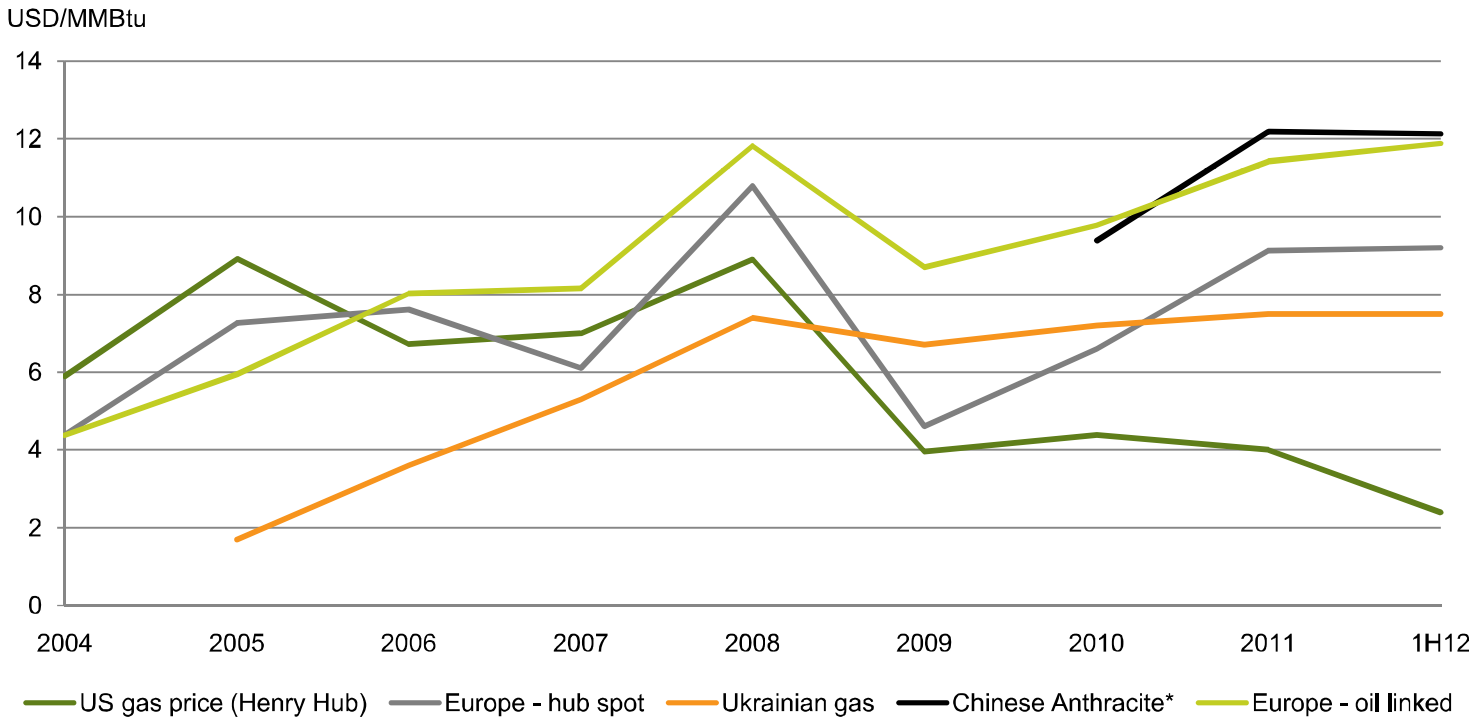


Source: Fertecon Oct 2012

Price relations

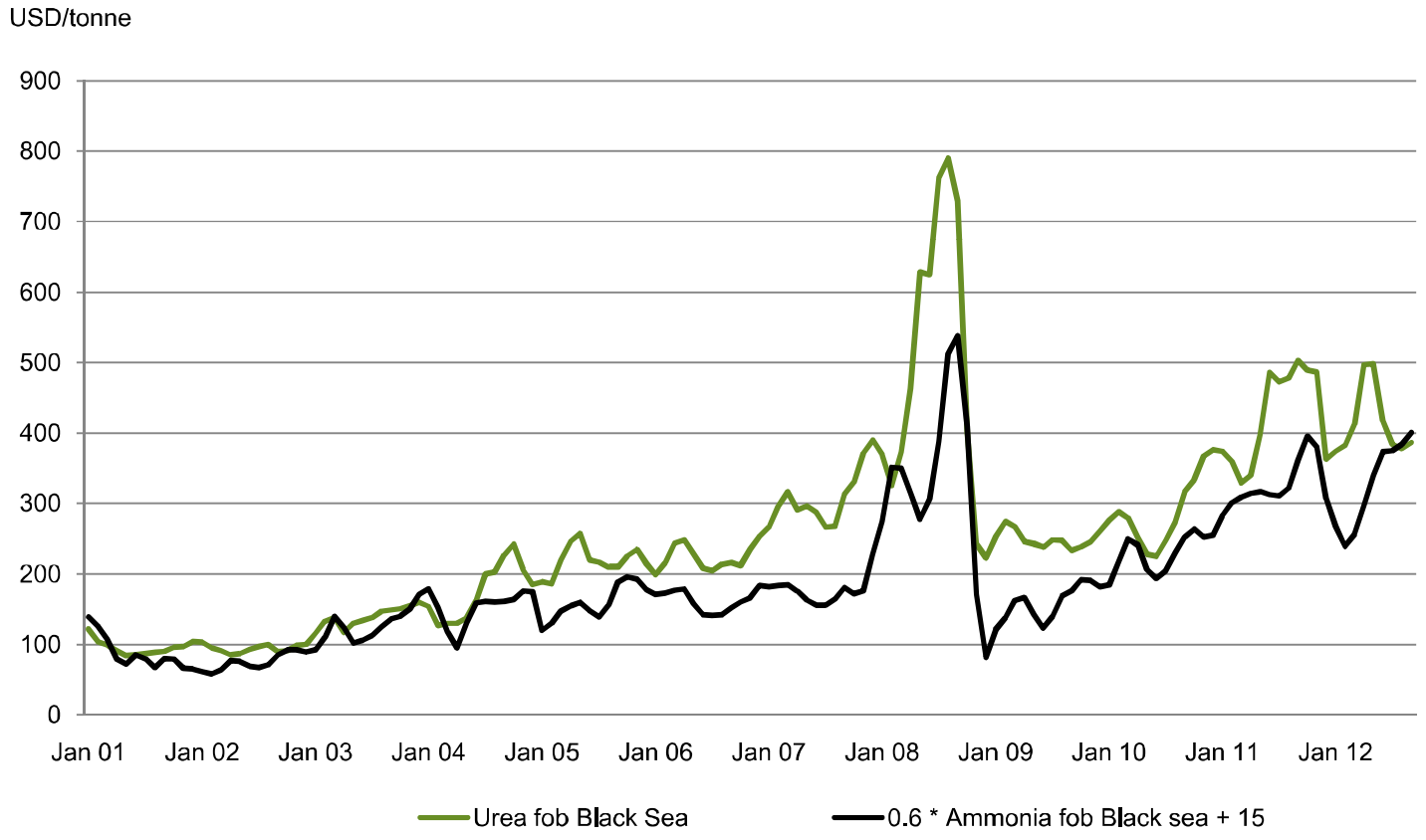
Feed-stock costs

Yearly average gas prices



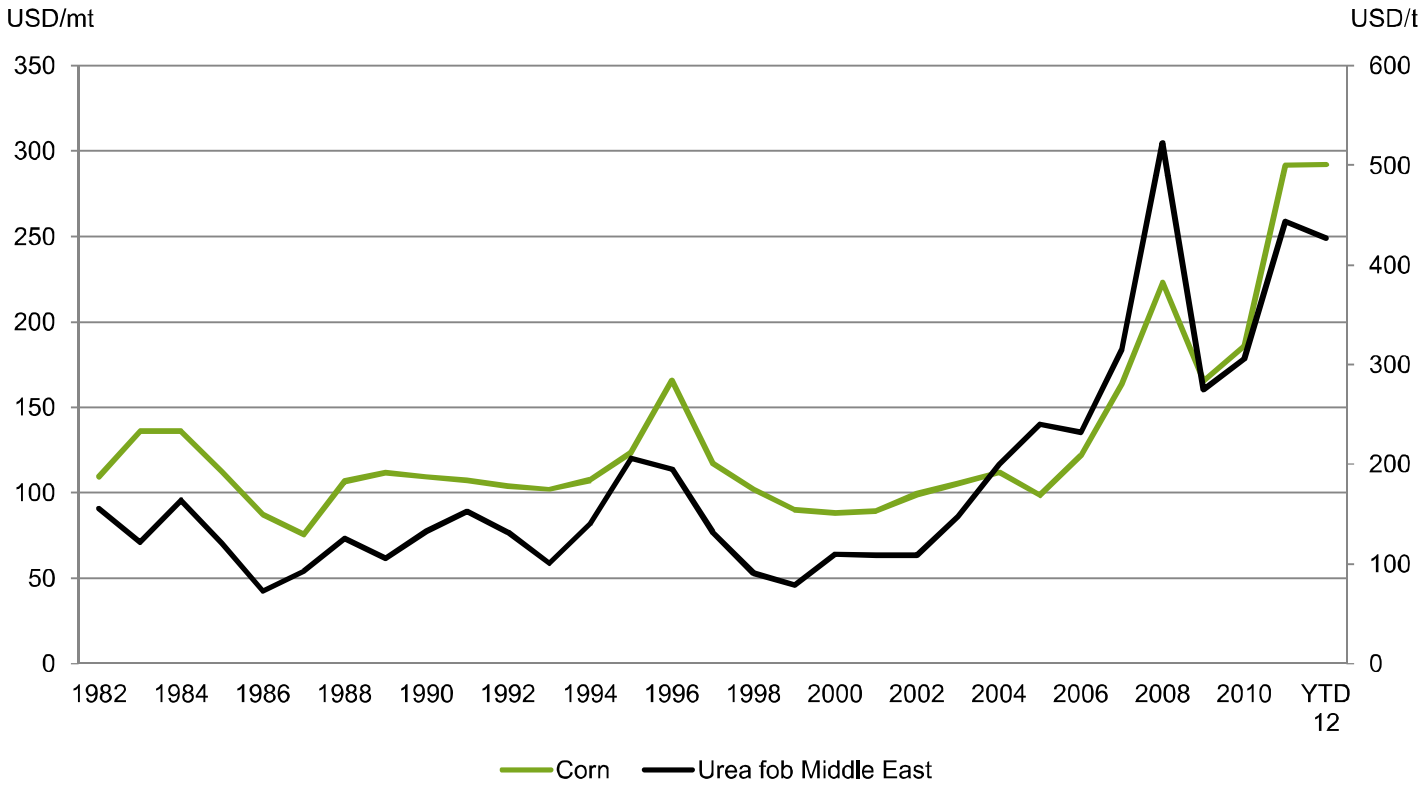
Source: World Bank, Fertecon, Pira (average import price into EU from World Bank used up to 1999)

Ammonia sets the floor for urea



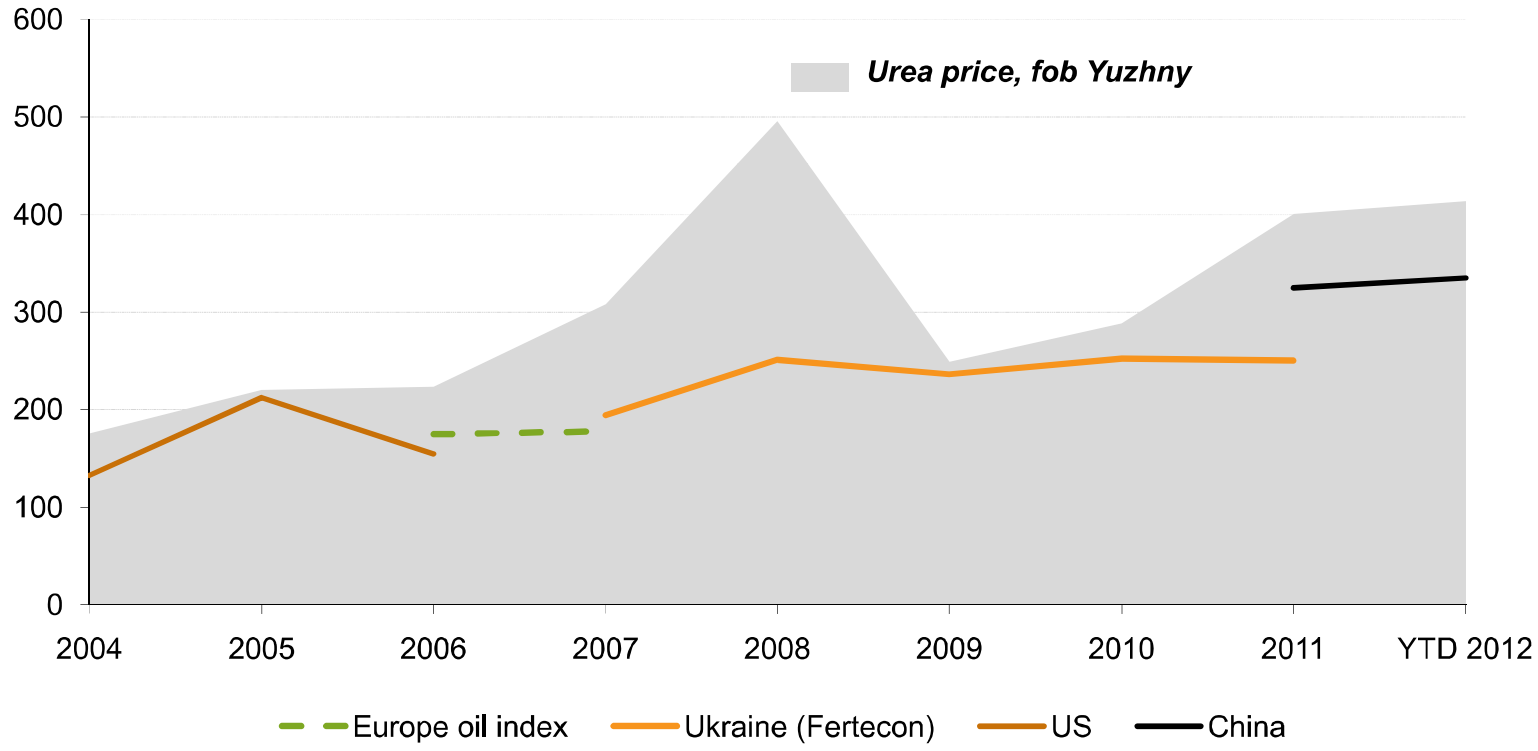
Source: Average of international publications

Grain prices set the ceiling for urea



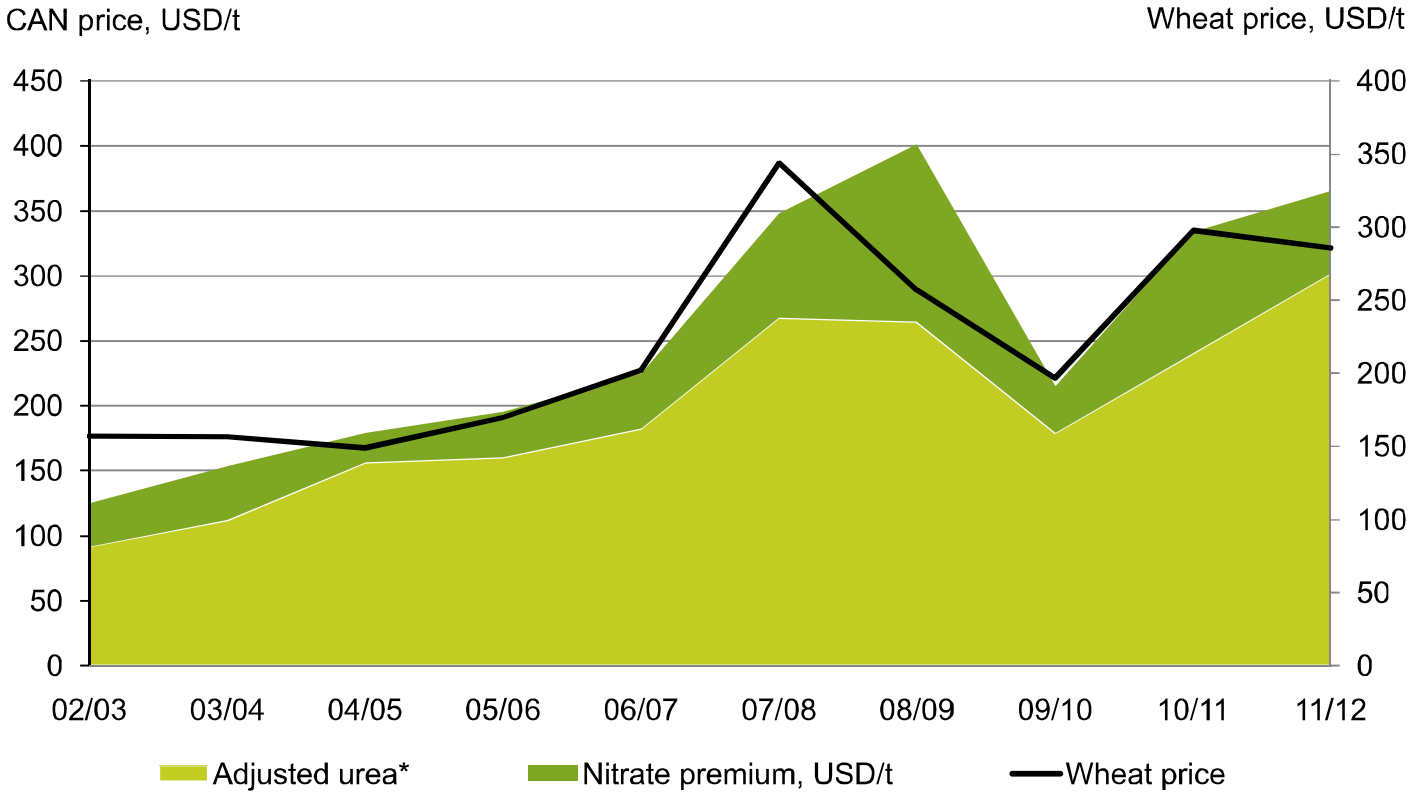
Source: World Bank, Fertilizer publications

Only shorter periods with supply-driven urea market



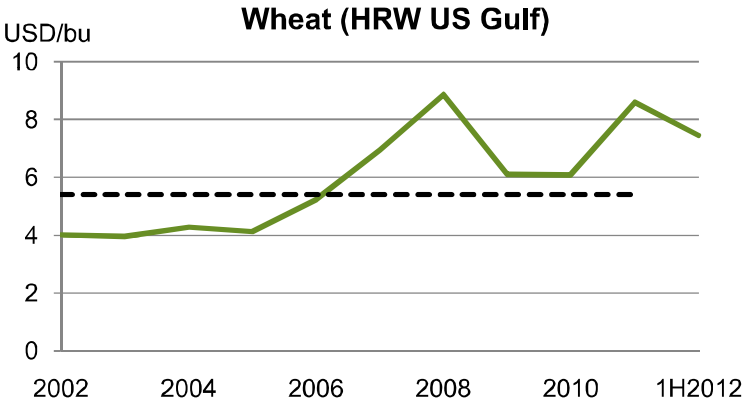
Source: Fertecon (Ukraine), Yara estimates

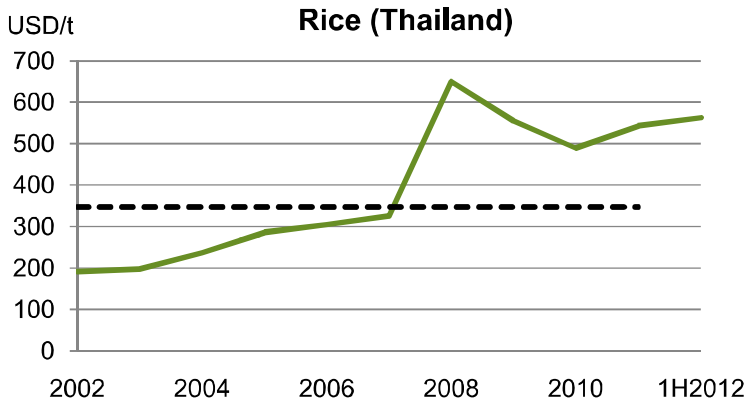
Nitrate premium is mainly a function of crop prices and proper marketing

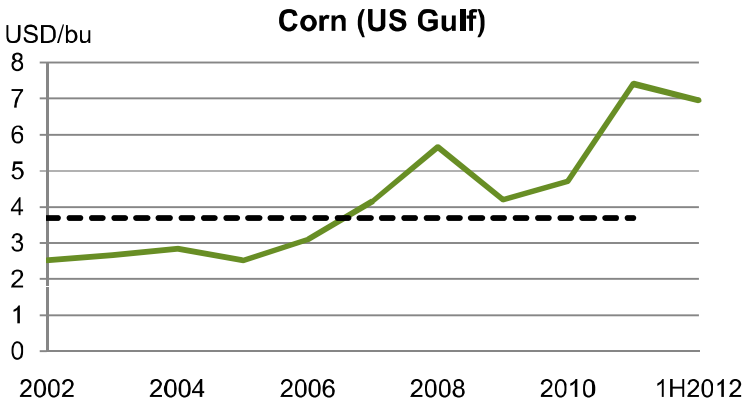


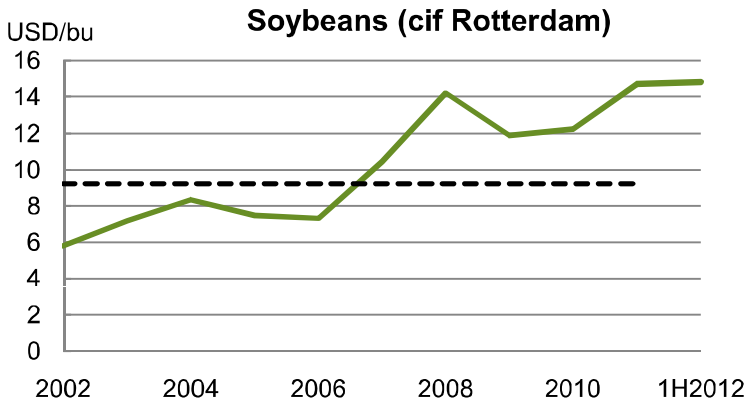
** Urea fob Black sea adjusted for import costs into Europe and nitrogen content similar to CAN*

Grain/oilseed prices – yearly averages





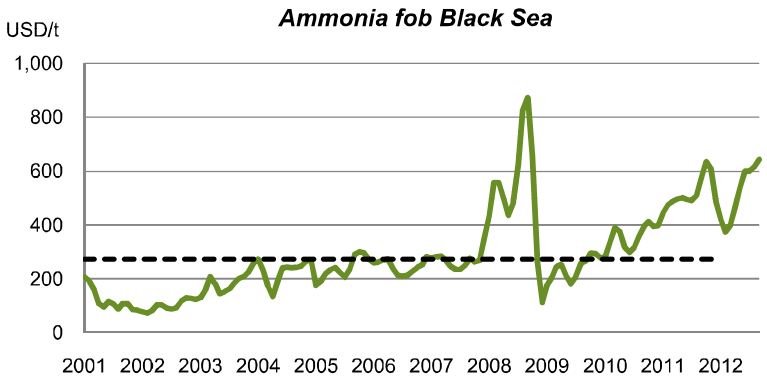


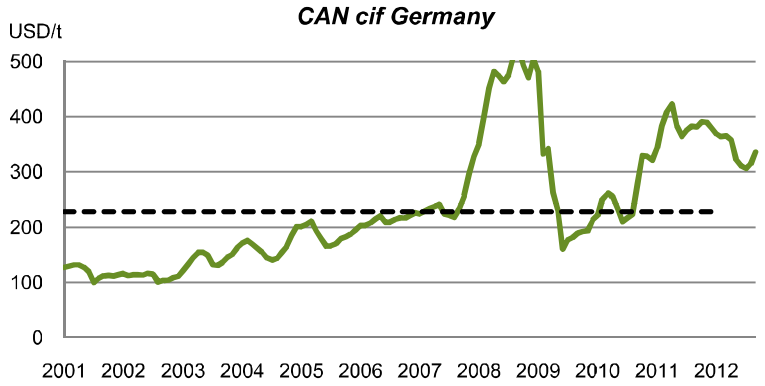


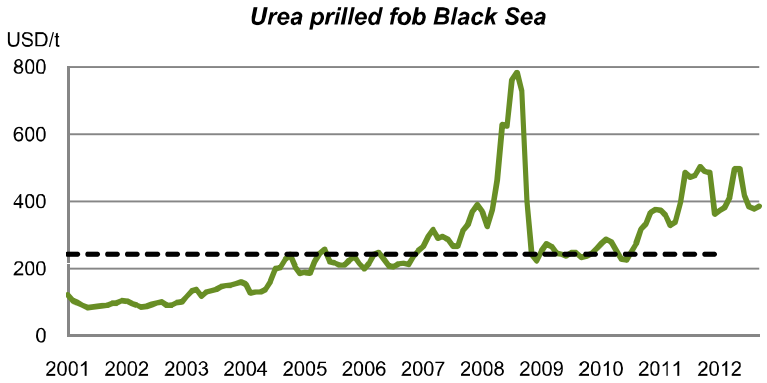
Source: World Bank, Aug 2012

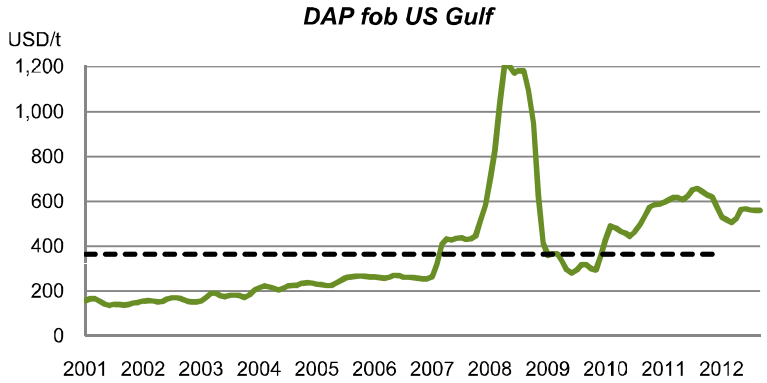
--- Average prices 2001-2011

Fertilizer prices – monthly averages









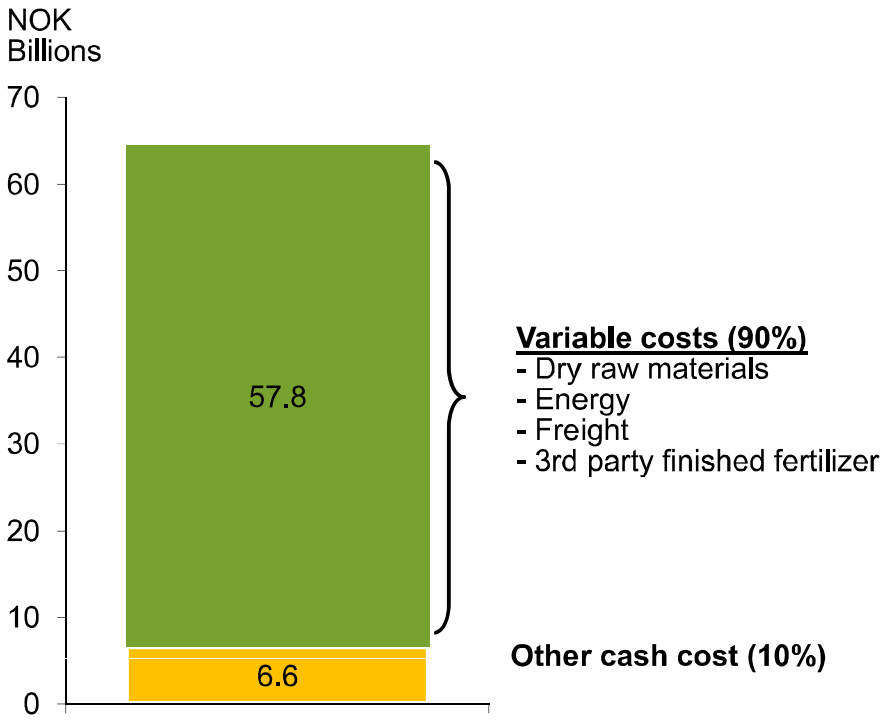
Average prices 2001 - 2011

Source: Average of international publications


YARA
Knowledge grows
Production economics

Yara's operating cash costs are mainly variable

Operating cash costs 2011



- Temporary plant closures can be made speedy and with limited stop/start costs
- Example for ammonia/urea plants:
  - Takes half a week to stop and a week to start
  - Cost of stopping is 2 days energy consumption
  - Cost of starting is 3 days energy consumption

Ammonia cash cost build-up – example

	Gas price:	8	USD/MMBtu
x	Gas consumption:	36	MMBtu/mt NH_3
=	Gas cost:	288	USD/mt NH_3
+	Other prod. cost:	26	USD/mt NH_3
=	Total cash cost	314	USD/mt NH_3

36 MMBtu natural gas/tonne ammonia

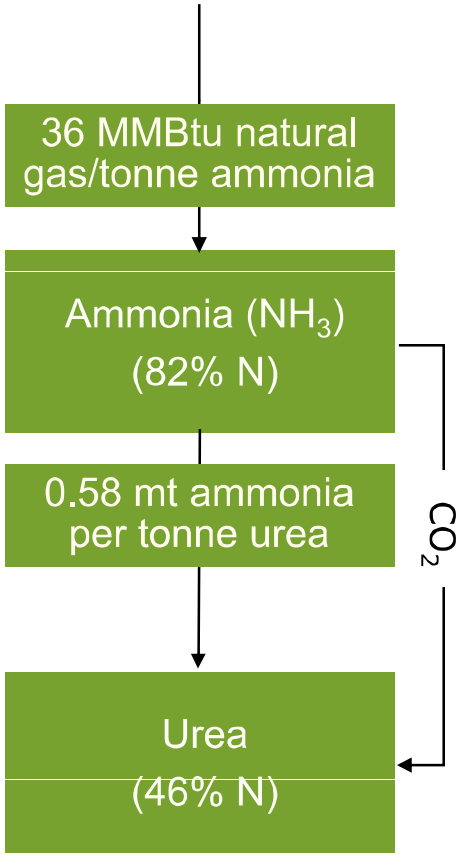
Ammonia (NH_3) (82% N)

Typical natural gas consumption for ammonia production

Source: Blue Johnson & Associates.

Urea cash cost build-up – example

	Ammonia price:	314	USD/mt NH_3
x	Ammonia use:	0.58	NH_3/mt urea
=	Ammonia cost	182	USD/mt urea
+	Process gas cost*	41	USD/mt urea
+	Other prod. cost**:	22	USD/mt urea
=	Total cash cost	245	USD/mt urea

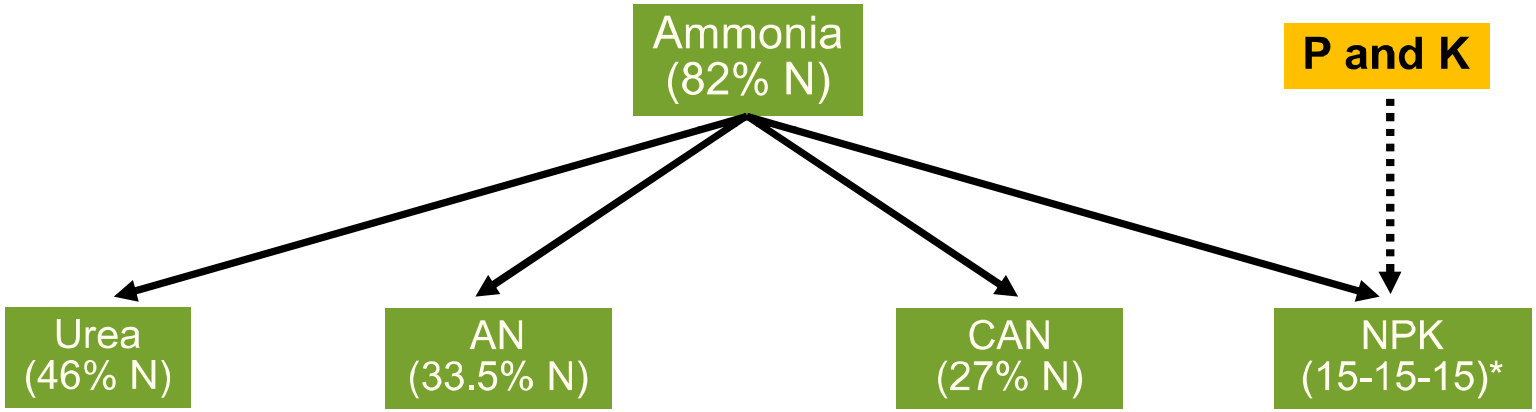


* Process gas cost is linked to natural gas price

** Including load-out

Source: Blue Johnson & Associates.

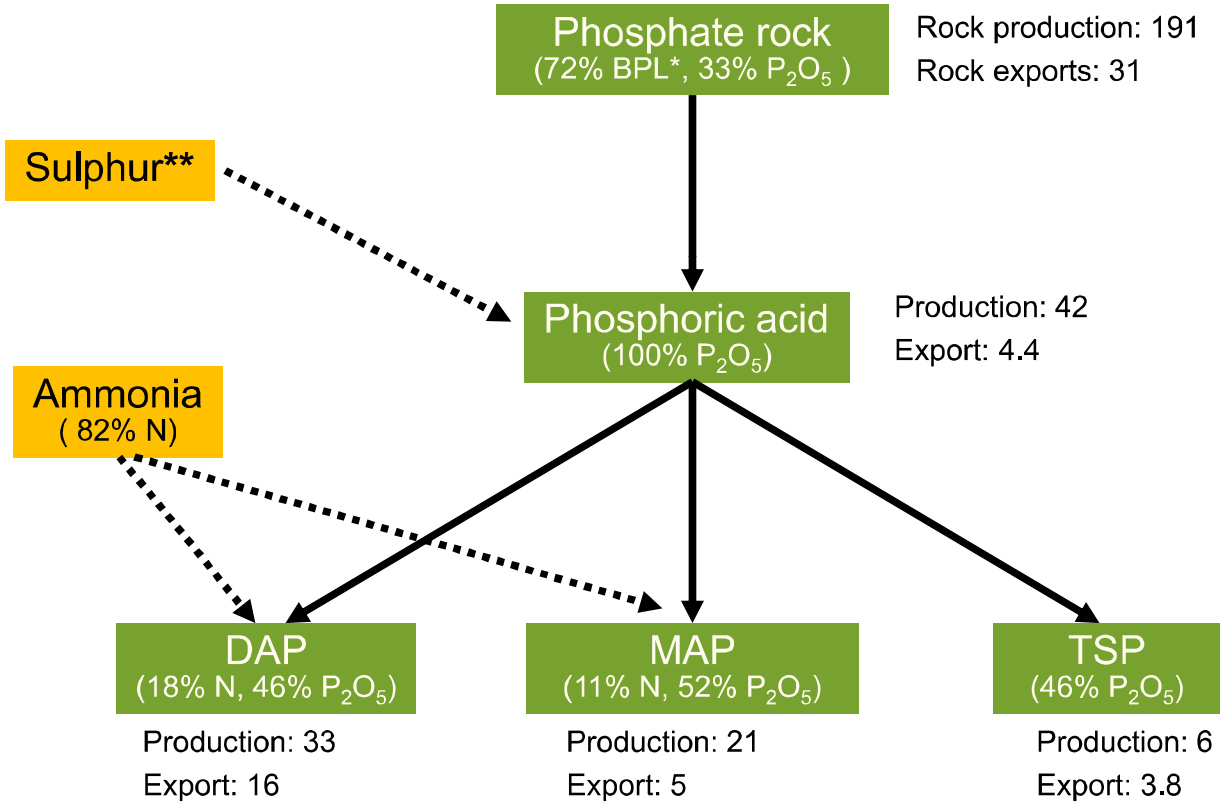
Theoretical consumption factors



* There are several NPK formulas. 15-15-15 is just an example

Main phosphate processing routes

2006 production and exports, million tons P_2O_5



* P2O5 content of phosphate rock varies. This is an example.

** 1 ton of phosphoric acid requires 1 ton of sulphur.

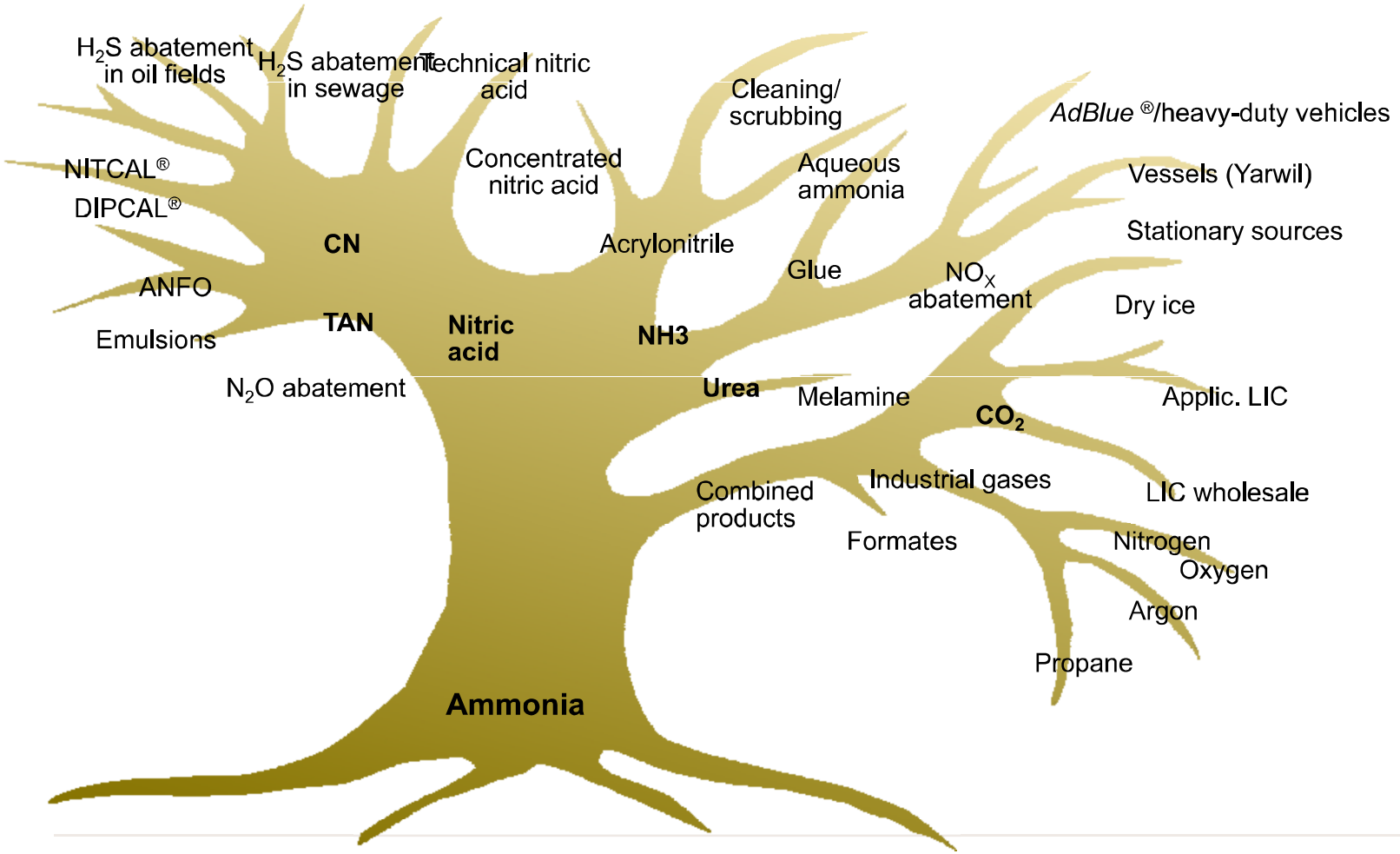
Source: IFA

YARA

Knowledge grows

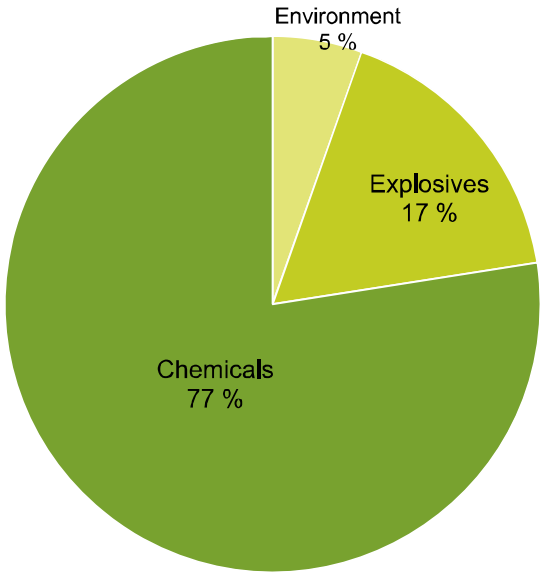
Industrial applications

Industrial nitrogen applications



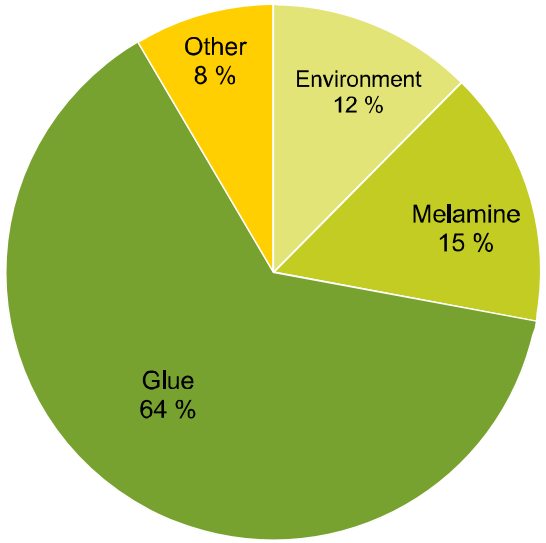
Industrial use accounts for 18% of global nitrogen consumption

~22 million tons N



18% of total N consumption

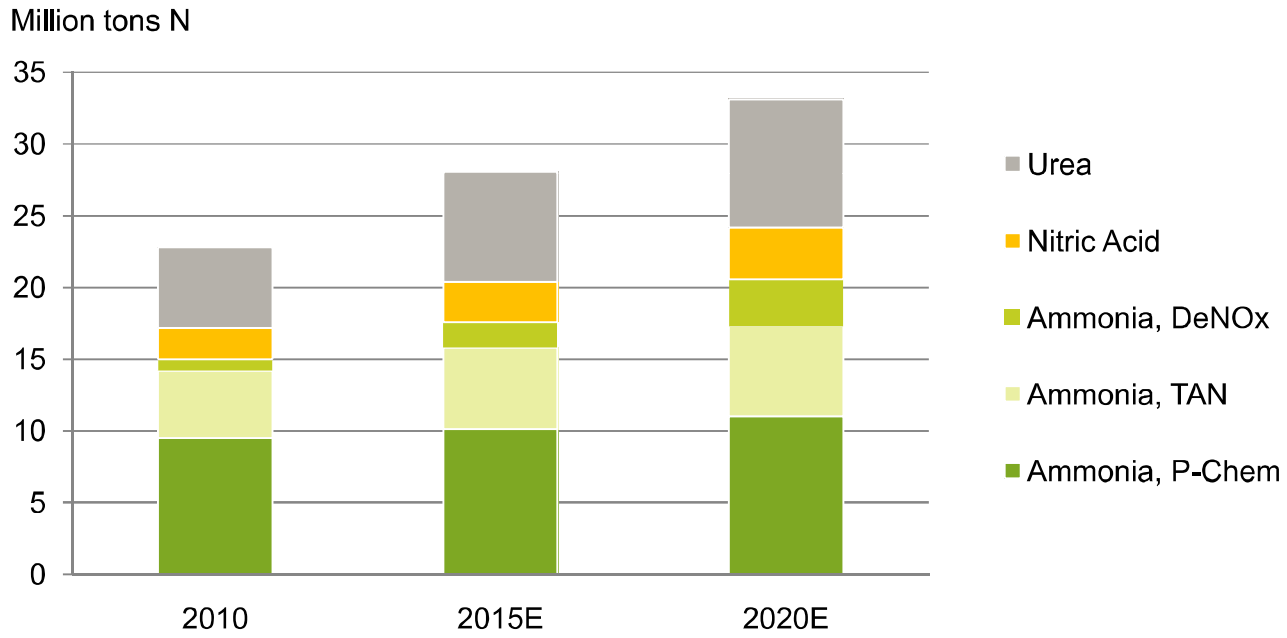
~7 million tons N as urea



10% of total urea consumption

Source: Yara estimates

Global demand development of nitrogen chemicals for industrial applications is strong



Estimated growth of Industrial applications is 10 million tons N (3.3 % annual growth)

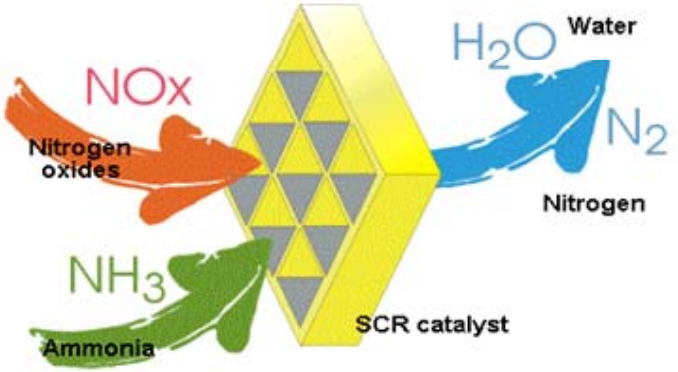
Source: Fertecon

Example

Urea and ammonia based solutions to improve air quality

Air1
NO_xCare
Yarwil

- Automotive, off and on road
- Stationary
- Maritime



Nitrogen oxides emissions lead to ground ozone layer and acid rain

Urea or ammonia combined with an SCR catalyst, eliminates up to 90% NO_x emissions

Legislation requires emission limits from mobile sources (transport fleets on land and at sea) and from industrial sources (power plants, cement factories, waste incinerators, refineries…)

AdBlue/DEF is a generic name for urea-based solution
Air1 is Yara's brand name for AdBlue/DEF

Example

Technical Nitrates for Civil Explosives

Various grades of Ammonium Nitrate and Calcium Nitrate for use in the civil explosives and mining industries

Example:

CO_2 has numerous industrial applications

Food additive:
High-quality CO_2
for beverage carbonisation

Food care:
CO_2 for greenhouses, chilling and freezing, processing and transport

Animal care:
Controlled atmosphere for livestock stunning

Manufacturing:
Welding and cutting gases

Blasting :
Multipurpose cleaning

Industries Served :

- ✓ Breweries
- ✓ Dairies
- ✓ Bakeries
- ✓ Meat and Poultry processing
- ✓ Fish Farming and processing
- ✓ Greenhouses
- ✓ Airline catering
- ✓ Refrigerated transport

Calcium nitrate for H_2S abatment

- Hydrogen Sulphide (H_2S) is a highly toxic, odorous, and corrosive gas formed in wastewater systems. It represents a significant health risk potentially causing loss of smell, eye irritation, rhinitis and respiratory difficulties amongst other symptoms
- Yara's calcium nitrate application is a natural biological system that removes and prevents the formation of H_2S in sewage systems and waste water treatment plants

Industries Served :

- ✓ Municipalities
- ✓ Wastewater treatment plants
- ✓ Dairies
- ✓ Pulp and paper industry
- ✓ Slaughter houses
- ✓ Breweries
- ✓ Oil fields

Sources of market information

- Fertilizer market information
  - FMB — www.fmb-group.co.uk
  - Fertecon — www.fertecon.com
  - Fertilizer Week — www.cruonline.crugroup.com
  - Profercy — www.profercy.com
  - The Market — www.icispricing.com
  - Green Markets (USA) — www.greenmarkets.pf.com
  - Beijing Orient Business (China) — www.boabc.com
  - China Fertilizer Market Week — www.fertmarket.com

- Fertilizer industry associations
  - International Fertilizer Industry Association (IFA) — www.fertilizer.org
  - Fertilizers Europe (EFMA) — www.efma.org

- Food and grain market information
  - Food and Agriculture Organization of the UN — www.fao.org
  - International Grain Council — www.igc.org.uk
  - Chicago Board of Trade — www.cbot.com
  - World Bank commodity prices — www.worldbank.org
  - US Department of Agriculture (USDA) — www.usda.gov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