ROLE OF FERTILIZERS IN INCREASED AGRICULTURAL PRODUCTIVITY

by

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FERTECON Limited

IATRC Symposium, Seville, 3 June 2013

informa bringing knowledge to life

FERTECON Limited

- Formed in 1978
- Leading global provider of fertilizer market information, prices and analysis
- Now part of Informa
- The link with Informa gives FERTECON new access to data and analysis resources on agriculture, shipping and freight and energy

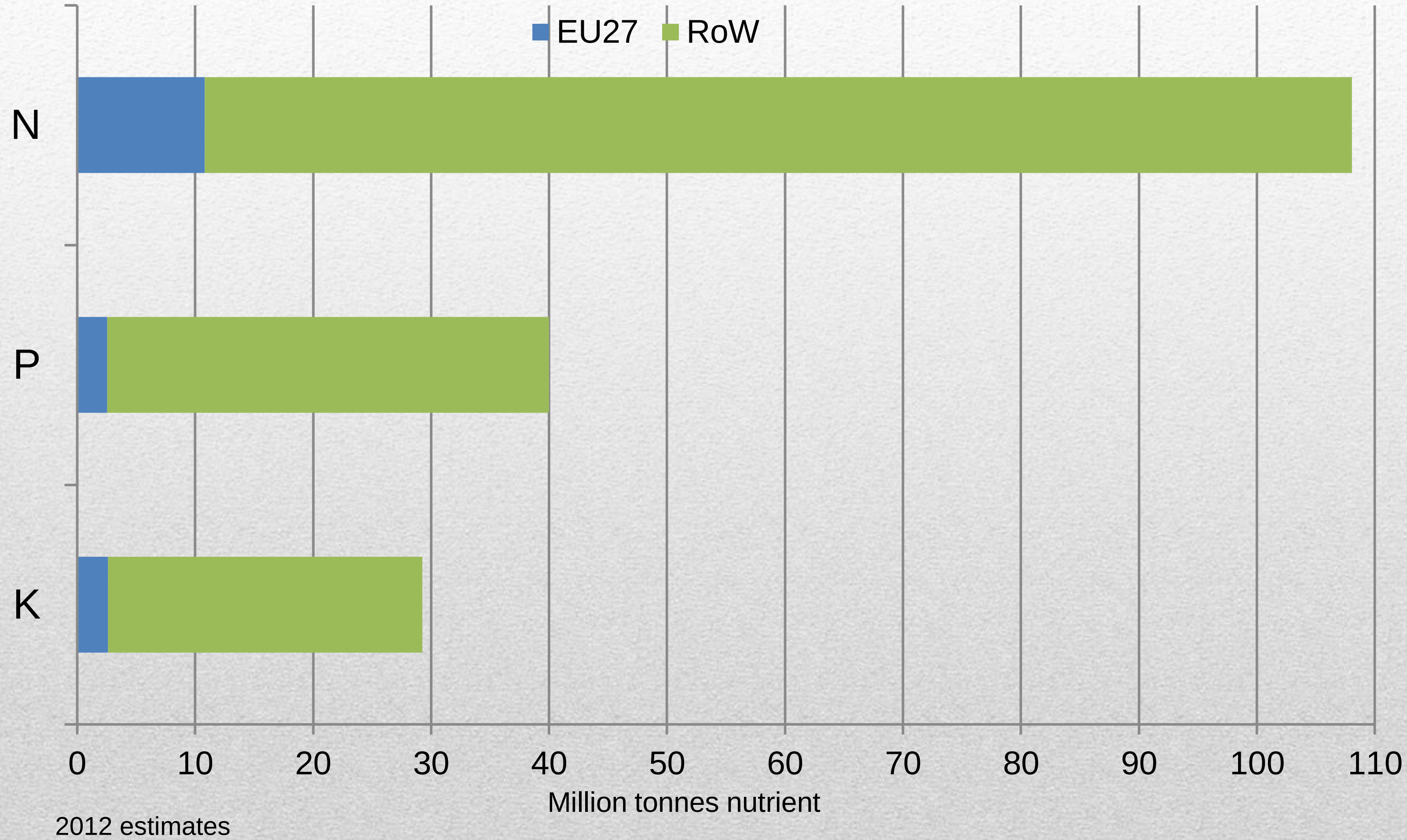
FERTILIZER USE

FERTILIZER ESSENTIALS

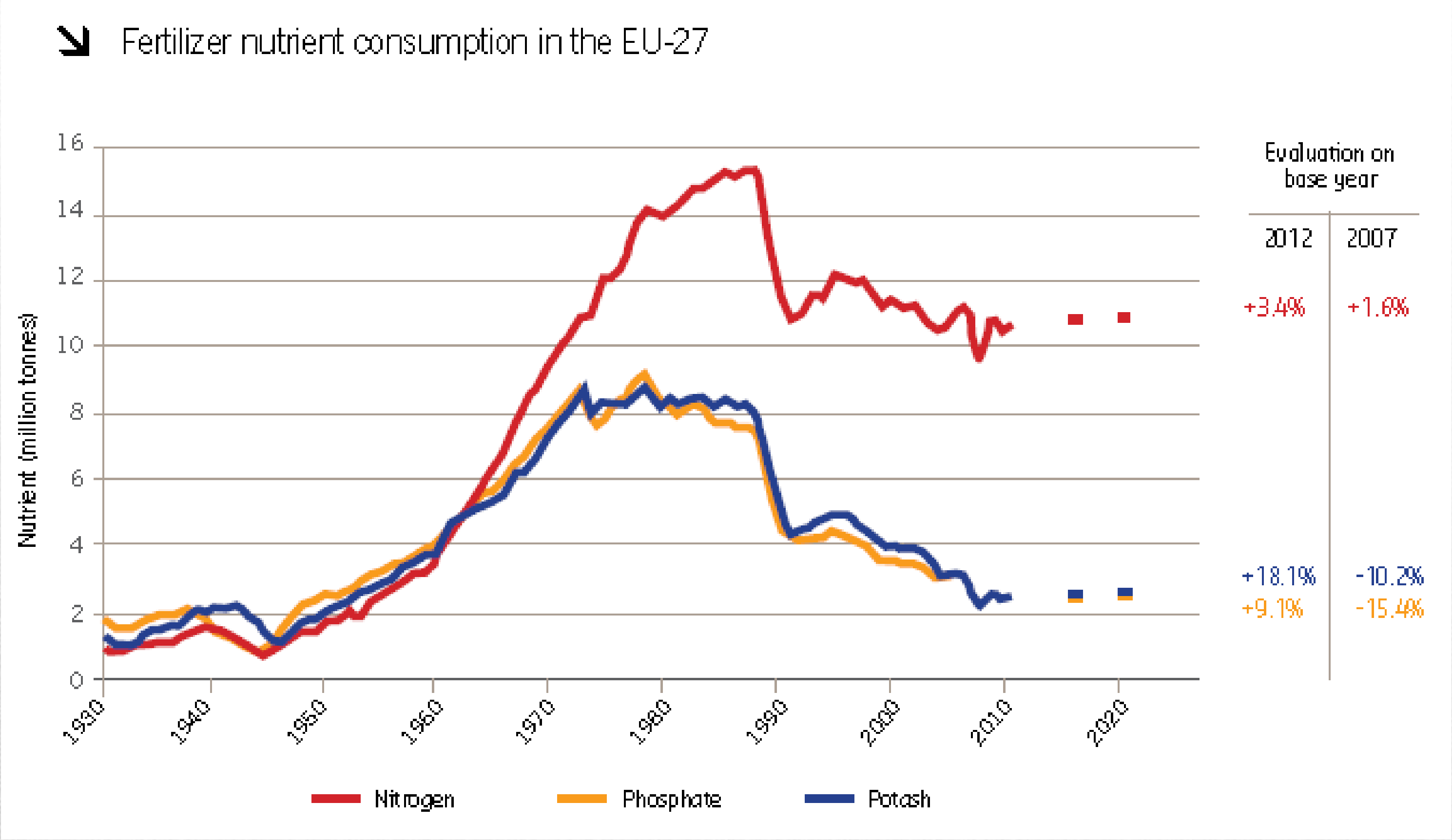
- There are three main nutrients
- Nitrogen (N)
- Phosphate (P_2O_5)
- Potash (K_2O)

- There are secondary and micronutrients such as sulphur, magnesium, zinc etc.
- Nutrients perform different functions in the growth of the plant and the three main nutrients cannot be substituted for each other
- Plants need balanced nutrient application – how much and in what proportion depends on the soil type and the crop being grown
- Without chemical fertilizers, crop production would be reduced by almost half
- Fertilizers generally account for around 25-30% of a farmer's direct input costs

WORLD/ EU FERTILIZER USE

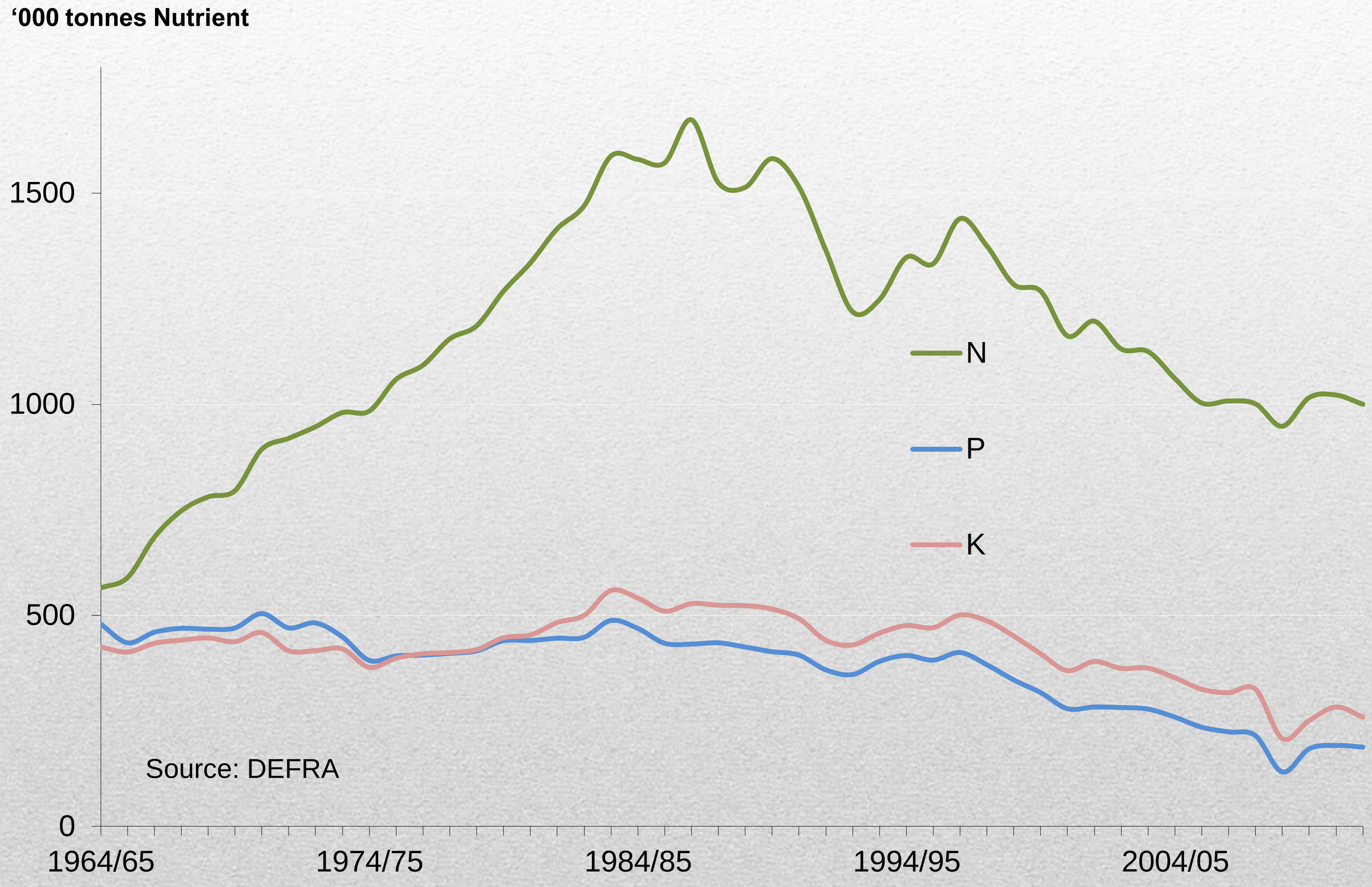


EU FERTILIZER USE

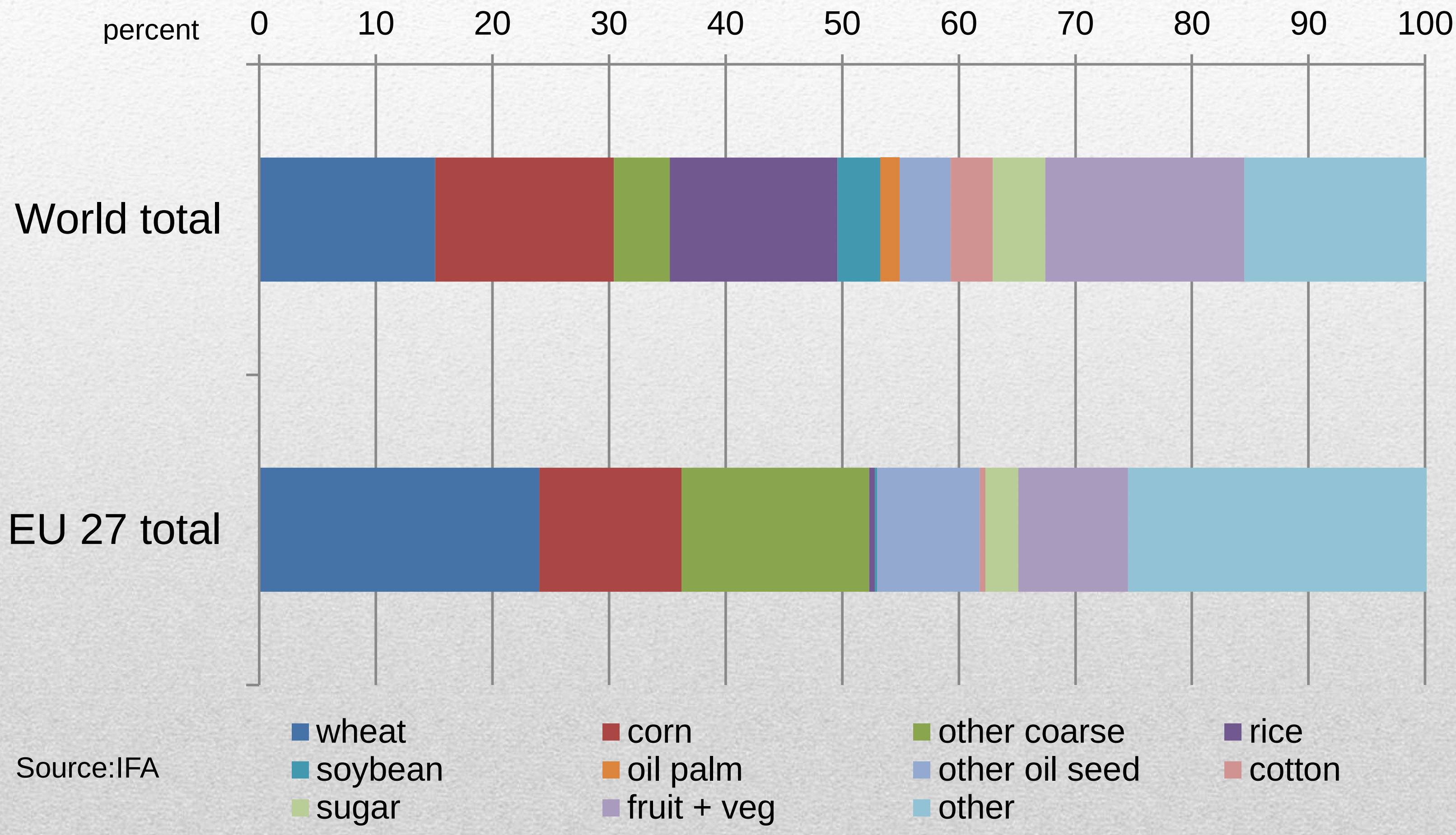


Source: Fertilizers Europe

UK FERTILIZER USE

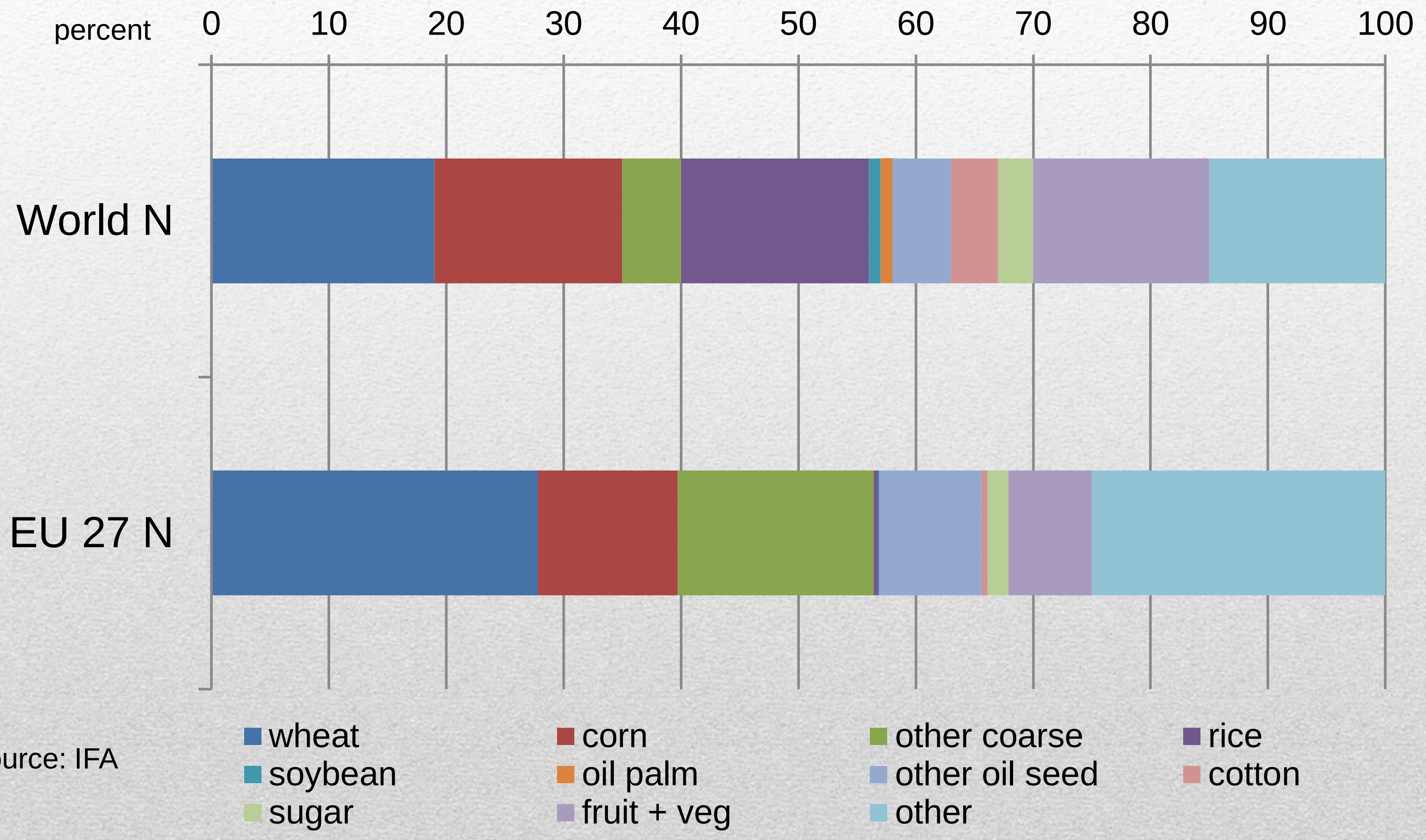


FERTILIZER USE BY CROP



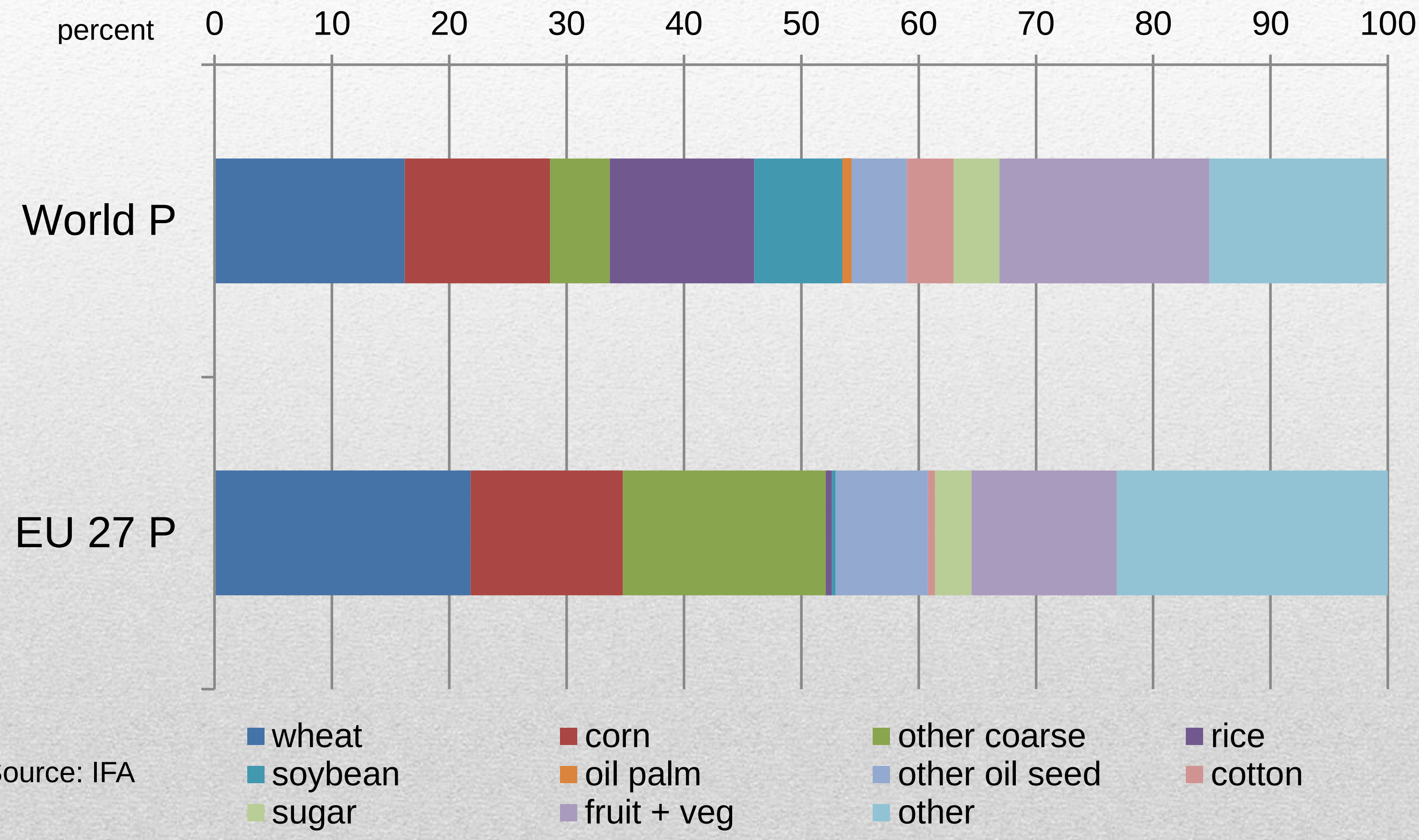
Source:IFA

NITROGEN USE BY CROP



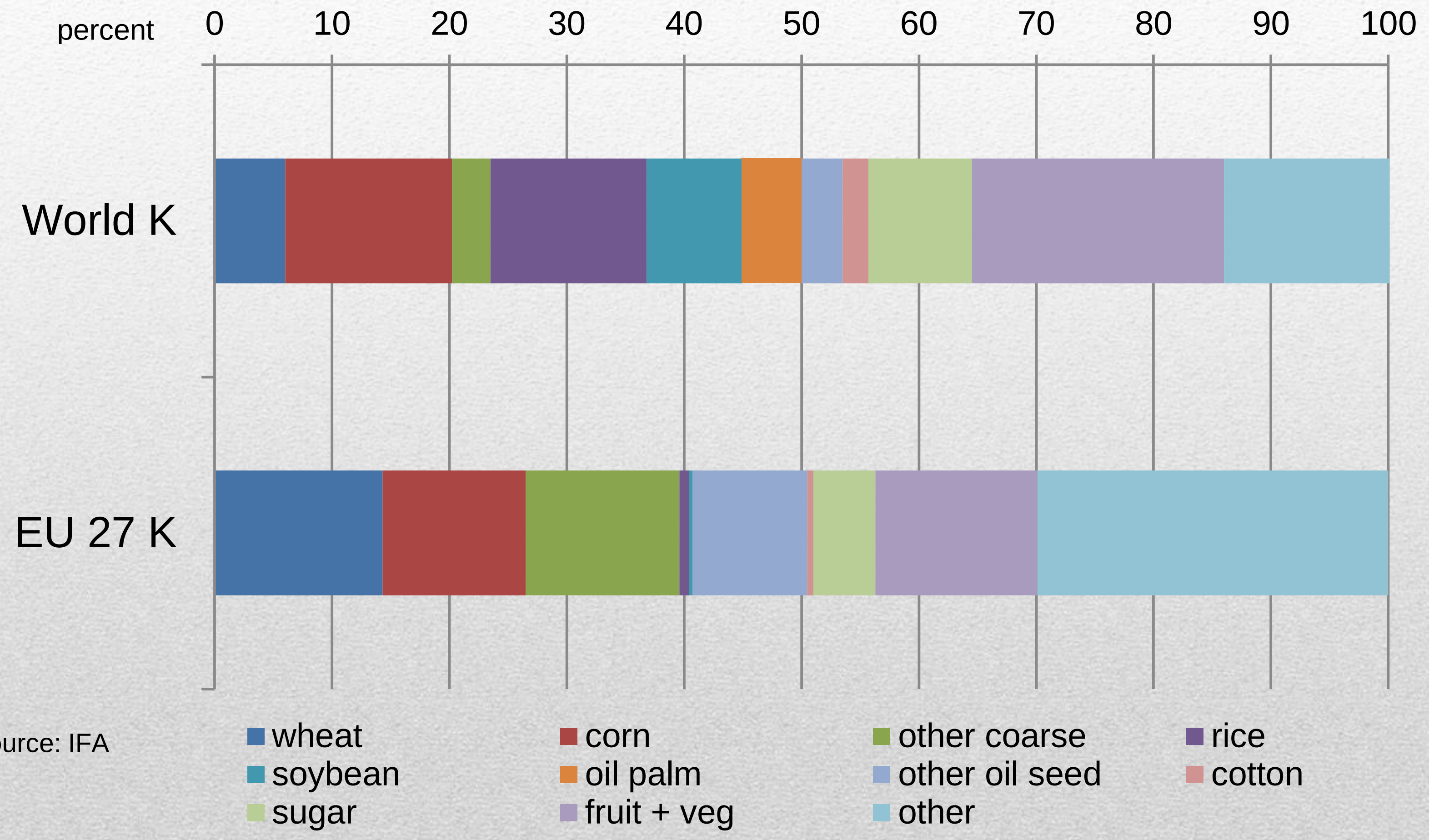
Source: IFA

PHOSPHATE USE BY CROP



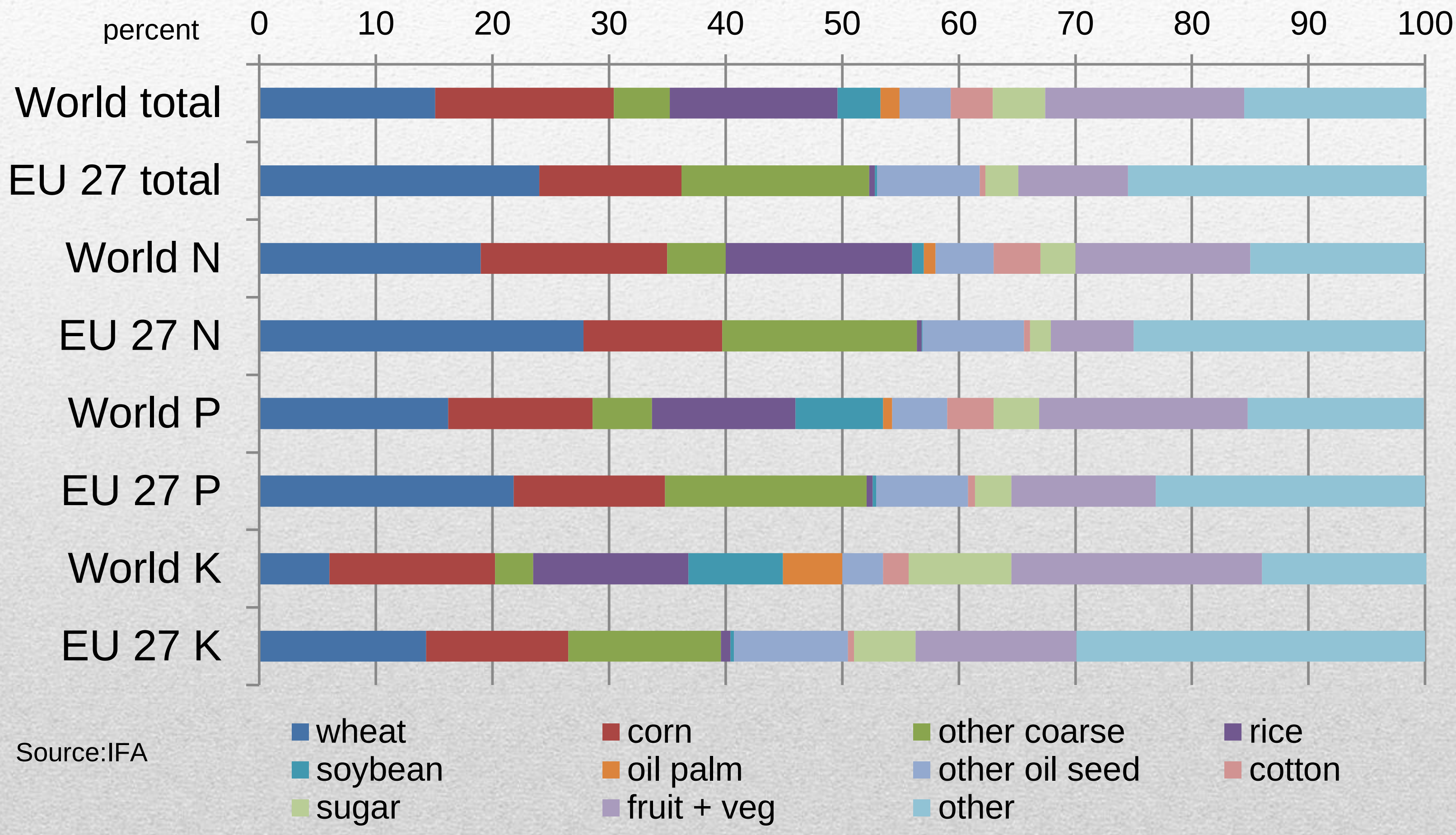
Source: IFA

POTASH USE BY CROP



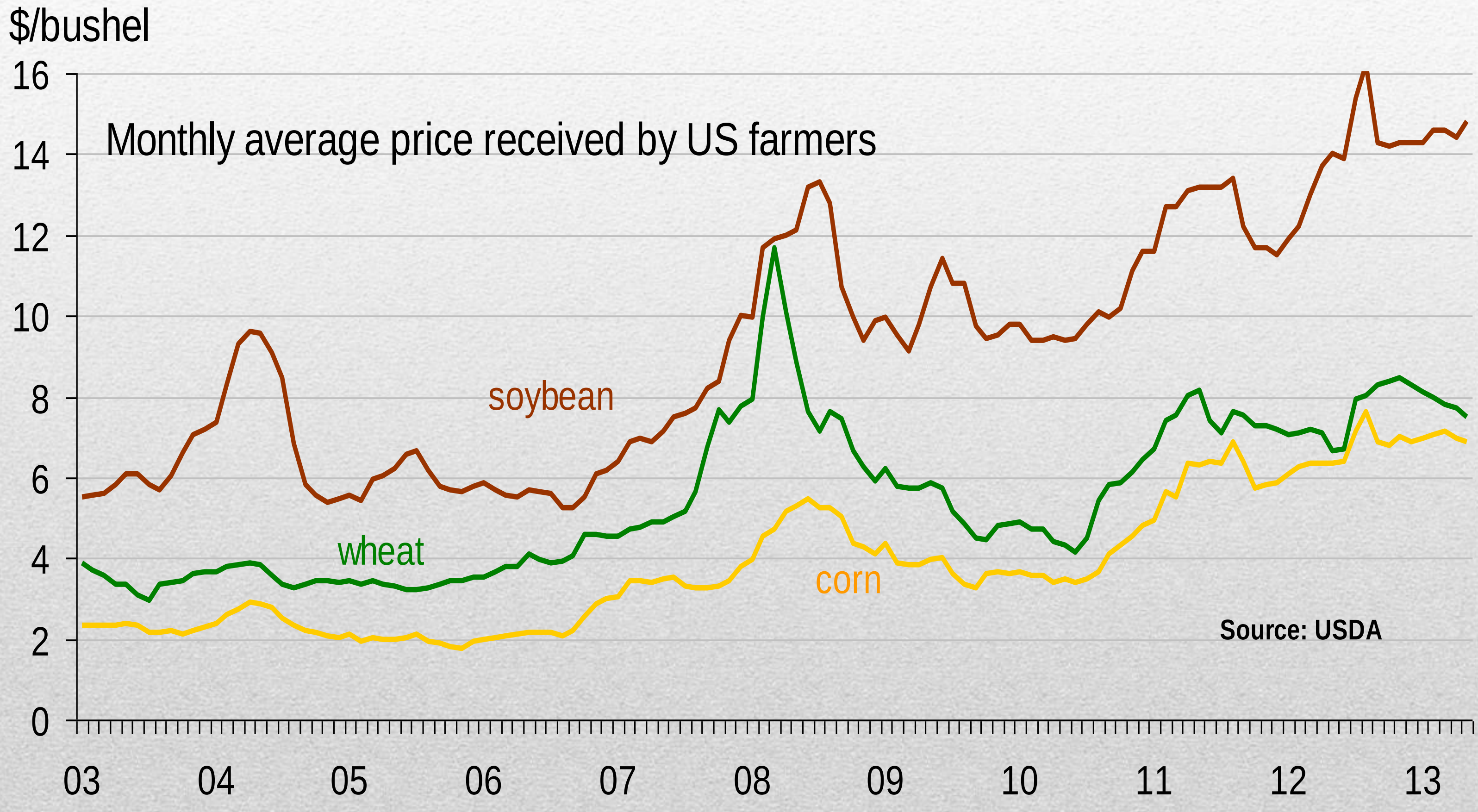
Source: IFA

FERTILIZER USE BY CROP



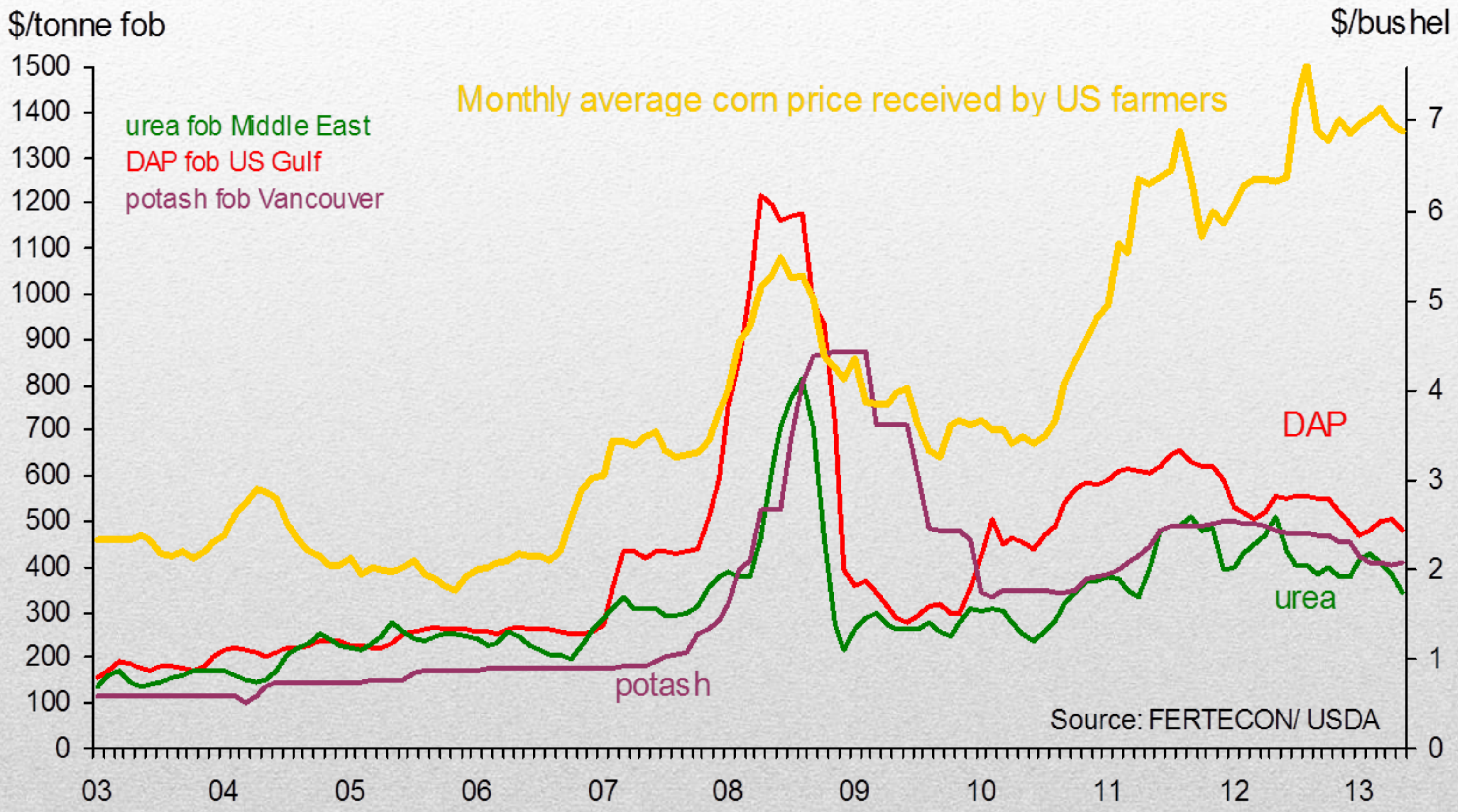
Source:IFA

CROP PRICES

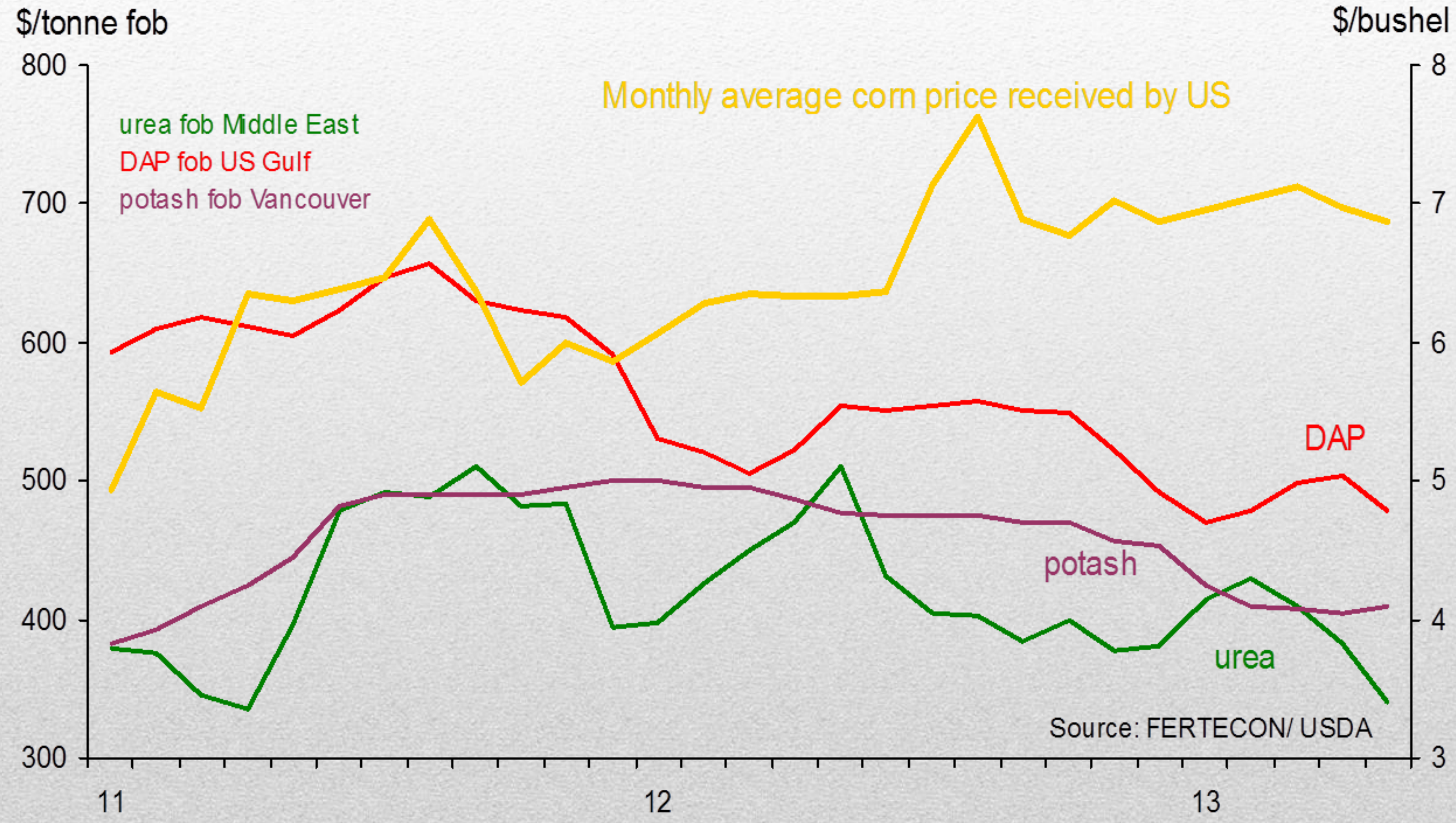


$/bushel
16
14
12
10
8
6
4
2
0
Monthly average price received by US farmers
soybean
wheat
corn
Source: USDA
03
04
05
06
07
08
09
10
11
12
13

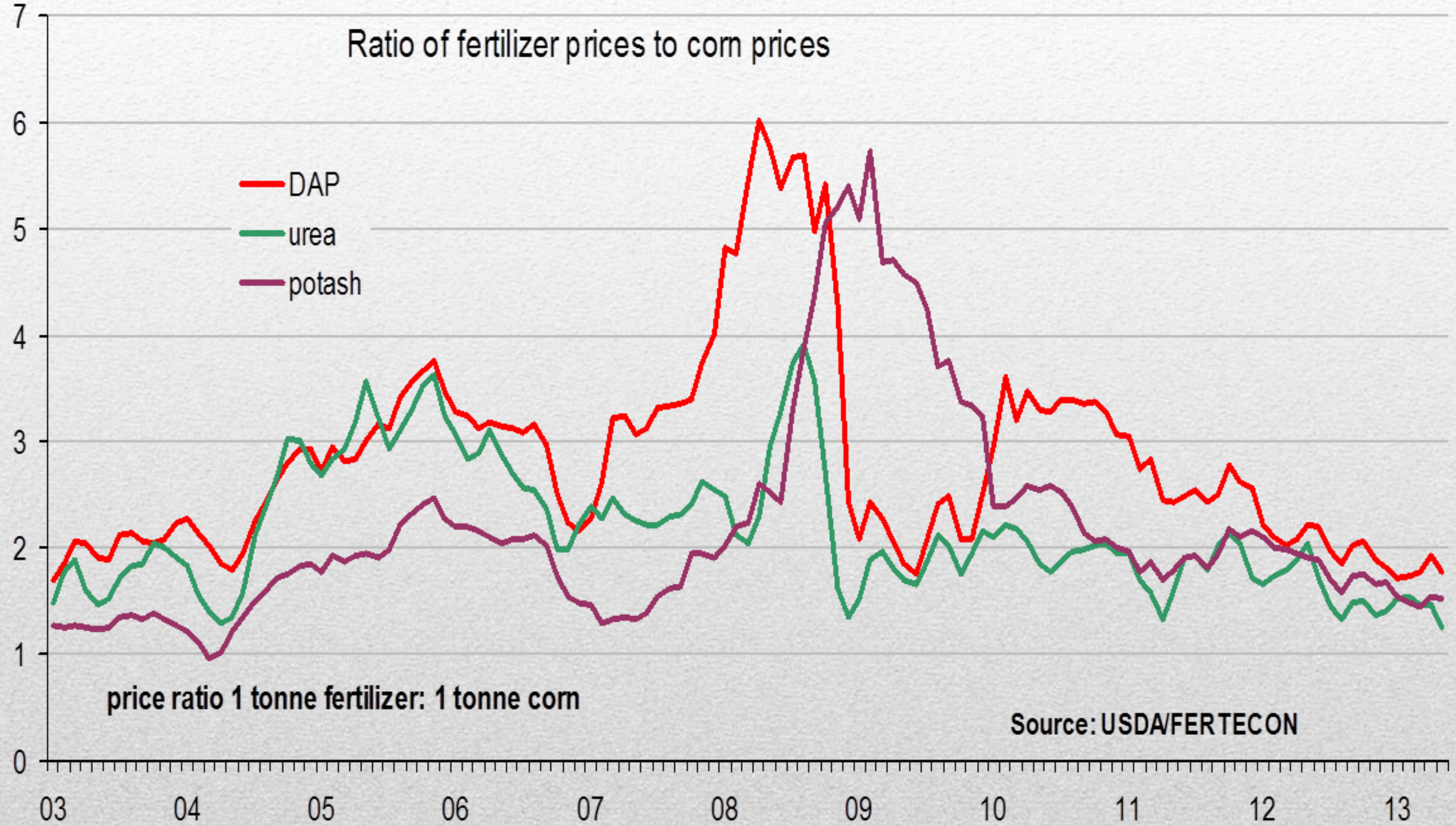
CROP vs FERTILIZER PRICES



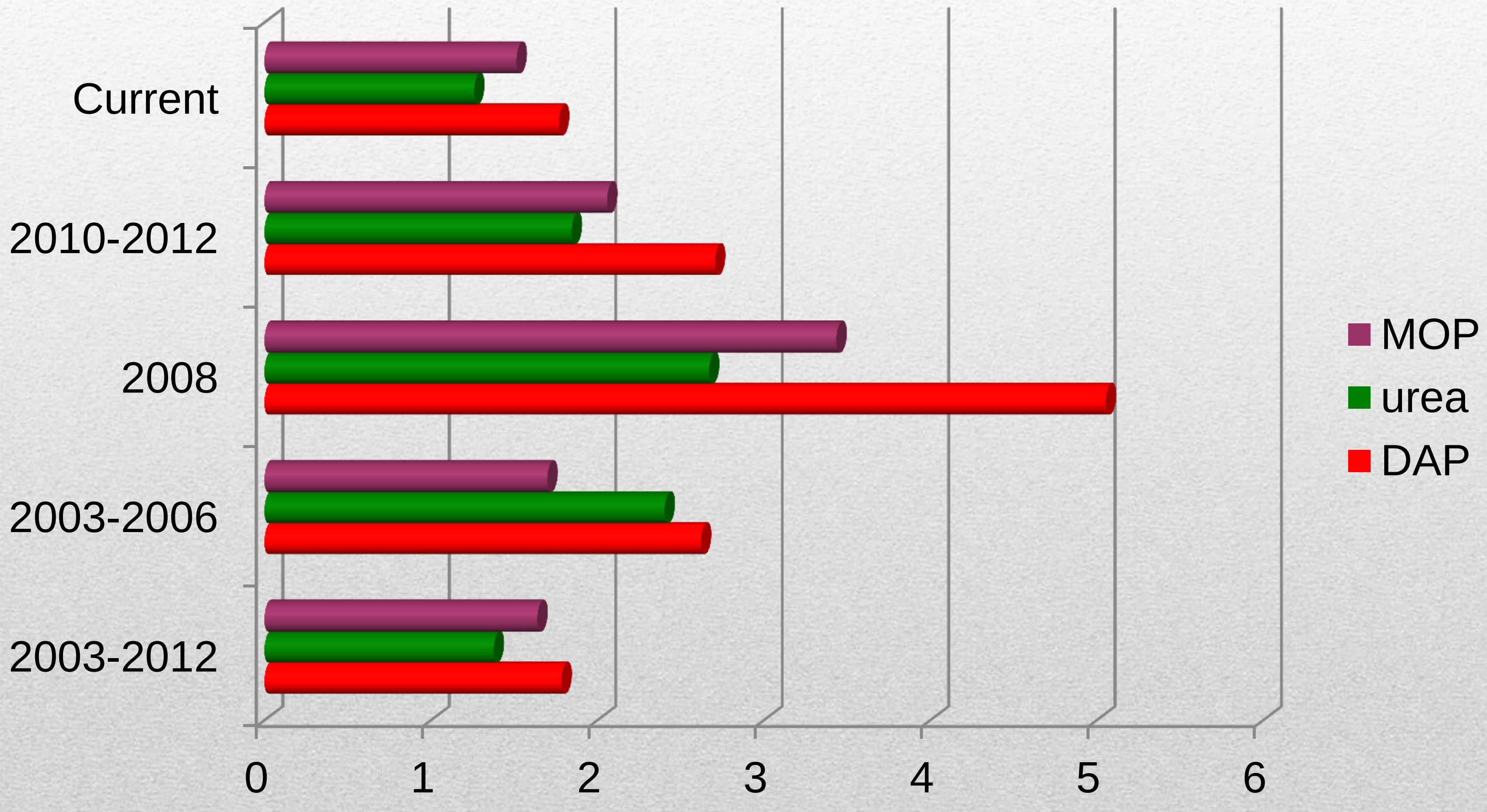
CROP vs FERTILIZER PRICES



FERTILIZER TO CROP PRICE RATIOS



CORN TO FERTILIZER RATIOS



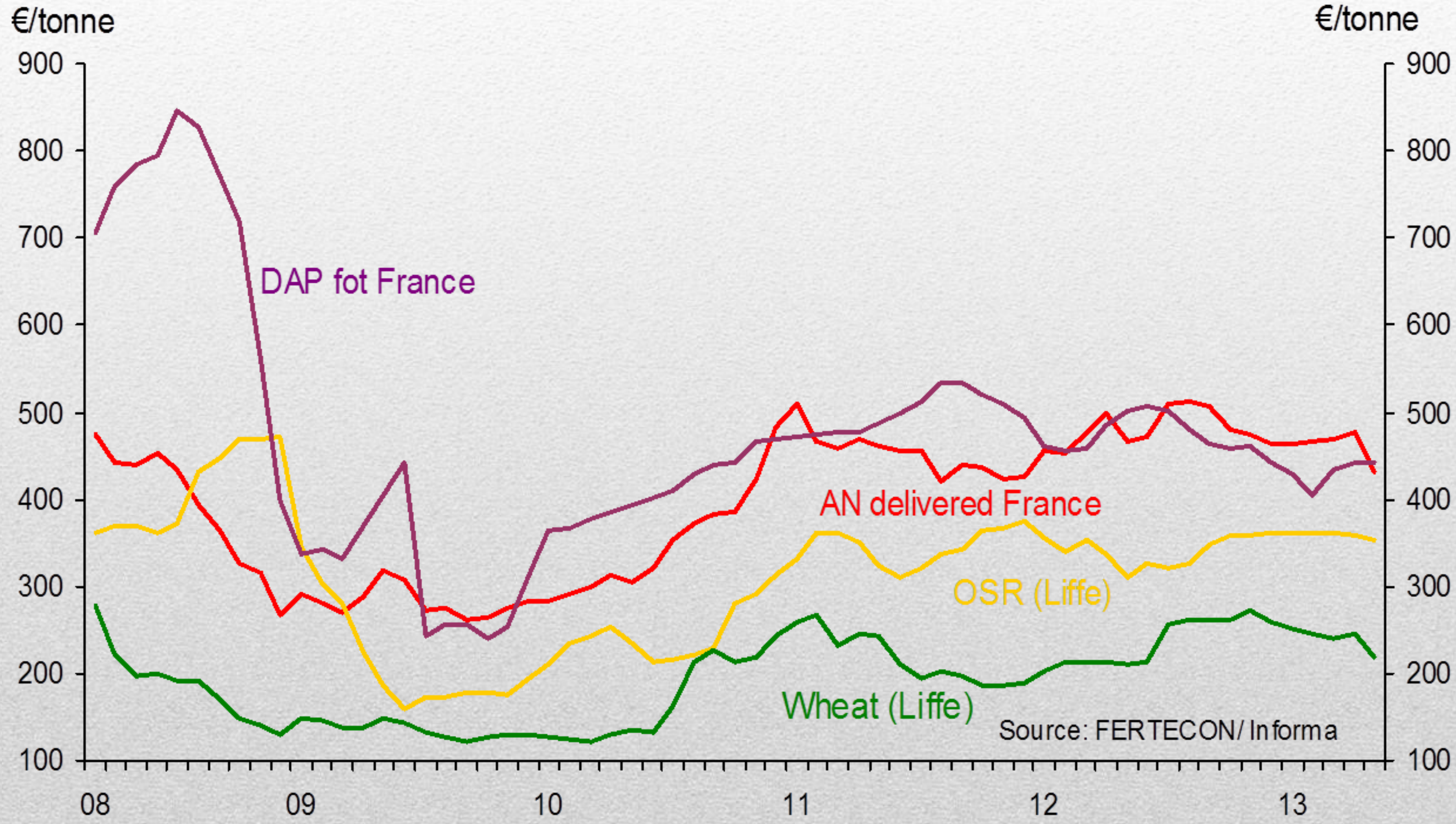
CROP : FERTILIZER CORRELATIONS

	UREA	DAP	MOP
2003-2012	0.75	0.71	0.67
2006-2010	0.75	0.71	0.89
2011-2012	0.17	-0.23	0.46

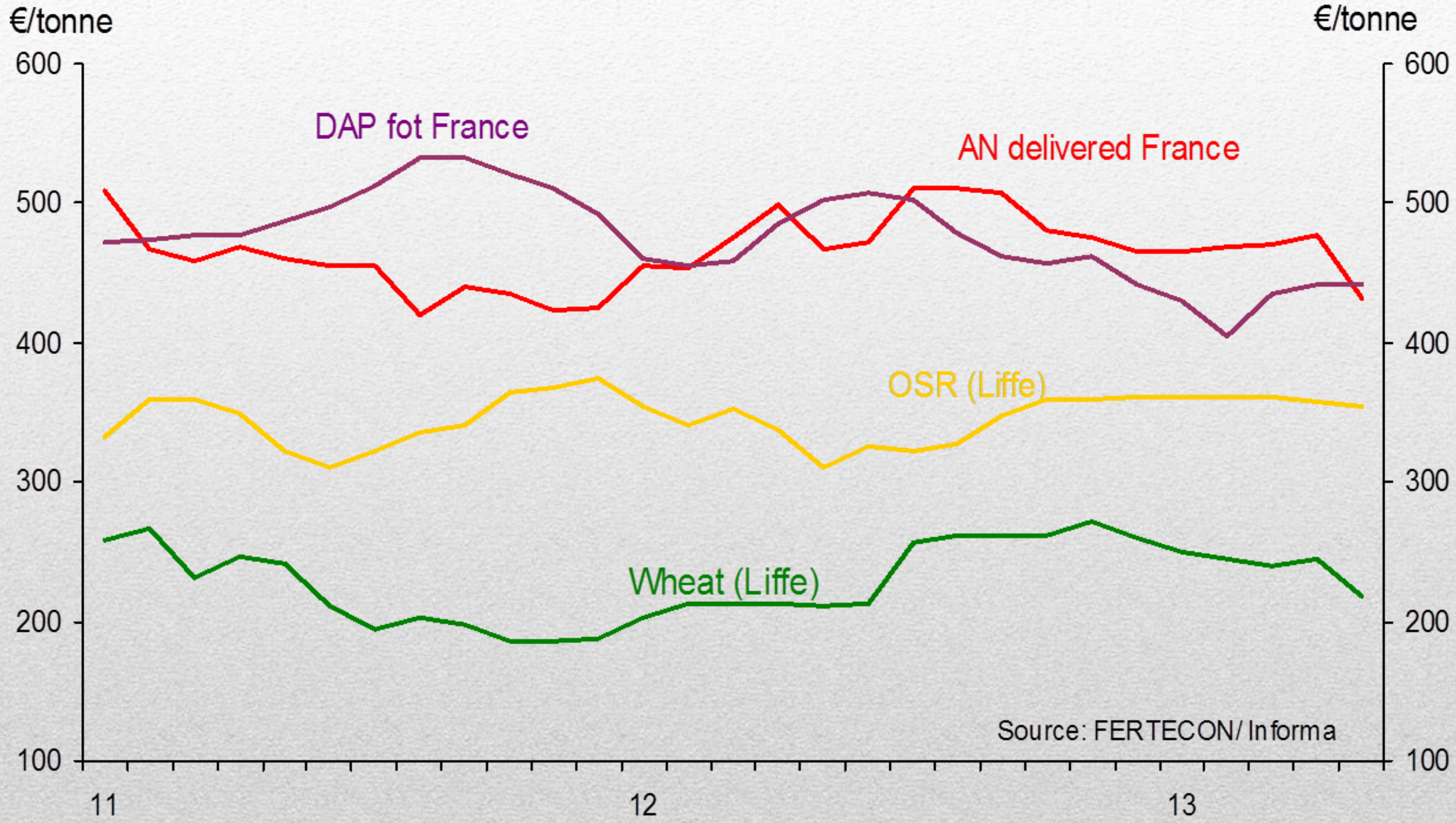
CORRELATION BREAKDOWN

- Fertilizer price are driven by supply as well as demand
- Time lags
- Levels were already high enough to stimulate good fertilizer demand at the start of 2011 – you don’t necessarily put more fertilizer on $7 corn than $5 corn
- Influence of non-commercial and semi-commercial markets – especially India

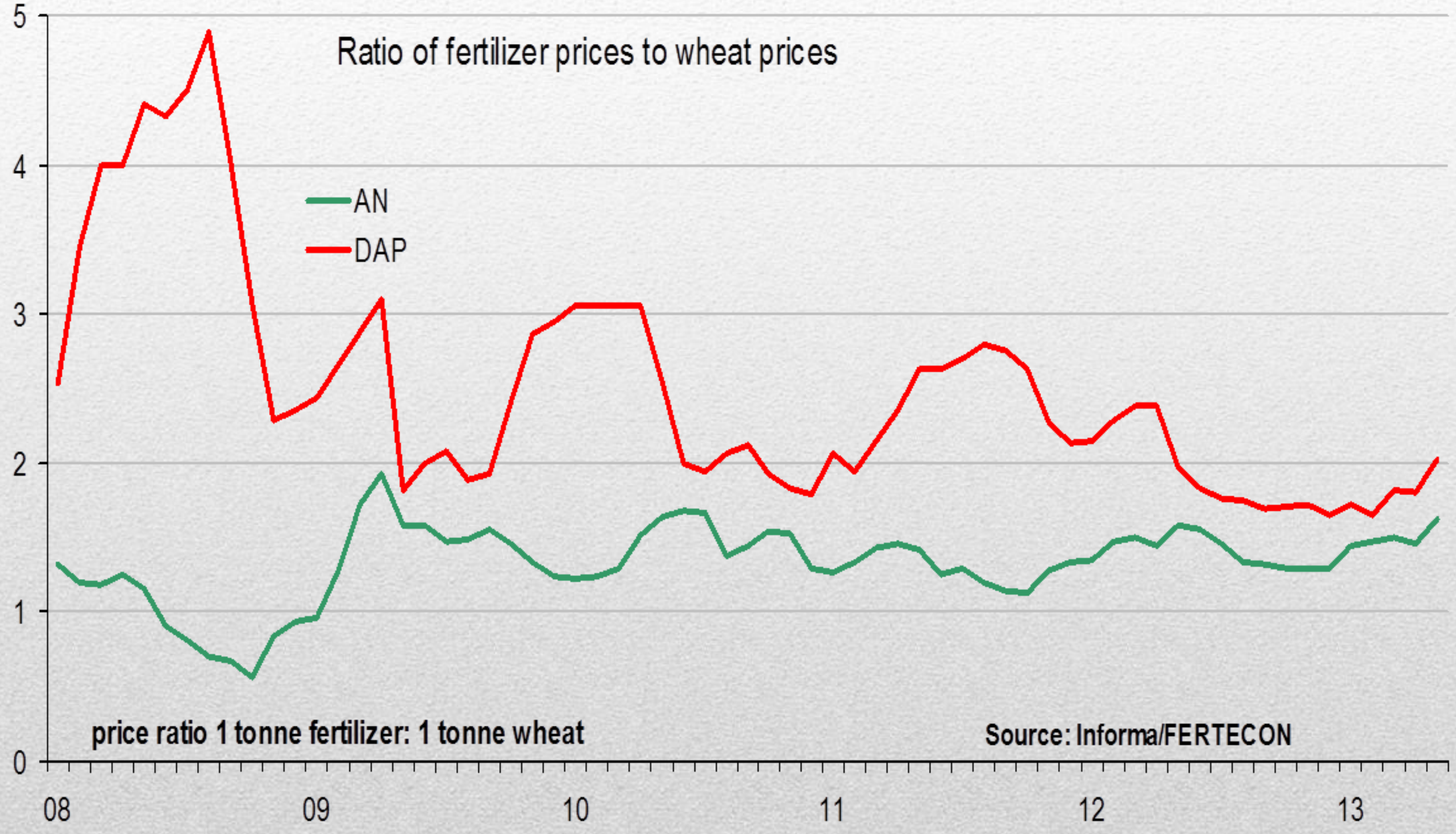
CROP vs FERTILIZER PRICES - EUROPE



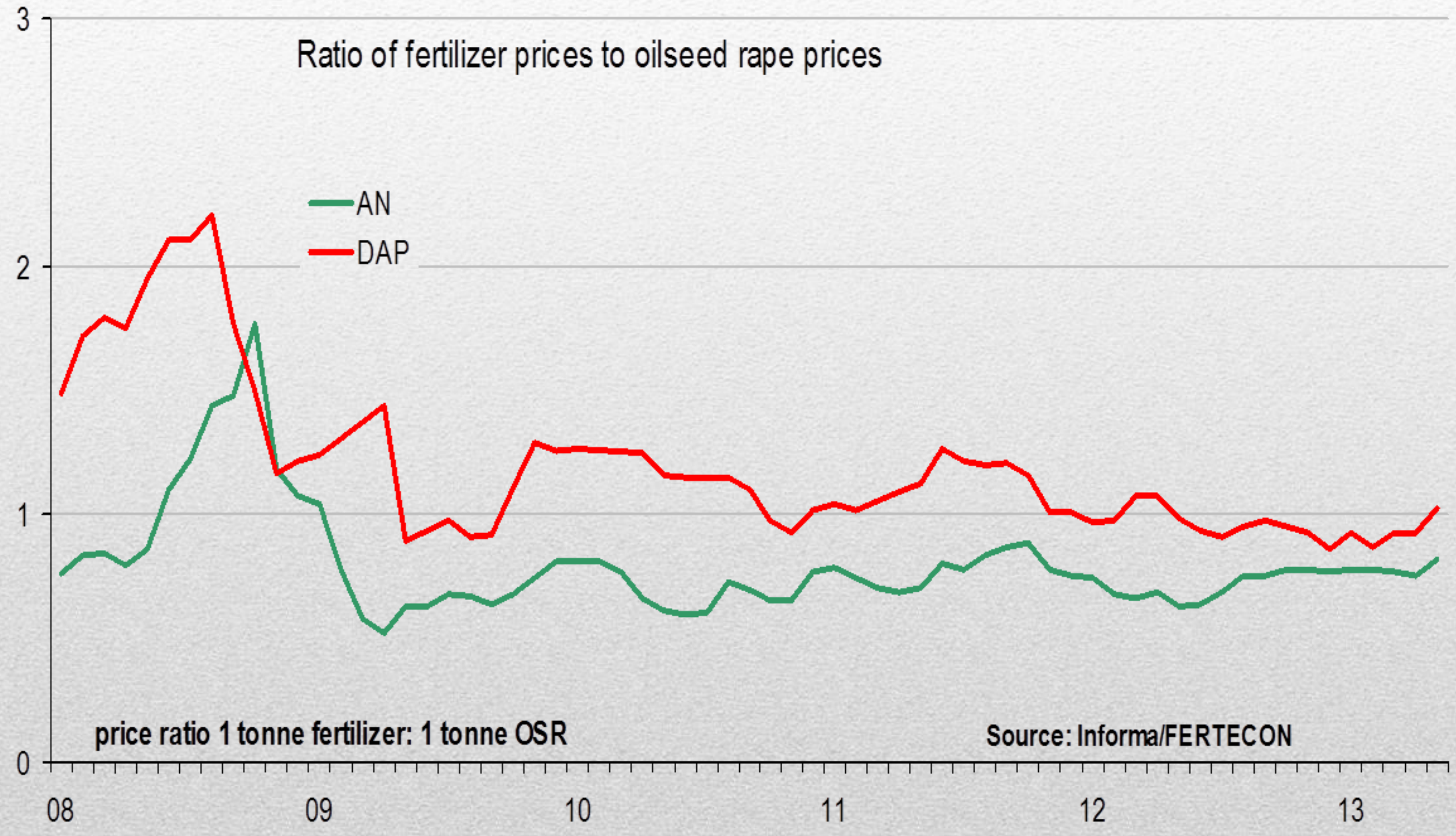
CROP vs FERTILIZER PRICES - EUROPE



FERTILIZER TO CROP PRICE RATIOS- EUROPE

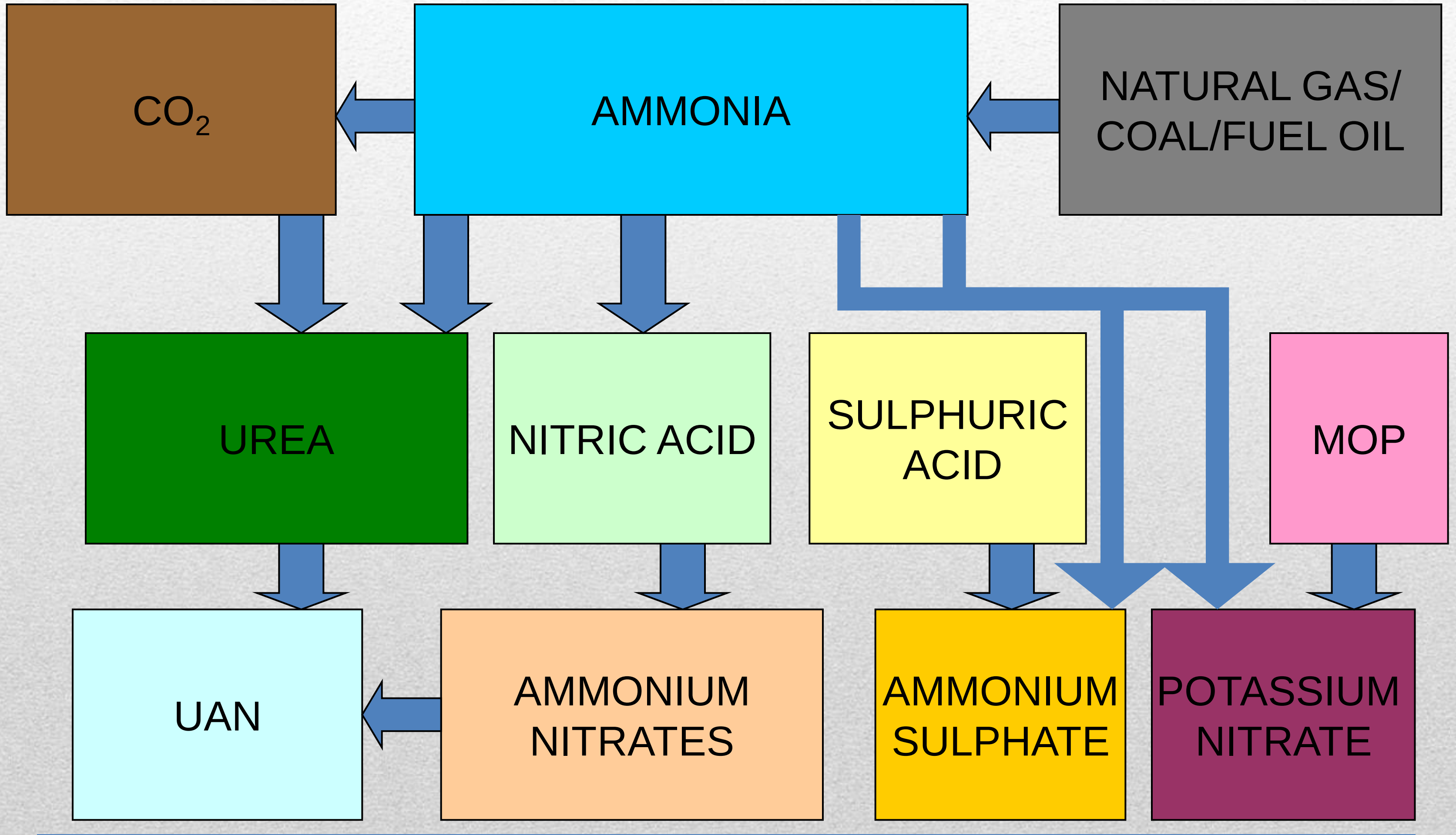


FERTILIZER TO CROP PRICE RATIOS- EUROPE

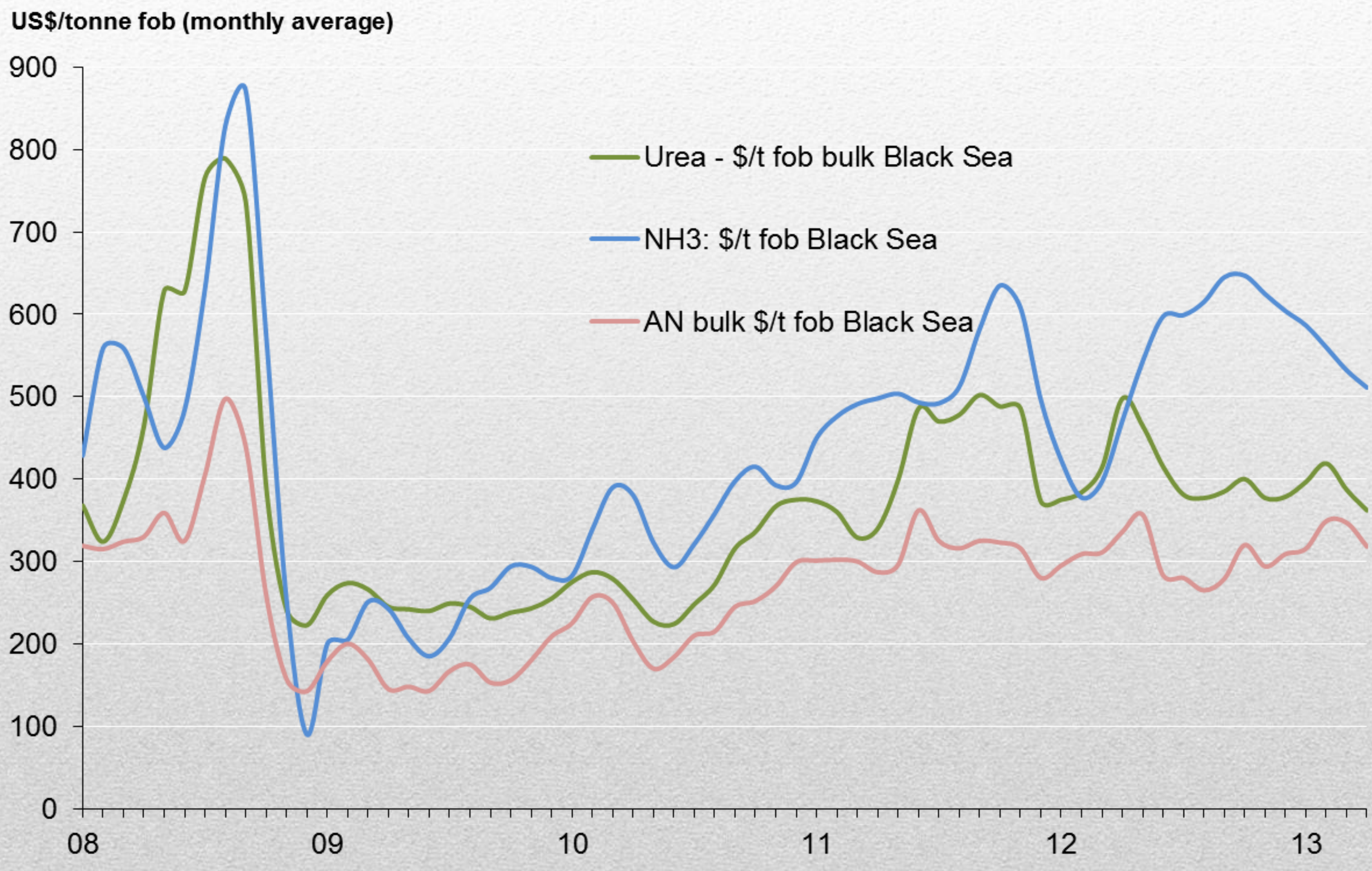


NITROGEN

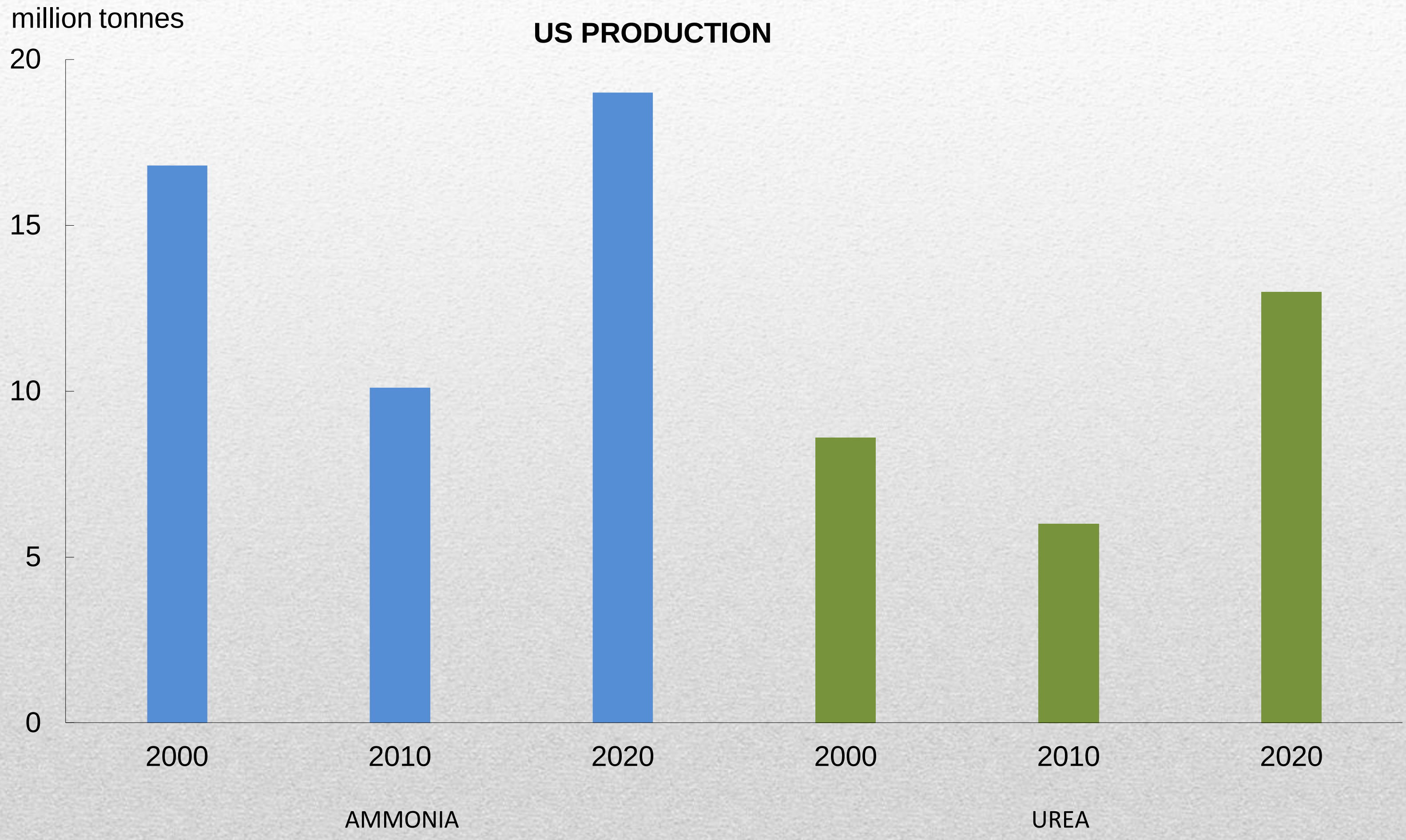
NITROGEN PRODUCTION



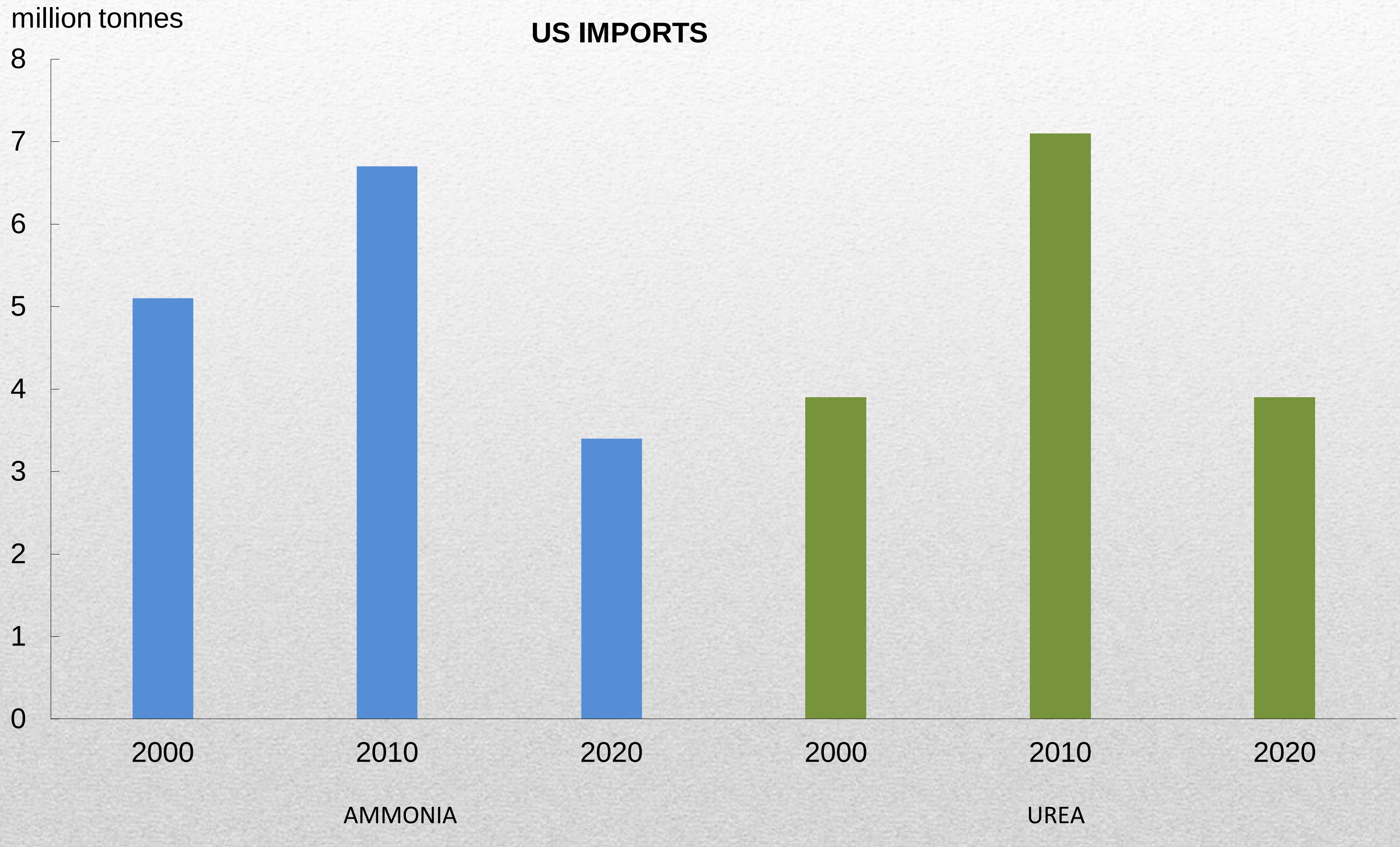
NITROGEN FERTILIZER PRICES



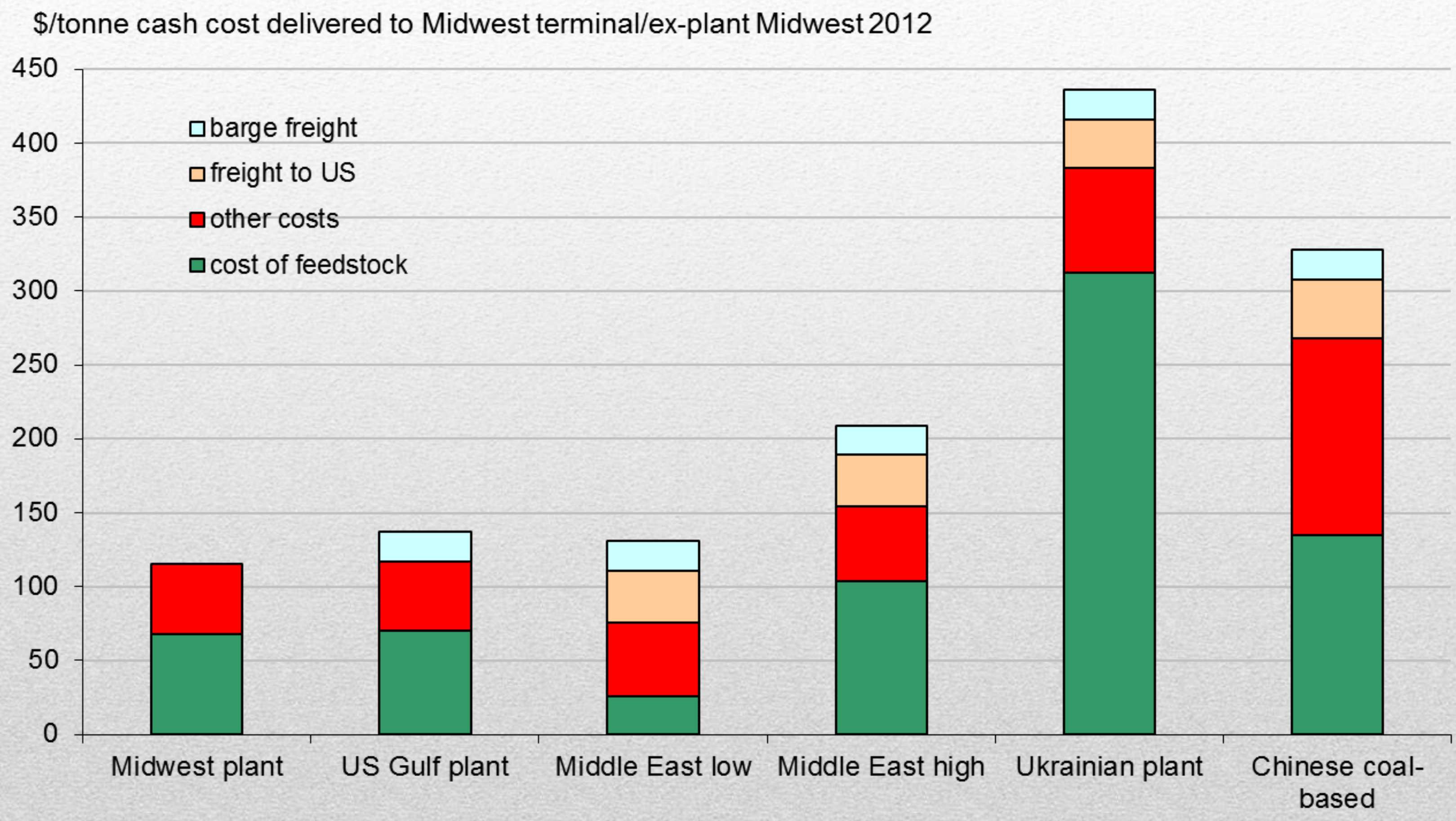
THE SHALE GAS EFFECT



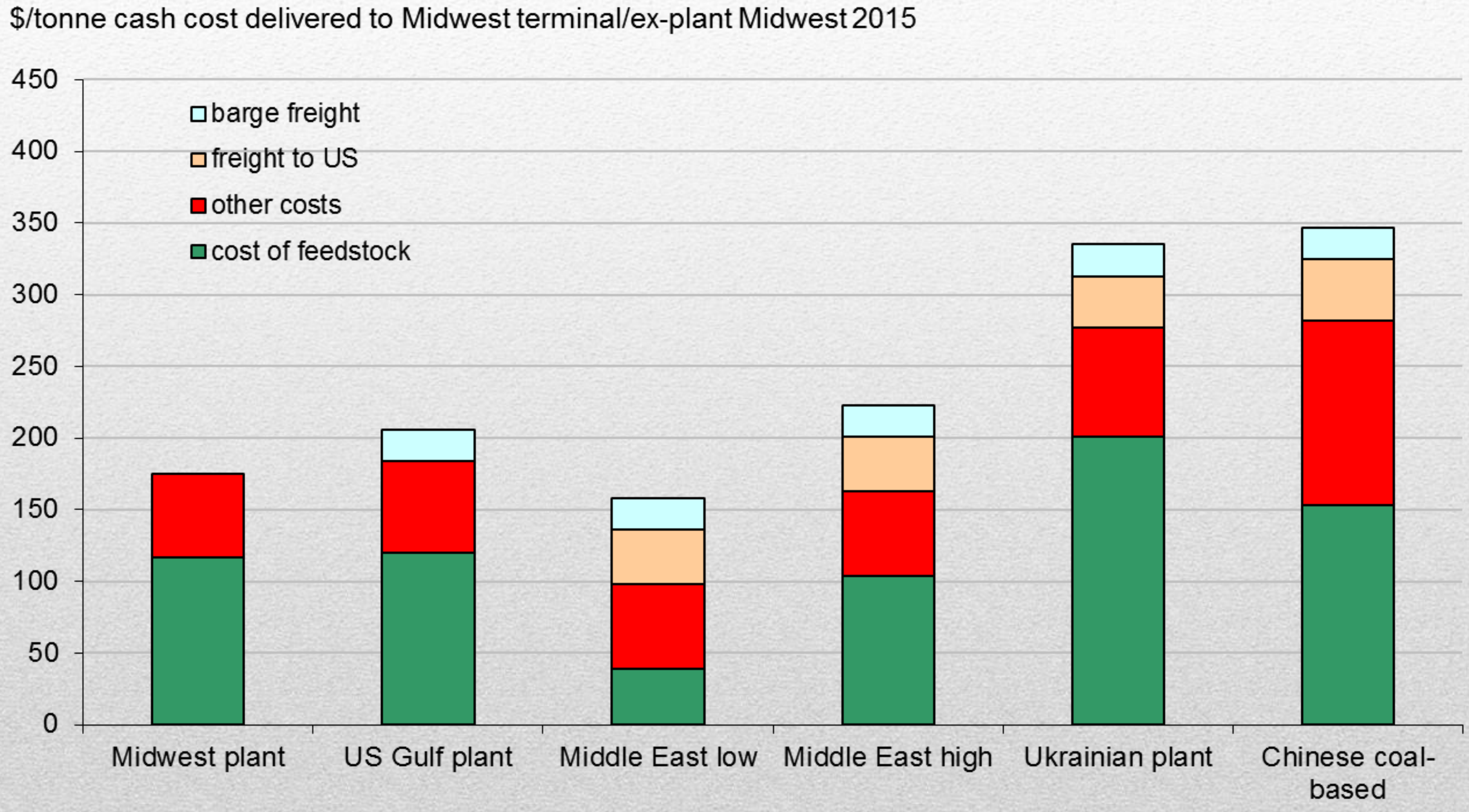
US IMPORTS FALL



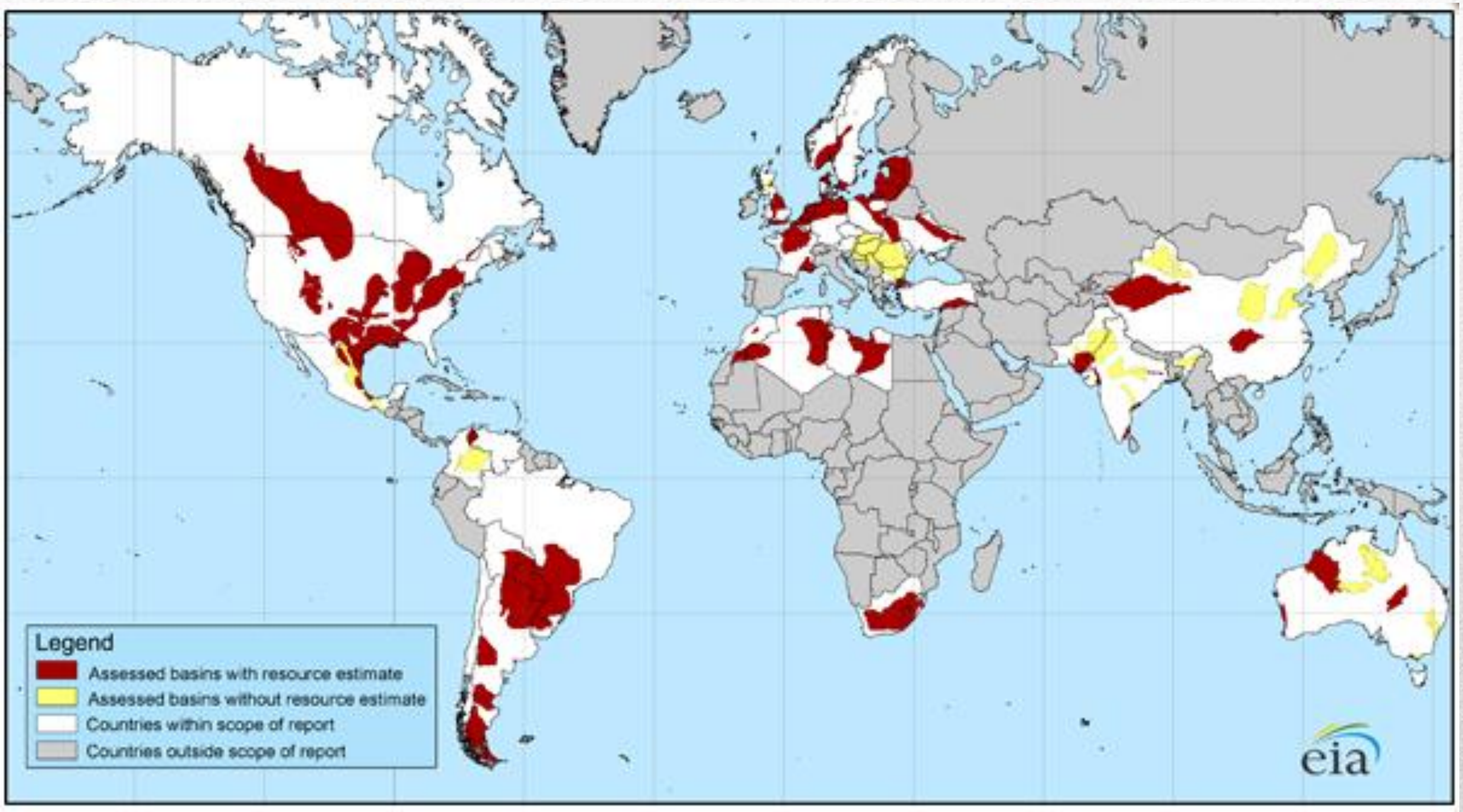
US UREA COST OF SUPPLY - 2012



US UREA COST OF SUPPLY - 2015



SHALE GAS POTENTIAL

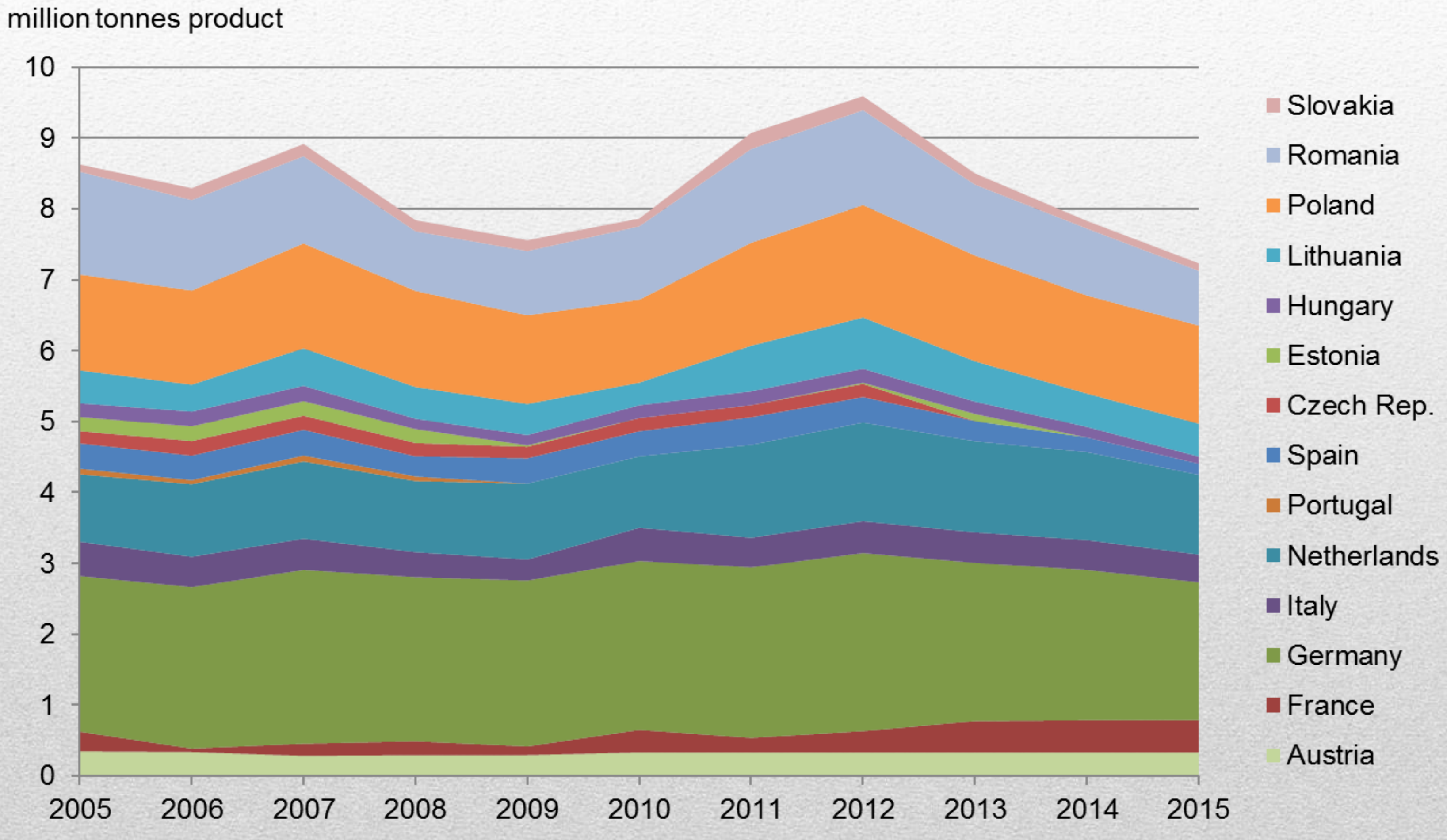


Source : EIA

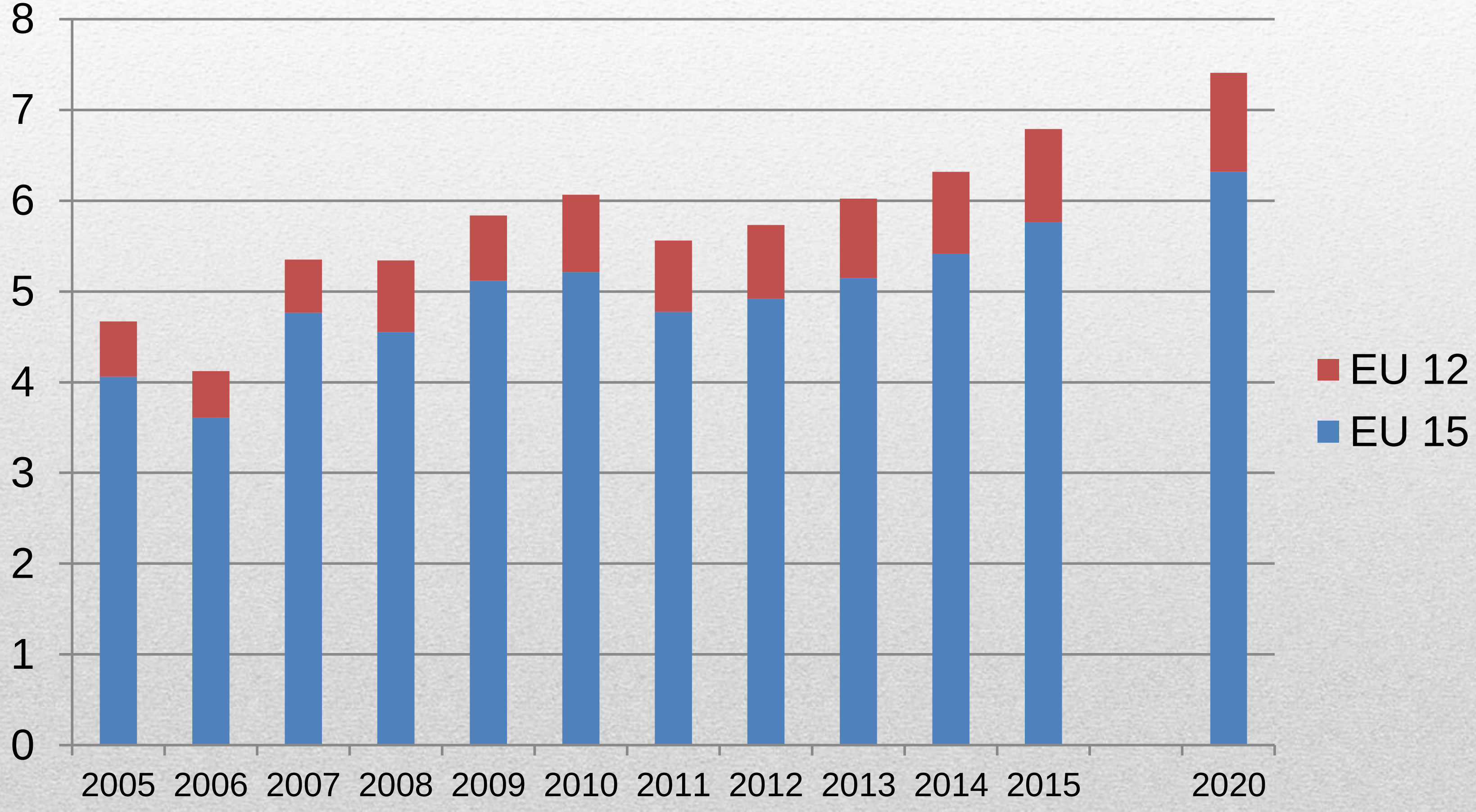
SHALE GAS PROSPECTS

- In Europe several countries – e.g. France and Germany are resisting shale gas development
- In the EU, the UK and Poland are the most advanced on shale gas development
- Ukraine is attempting to develop shale gas as quickly as possible to result dependence on Russia
- Shale gas production costs will be higher in Europe due to geology, reserve ownership, availability of rigs. Best estimates of costs are at least $5/mmBtu
- China is looking at rapid development of its shale gas resources

EU UREA PRODUCTION



EU UREA IMPORTS



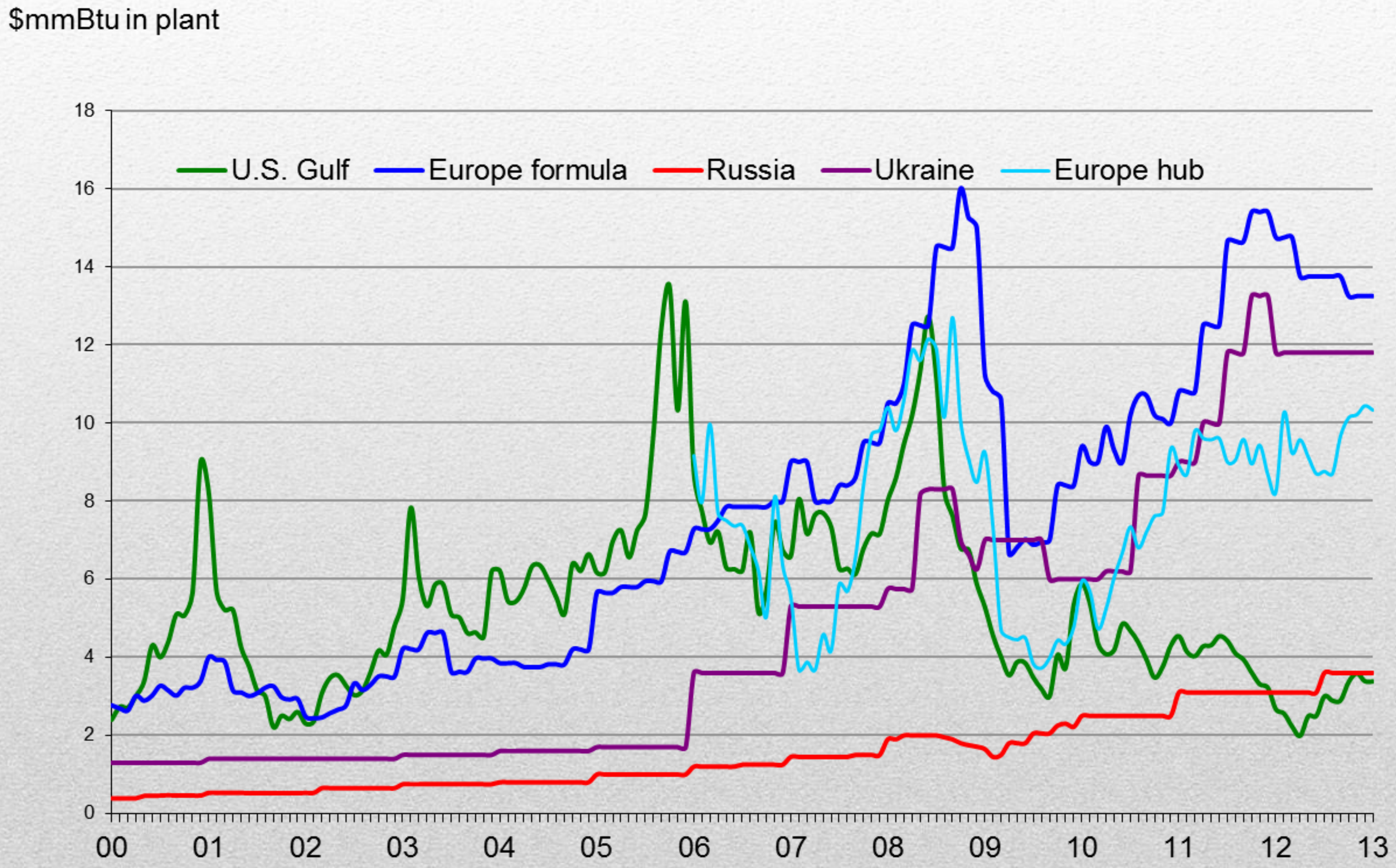
NITROGEN PRODUCTION COSTS

- The EU 15 has the most efficient nitrogen fertilizer plants in the world – more efficient than the US and even new plants in North Africa and the Middle East

- However, it has some of the highest production costs in the World

- This is due to high gas costs in Europe

GAS PRICES


$mmBtu in plant
18
16
14
12
10
8
6
4
2
0
U.S. Gulf
Europe formula
Russia
Ukraine
Europe hub
00
01
02
03
04
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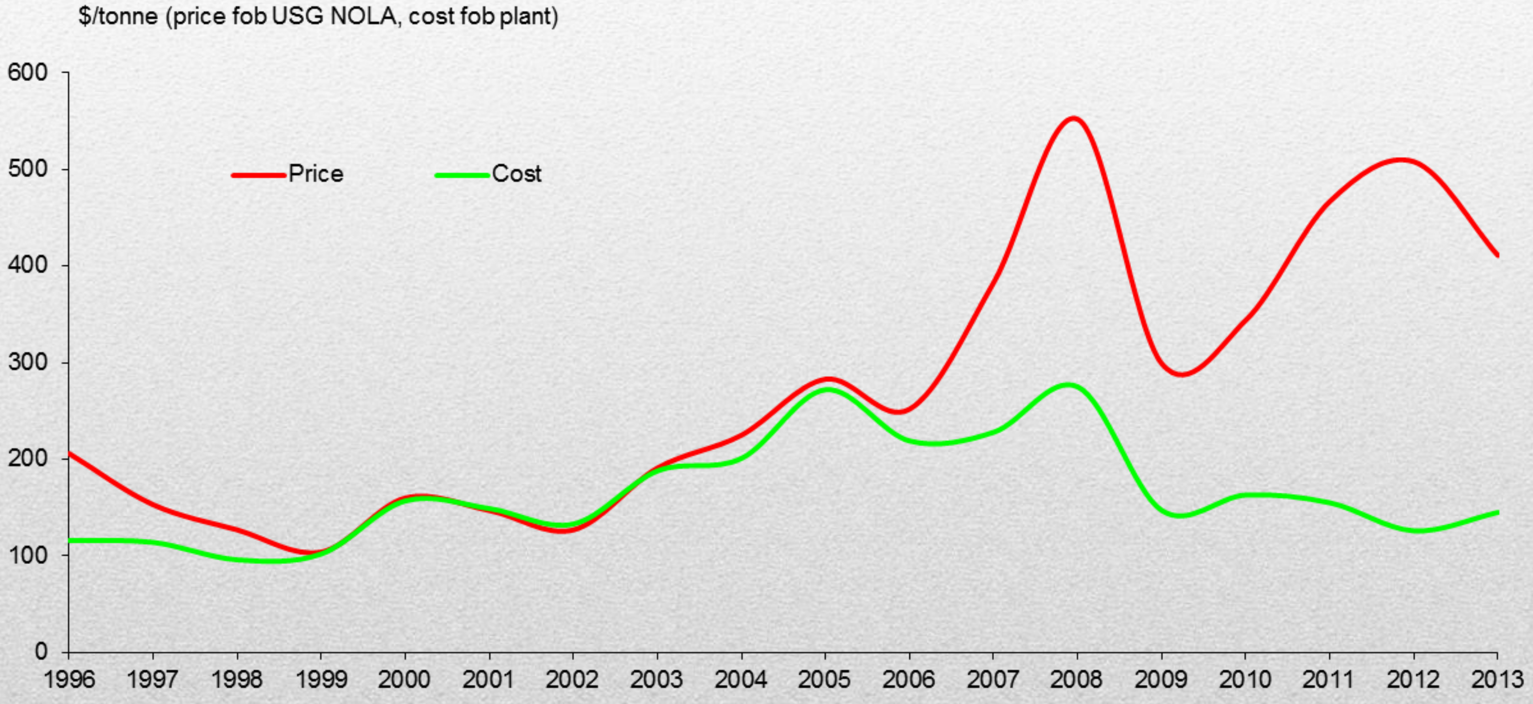
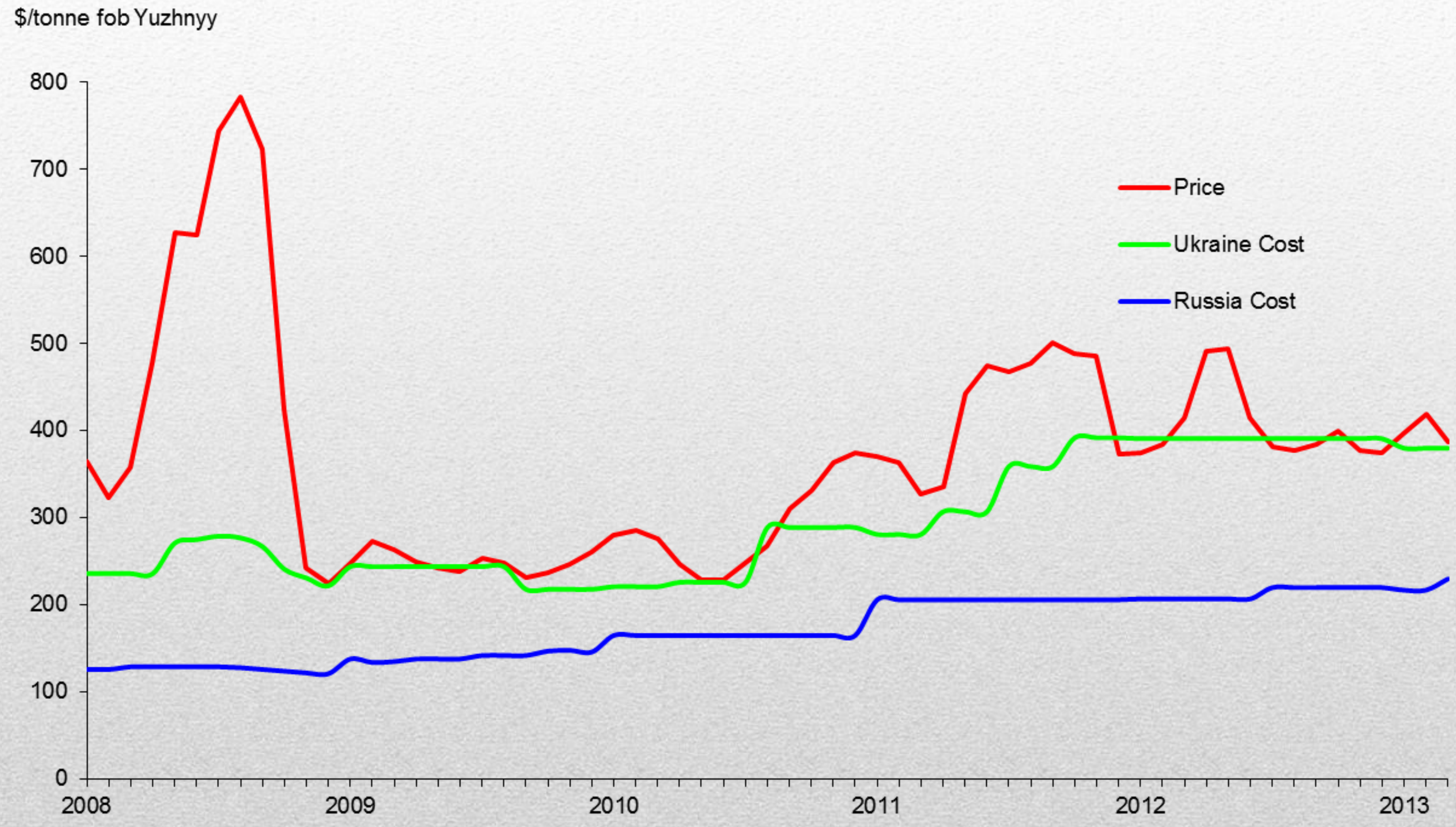
12
13

US COSTS AND PRICES

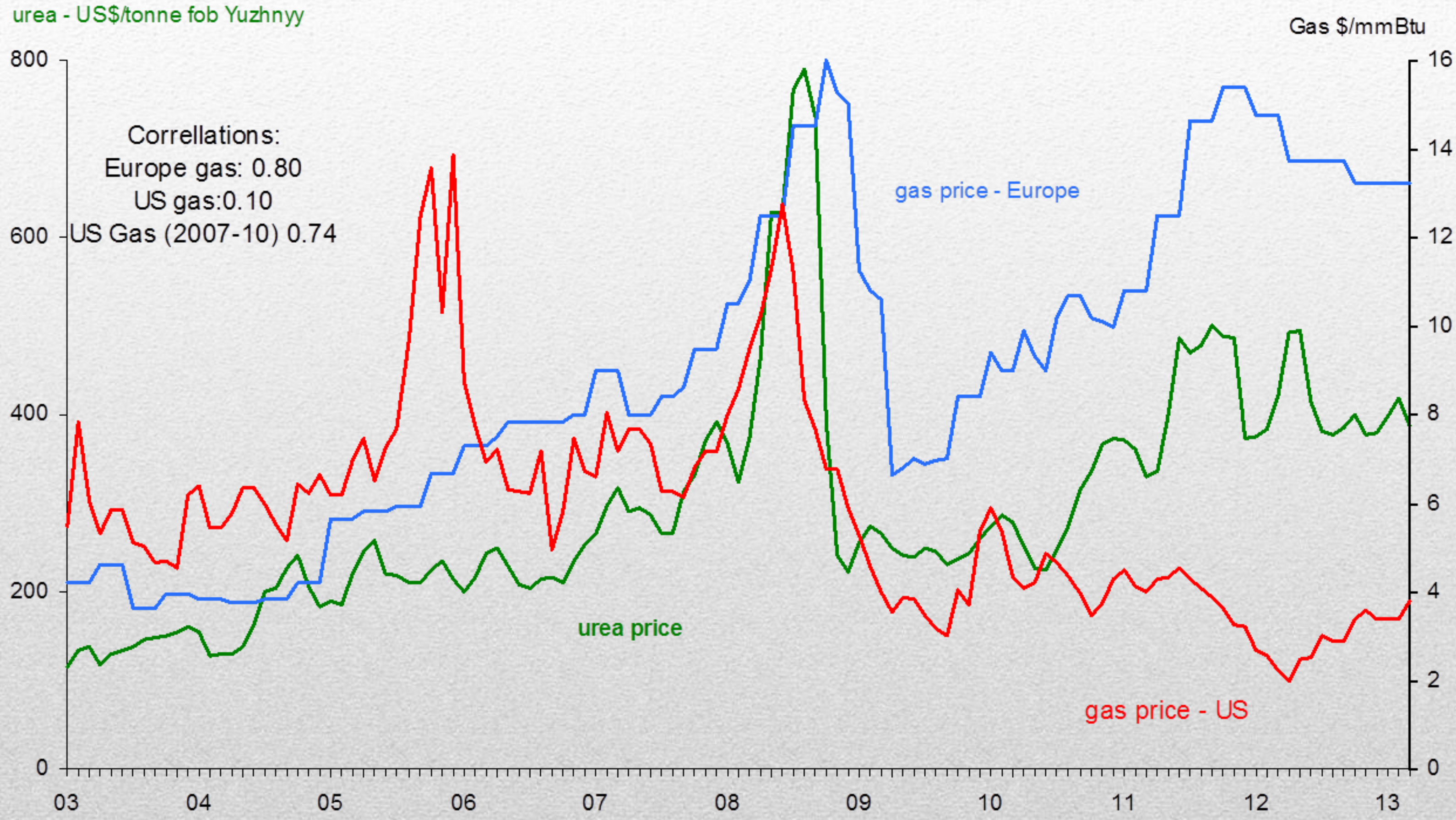
AVERAGE ANNUAL UREA PRICES AND US GULF SUPPLY COSTS



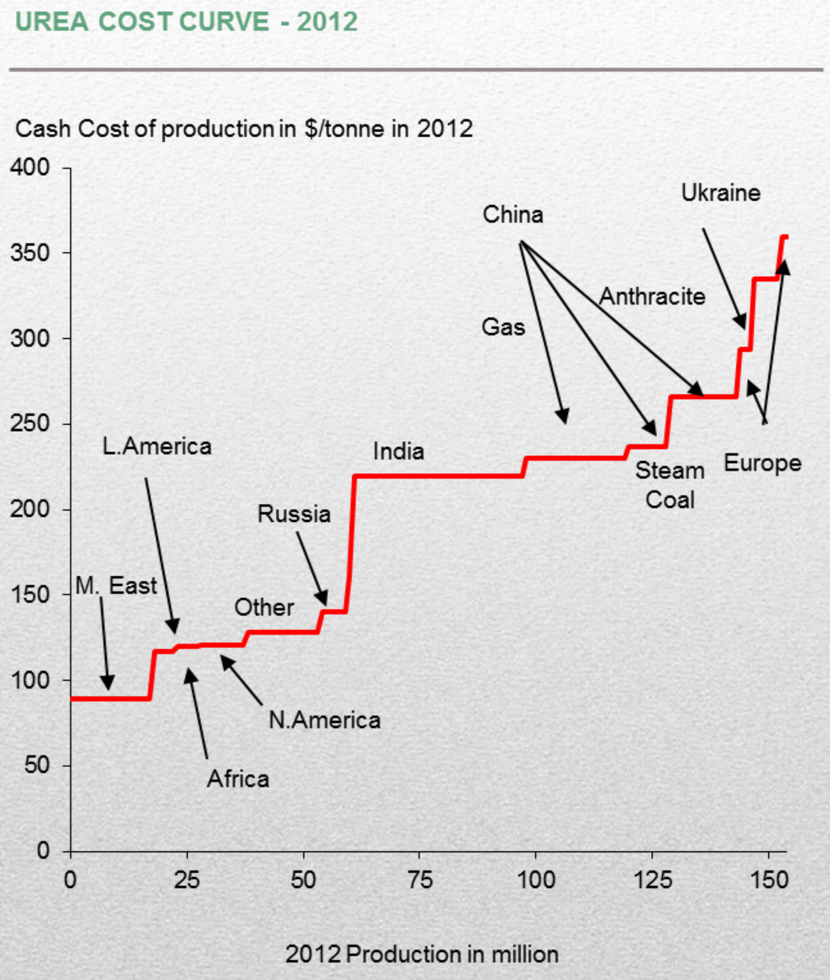
UKRAINE COSTS AND PRICES

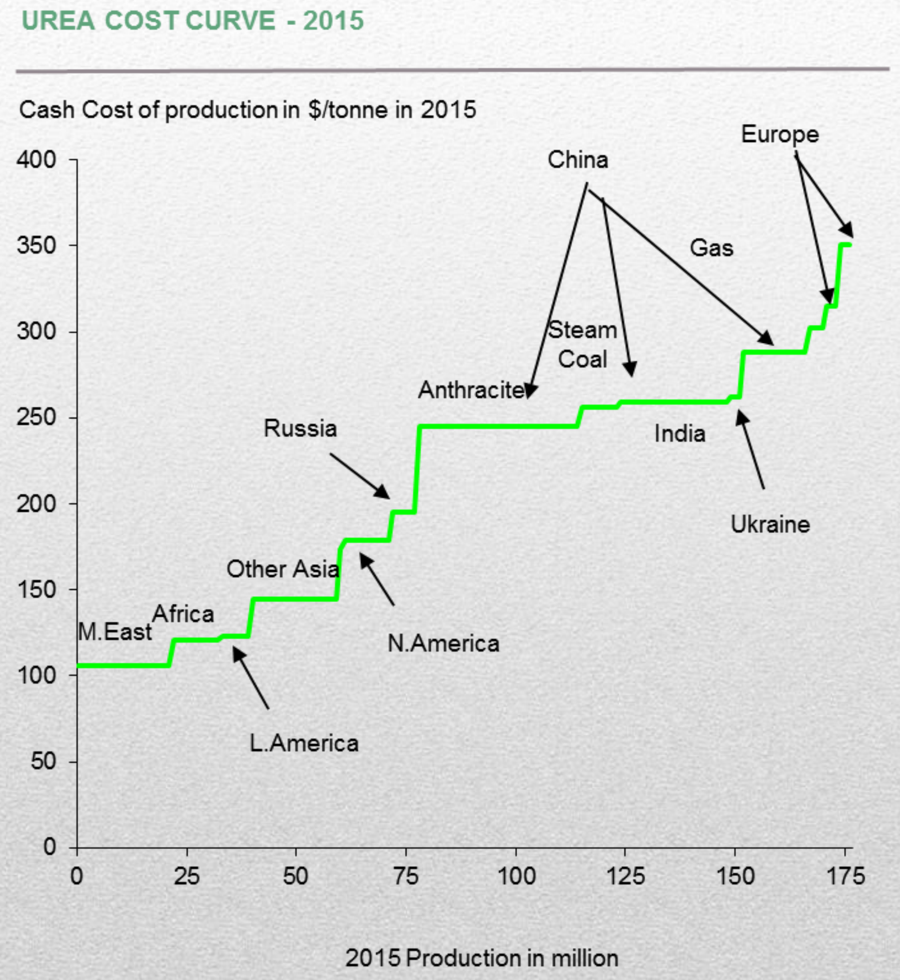


UREA AND GAS PRICES

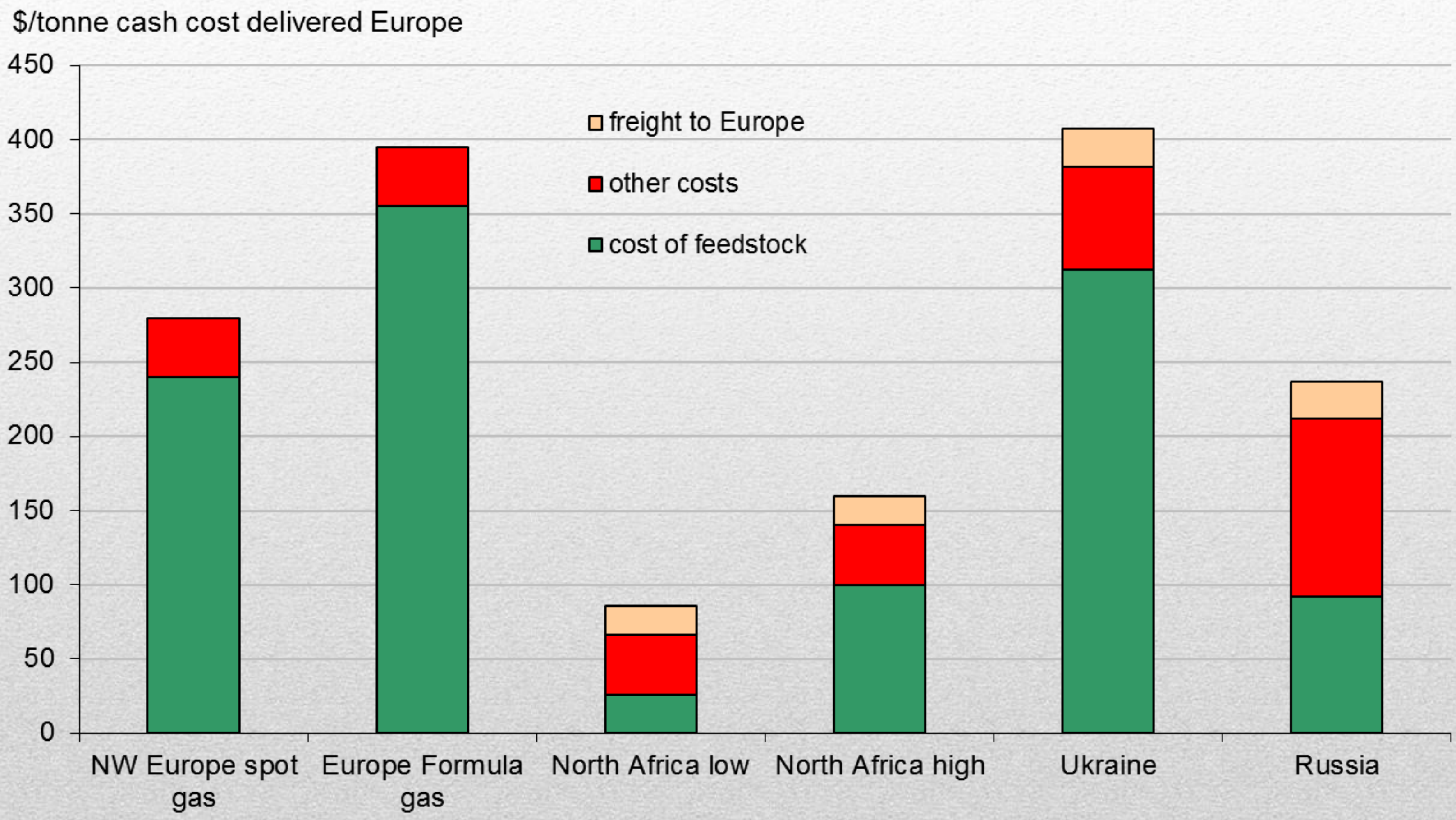


UREA COST CURVES

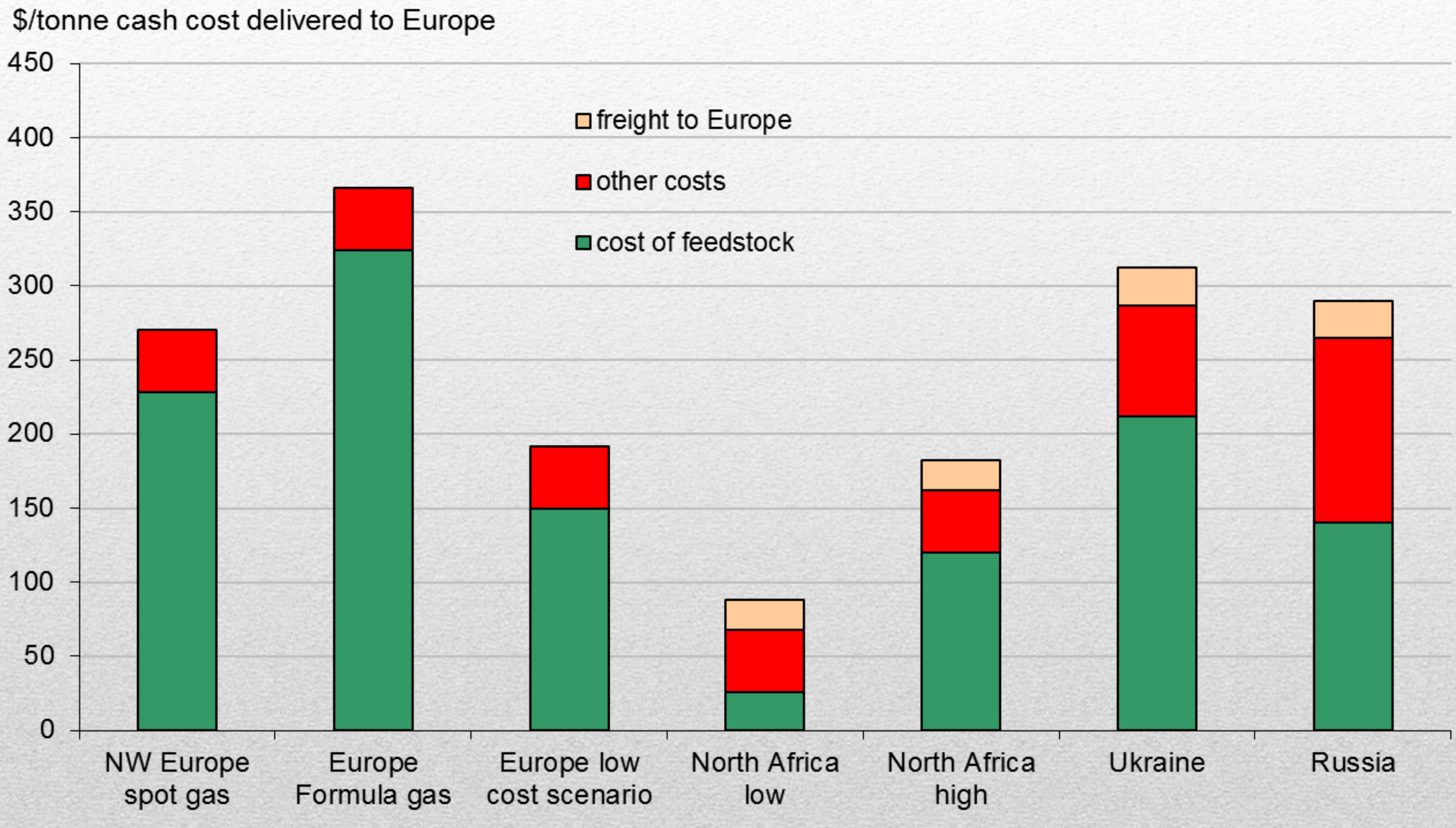




EUROPE: UREA COST OF SUPPLY - 2012



EUROPE: UREA COST OF SUPPLY - 2015



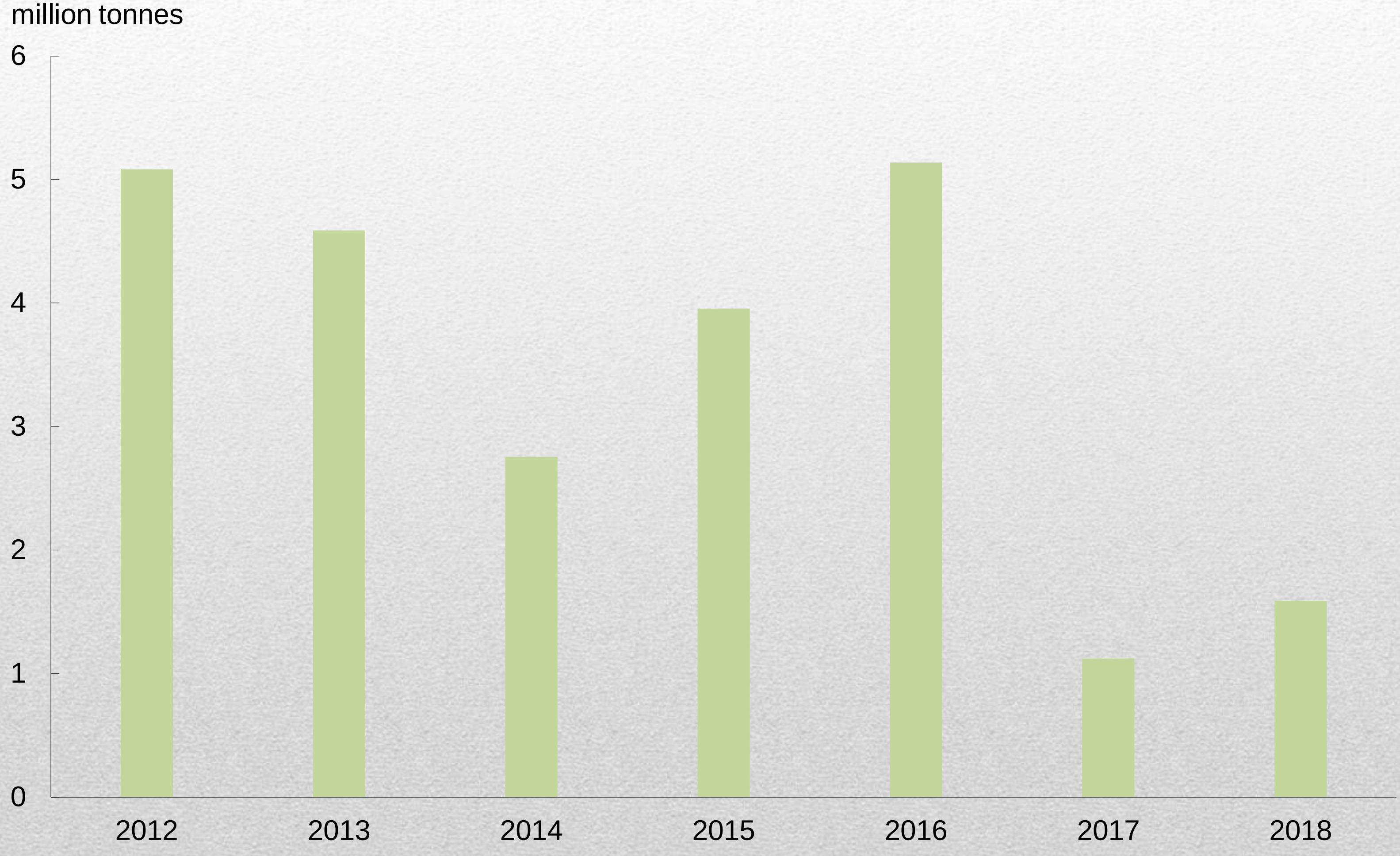
EMISSION TRADING SCHEME

- EU ETS now applies to CO_2 emissions from ammonia production, N_2O emissions from nitric acid production (for ammonium nitrate) and CO_2 emissions relating to energy use
- Applies even when CO_2 is captured – for urea production or industrial uses
- Benchmarking means that currently the most efficient ammonia plants incur modest costs - although as emission benchmarks are reduced cost potentially will increase
- European plants are the most efficient in the world
- N_2O emissions from nitric acid plants being reduced by retrofitting of plants
- However, the collapse of the carbon price to under €5/t CO_2 has made the scheme meaningless and there are calls for it to be scrapped or amended

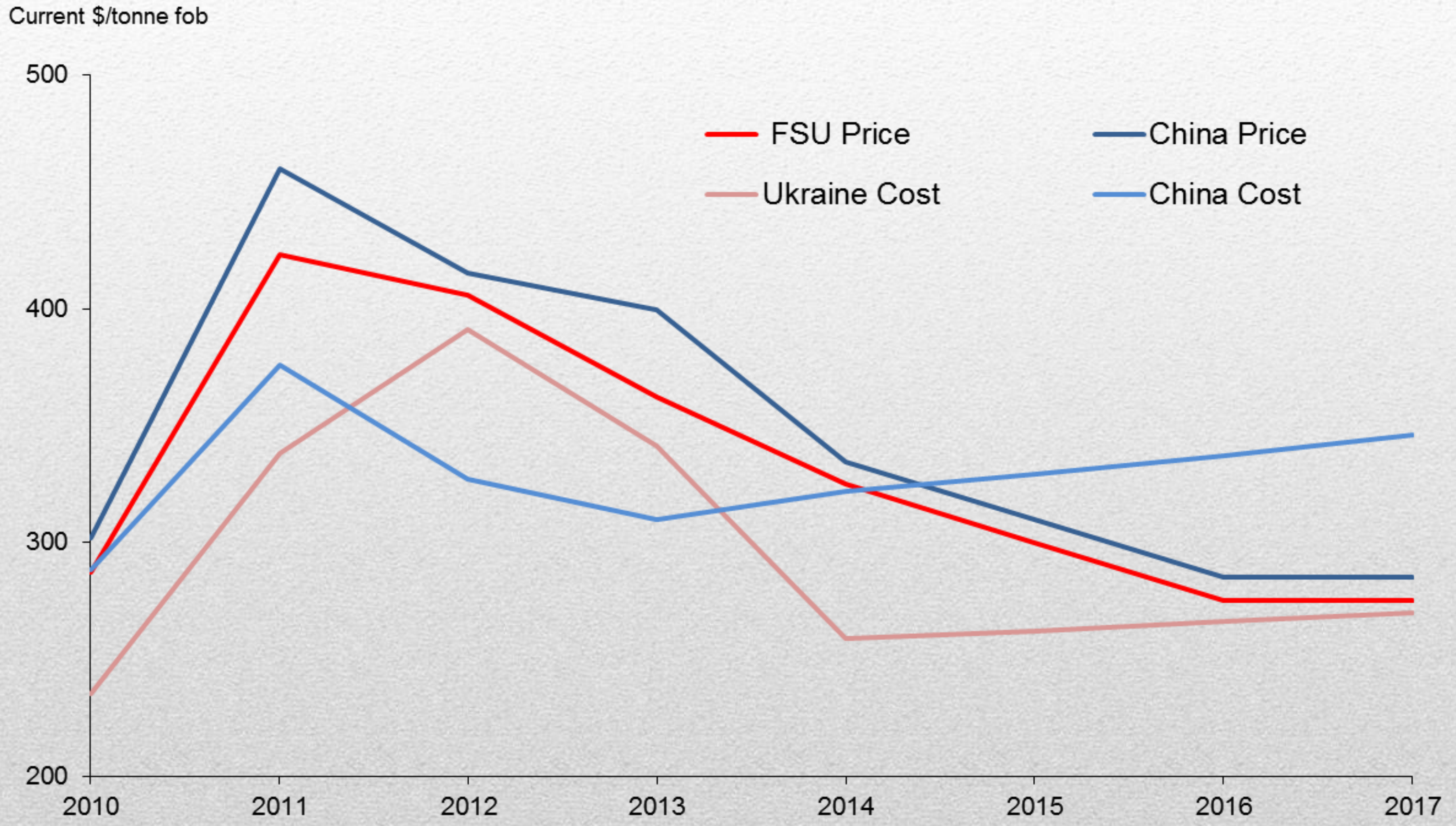
NEW UREA SUPPLY

- New low-cost capacity in Algeria (three 1.2 million t/y plants)
- Additional capacity in Africa (Nigeria and Gabon)
- New supply from Middle East (Qatar, Abu Dhabi, Saudi Arabia)
- Lower gas prices in North America encouraging new supply reducing import demand

NEW LOW-COST UREA EXPORT CAPACITY

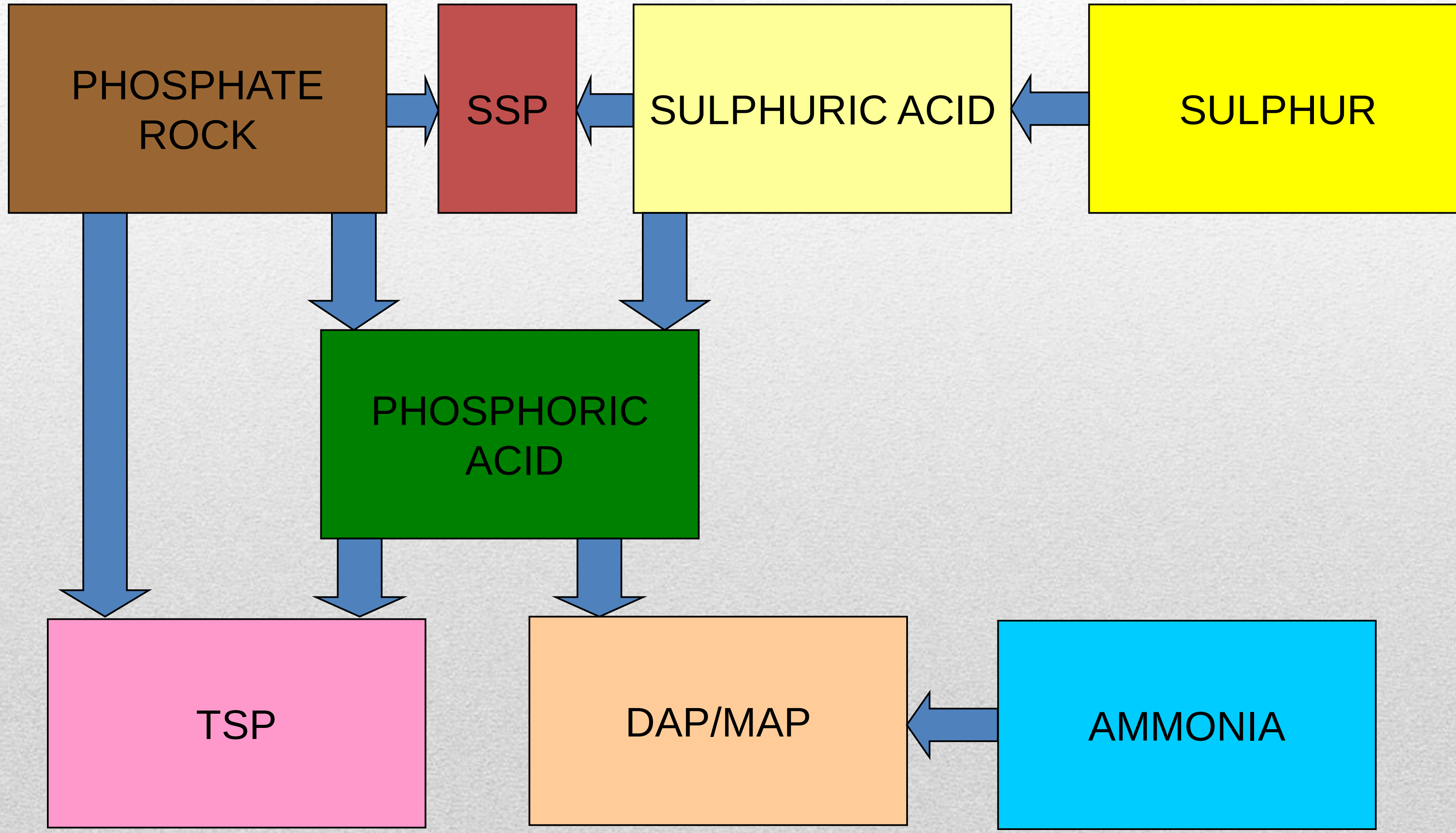


UREA COST AND PRICE FORECAST



PHOSPHATES

PHOSPHATE PRODUCTION



PHOSPHATE

- Phosphate prices had been high due to tight supply, but have now fallen
- As the Ma'aden project in Saudi Arabia, plus expansions in Morocco and elsewhere ramp up, the market has become more balanced
- Prices are expected to moderate further
- The very high phosphate prices of 2007-2008 have stimulated a massive interest in developing phosphate rock reserves – in Central Asia, Africa, Australia and Latin America
- "Peak Phosphate" is a myth – current known reserves will last over 300 years – or over 1000 years with increased efficiency of production and use

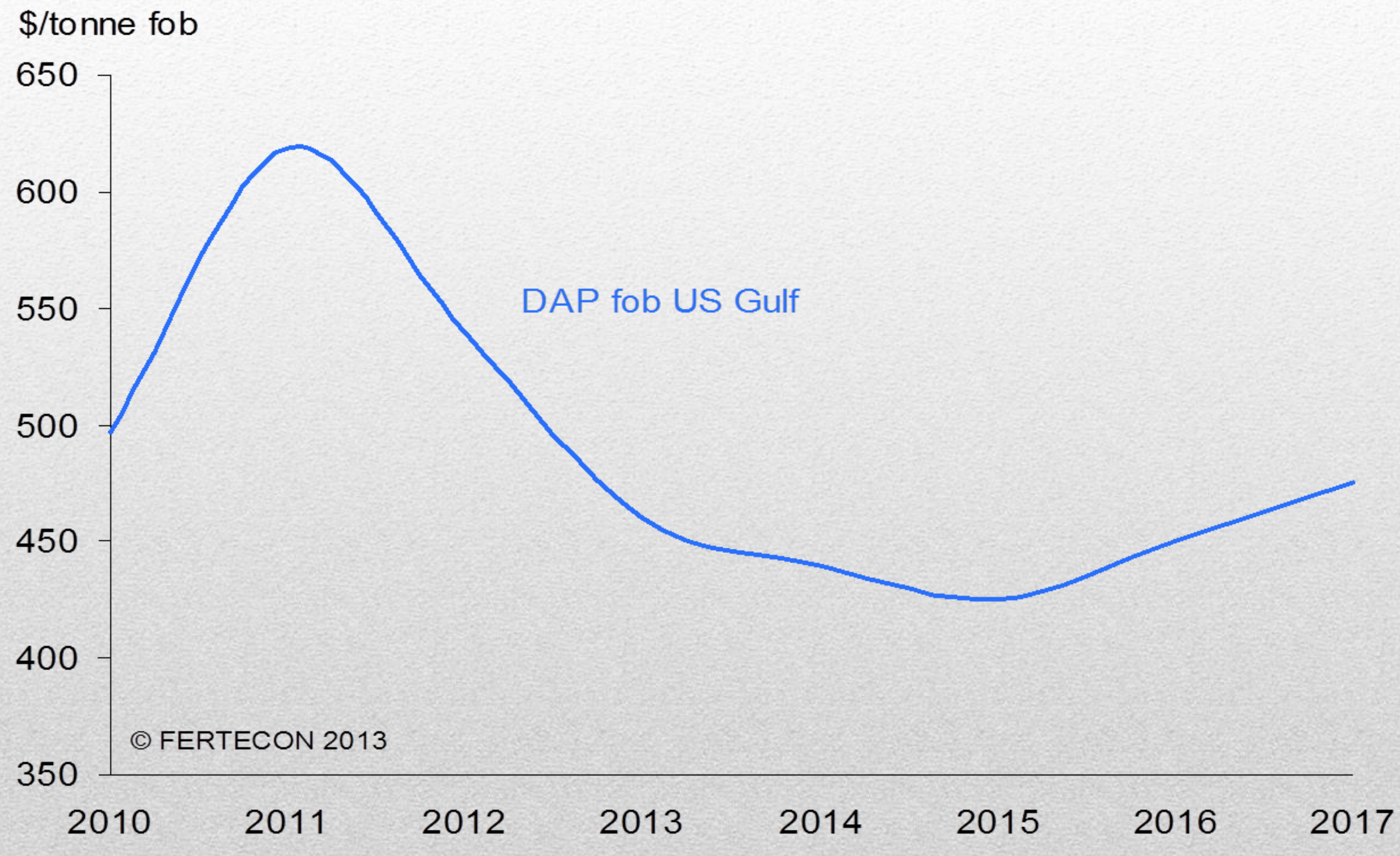
MOROCCO – AMBITIOUS EXPANSION PLANS

- State-owned OCP has ambitious expansion plans for its phosphate operations
- It has been looking for j-v partners, but is willing to go it alone
- It has the following projects for finished phosphate fertilizers:
- 2013 – 1 million t/y
- 2014 – 2 million t/y
- 2015 – 1 million t/y
- There are likely to be delays but will are likely to see at least part of this come on-stream

MA’ADEN 3 MILLION T/Y DAP PROJECT

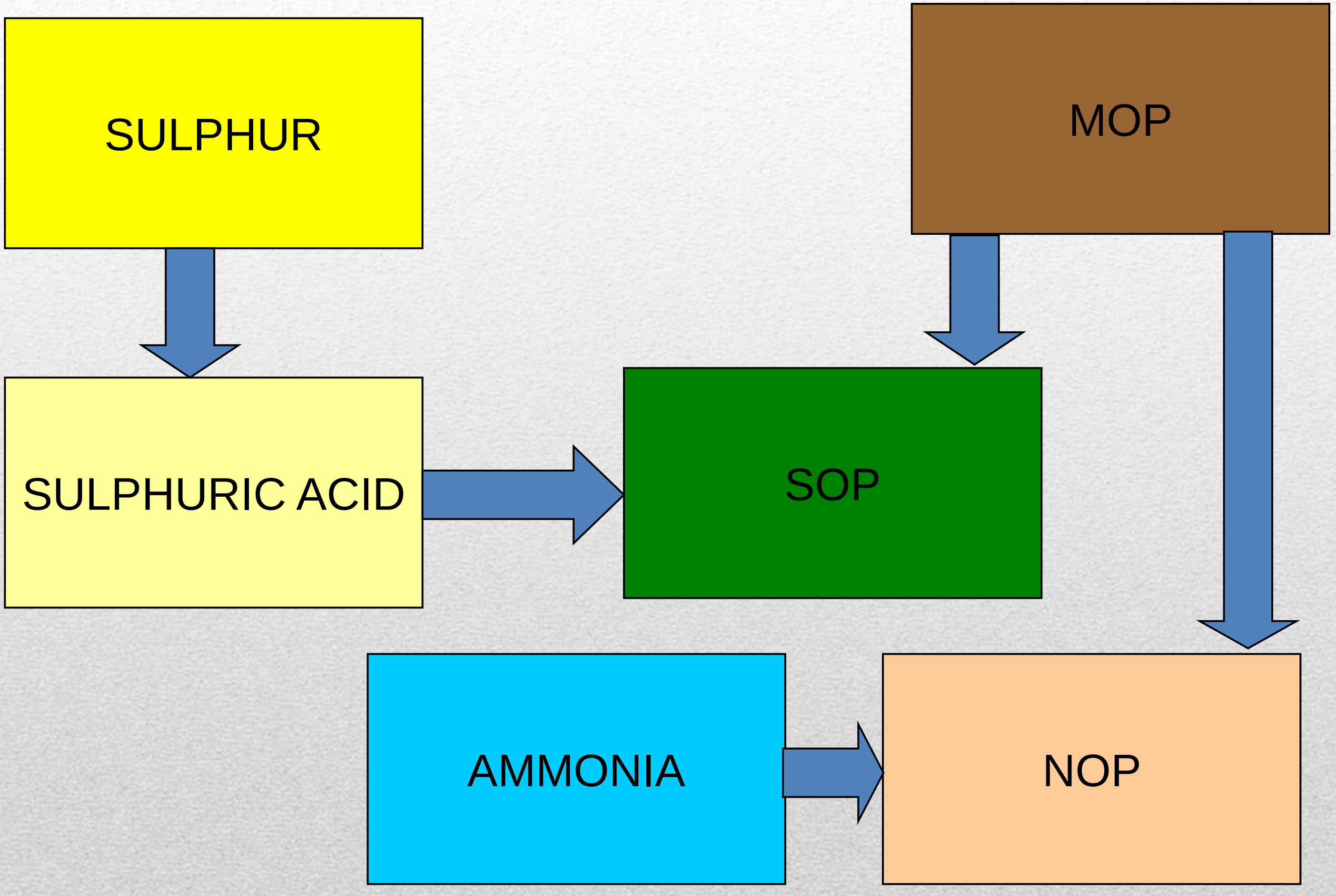
- The Ma’aden phosphate project in Saudi Arabia finally came on-stream in 2011. Full operation will be achieved soon
- Originally scheduled for 2009
- Represents 18% of global DAP export supply
- Delay means that supply was initially easily absorbed into the market given strong demand
- Go ahead and a new project and expansion of existing plant will see Saudi Arabian supply increase substantially over the next 5 years

PHOSPHATE PRICE OUTLOOK

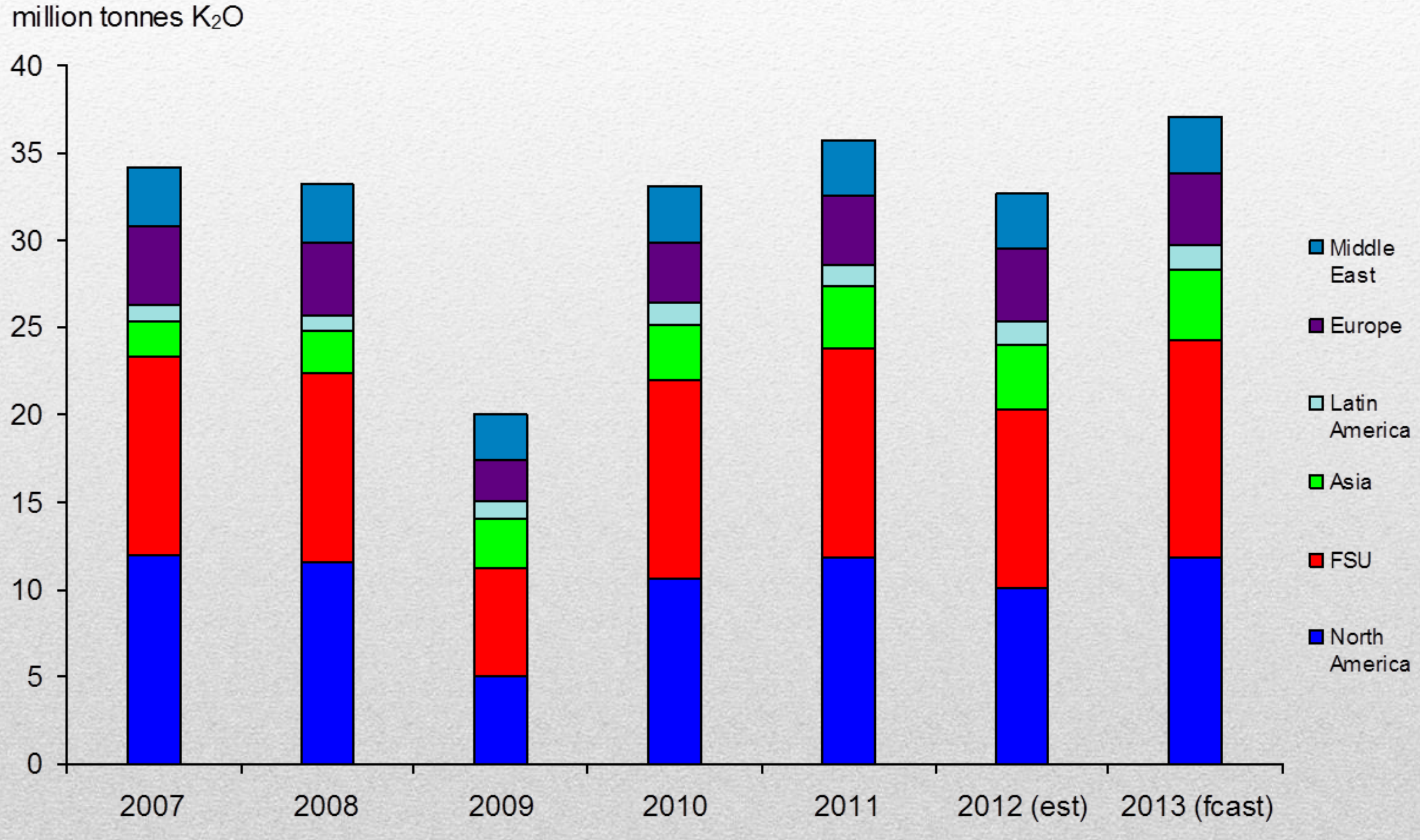


POTASH

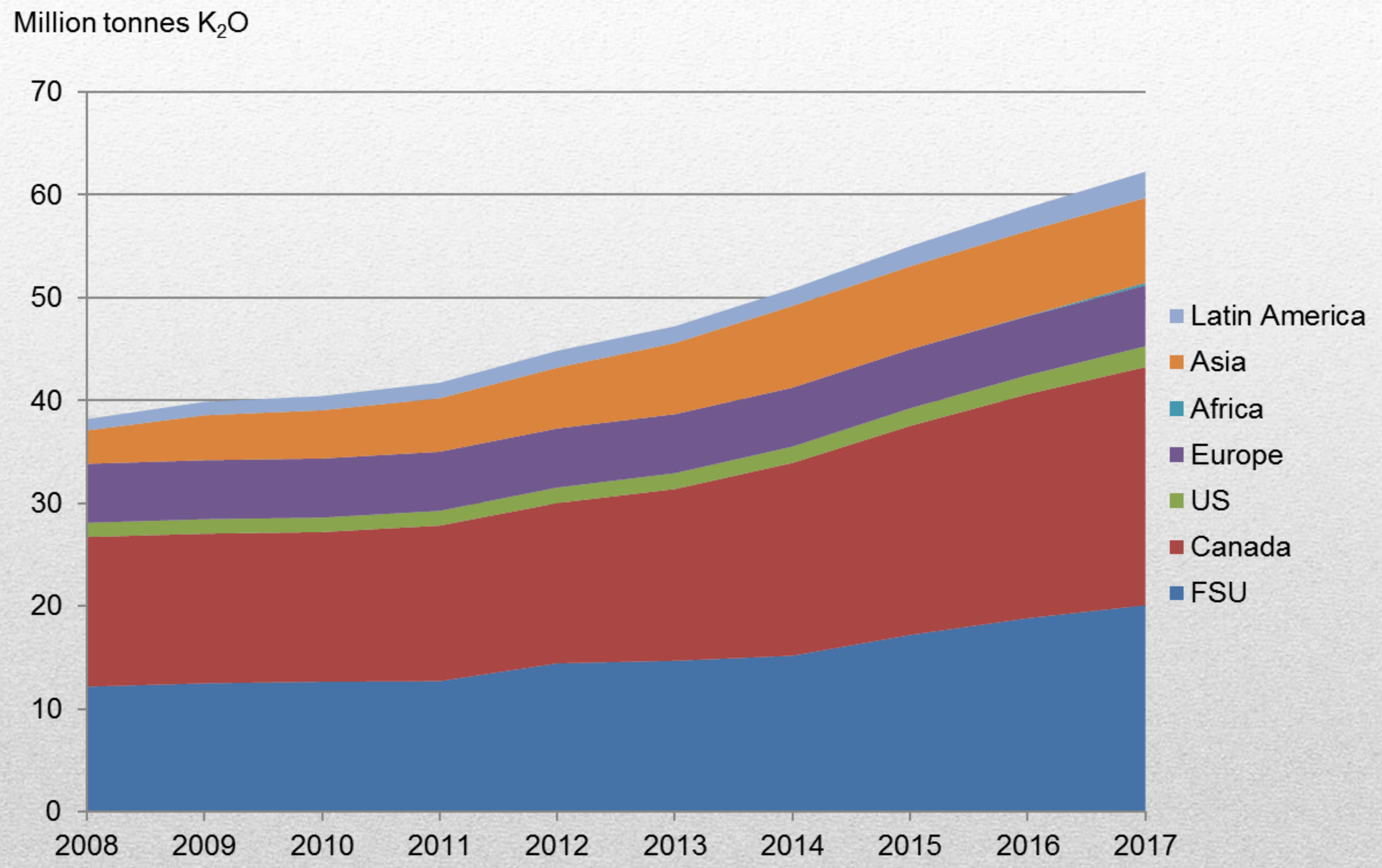
POTASH PRODUCTION



WORLD POTASH PRODUCTION



NEW POTASH CAPACITY



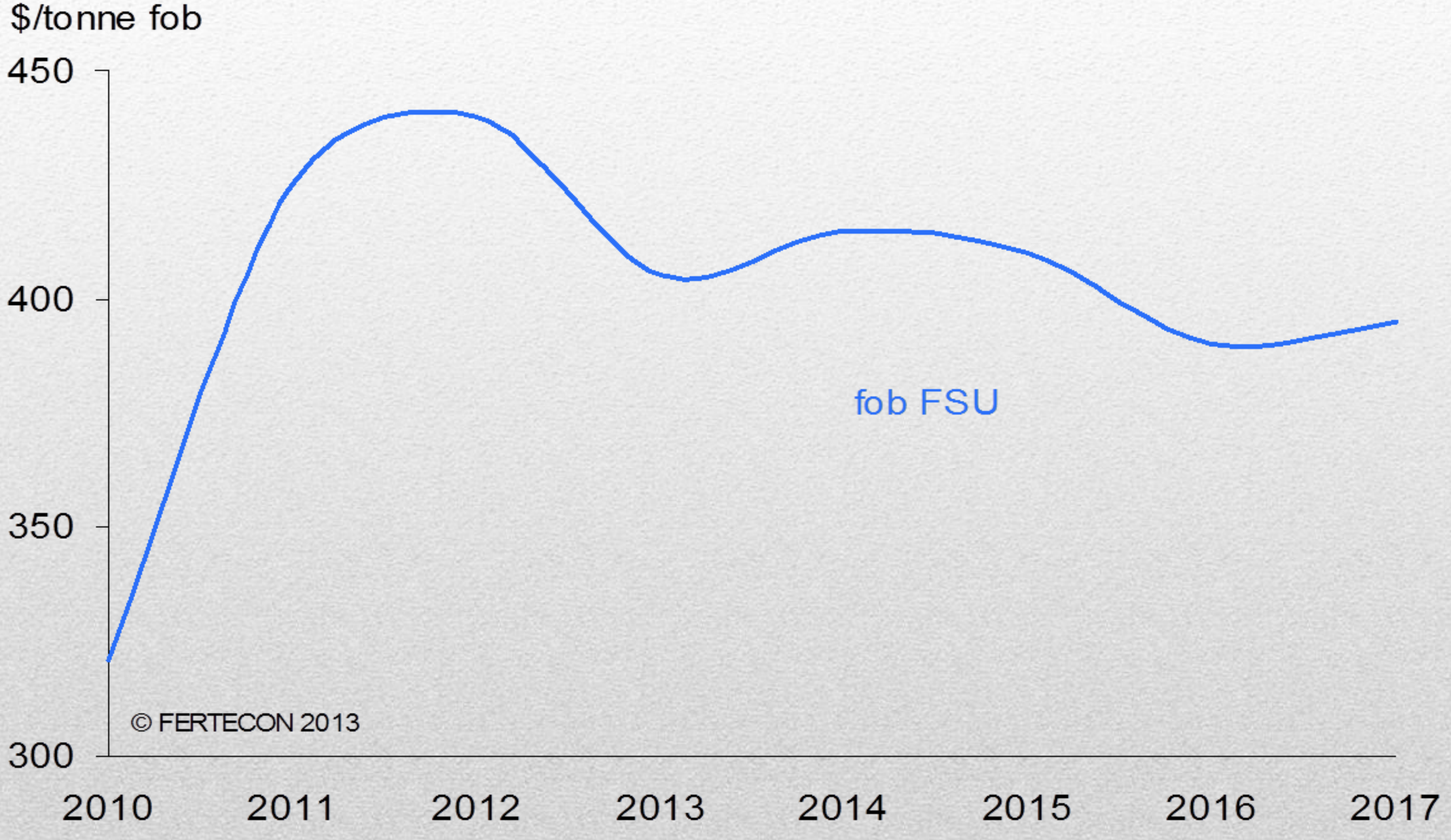
POTENTIAL NEW POTASH PRODUCERS

	2012 existing	2020 additions
Europe	K+S, Israel Chemicals	Sirius (UK)
CIS	Uralkali, Belaruskali	Acron, EuroChem
Africa	-	Congo, Ethiopia, Eritrea
Asia	around 30 enterprises in China, 1 in Laos	Several enterprises in Laos
North America	Agrium, Mosaic PotashCorp, Compass, Intrepid	IC Potash, several other potential projects
Latin America	SQM, Vale	Several potential projects in Brazil

POTASH PROJECTS

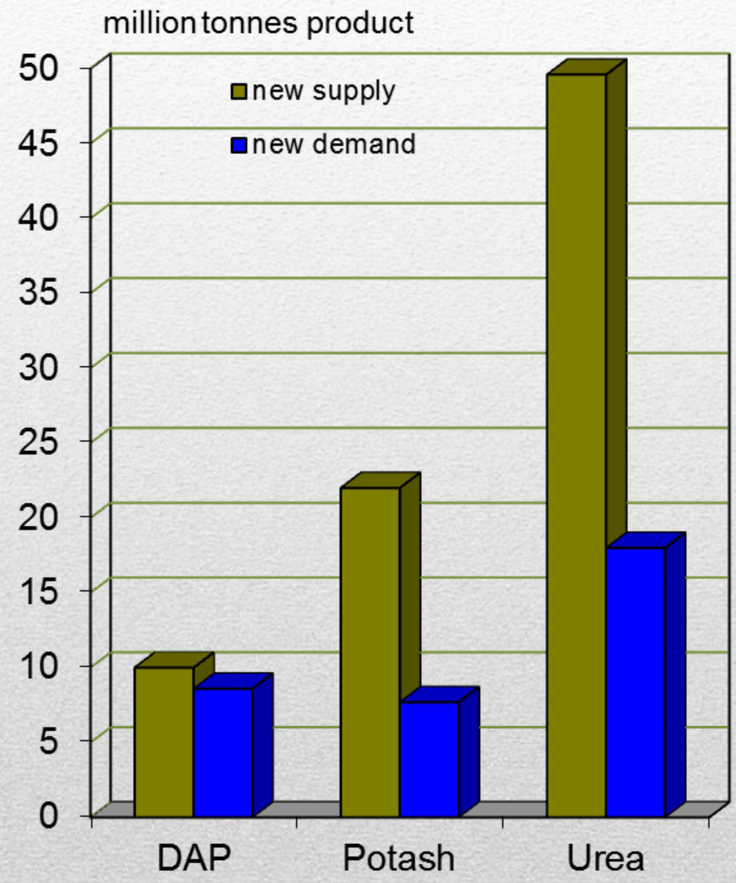
- Lots of greenfield projects have been announced but few will be developed
- Projects from junior mining companies will struggle to get finance
- Even projects from major companies face challenges – e.g. Vale’s Rio Colorado in Argentina now cancelled, major delays at Eurochem’s first Russia project
- The big unknown - BHP Billiton's Jansen project: over $1 billion spent but still no board approval
- The one certainty with greenfield projects the will cost more and take longer to build than forecast

POTASH PRICE OUTLOOK



SUPPLY/DEMAND OUTLOOK

SUPPLY / DEMAND GROWTH 2011-2015



- Supply is growing faster than demand in all three nutrients, particularly nitrogen
- New urea capacity in the will add 49 million tonnes/year (27 million in China)
- New potash supply adds 22 million tonnes MOP (29% increase)

AFRICA PROJECTS

- Nitrogen
- Phosphate
- Potash

FERTILIZER OUTLOOK

- Supply of all nutrients is growing faster than demand
- Availability of low-cost gas in Sub Saharan Africa, North Africa, Middle East and North America stimulating new nitrogen capacity
- Europe will remain at the high end of the cost curve unless there is massive development of shale gas lowering gas costs
- Europe's import dependence for nitrogen will increase
- Phosphate supply will grow, especially from North Africa and Saudi Arabia
- There will be more than adequate supply of phosphates – "Peak Phosphate" is a myth
- Potash supply will also increase faster than demand. Potential supply growth in Europe from polyhalite developments in UK

CAPITAL COSTS

- Capital costs of new plants continues to increase and this creates a long term floor price for fertilizers
- A 1 million tonne/year ammonia/urea complex now costs at least $1.5 billion
- A 2 million tonne/year potash mine costs at least $2.8 billion
- A 1 million tonnes/year phosphate fertilizer complex with mine, beneficiation and processing costs around $2 billion
- High capital costs mean fertilizer prices have to be sufficient to justify new investment to maintain supply

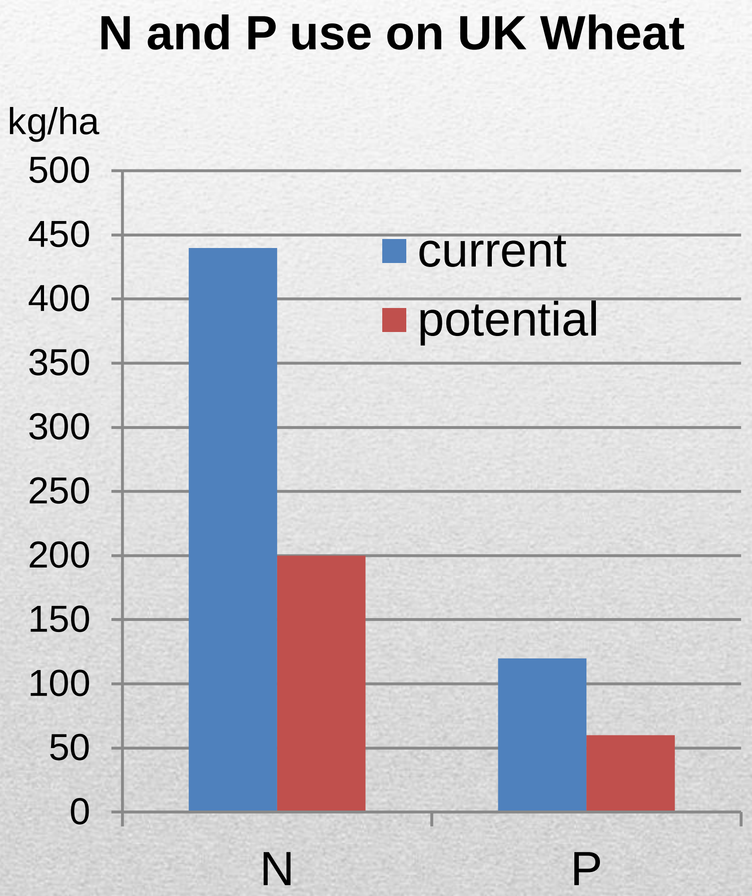
NUTRIENT USE EFFICIENCY

- Longer term, fertilizer consumption growth is expected to slow as the efficiency of fertilizer use increases
- This will be achieved by five main trends
  - Improved application techniques – precision farming
  - Controlled release fertilizers
  - Nutrient use efficiency increased in crops through plant breeding – both conventional and GMO
  - Increased nutrient recycling – from crop, animal and human waste
  - Integrated nutrient management – using available on-farm organic nutrients supplemented by mineral fertilizers
- All these are happening now and their impact will accelerate
- The industry promotes nutrient stewardship programmes like the 4Rs – applying the right fertilizer in the right place at the right time in the right way

NUTRIENT USE EFFICIENCY

- Fertilizer use per tonne of crop will fall as improved techniques are applied and new crop varieties introduced
- This suggests that fertilizer costs for crop production could also fall
- However, “smart” fertilizers and smarter application techniques are more expensive
- There is no one “golden bullet” but a range of approaches that together will lead to substantially increased nutrient efficiency
- There is also an environmental benefit – more efficient fertilizer use means less run-off and lower emissions of CO_2 and N_2O

IMPROVING FERTILIZER EFFICIENCY



- A recent paper* estimated that net fertilizer use on UK wheat could be halved using *existing* technology
- This would involved use of controlled release fertilizers, precision application and nutrient recovery from waste

* Scope for innovation in crop nutrition to support potential crop yields. Sylvester-Bradley and Withers, IFS Proceedings No.700, 2012

PRECISION FARMING DOES NOT HAVE TO BE HIGH-TECH

Source: Montpellier Panel report on Sustainable Intensification

IS FERTILIZER SUPPLY SUSTAINABLE?

- The shale gas revolution means there is adequate natural gas feedstock for nitrogen production for the foreseeable future
- Longer term nitrogen fertilizer production is not dependent on hydrocarbons – it can be produced using hydrogen extracted from water using renewable energy
- Fertilizer production is becoming more efficient – lower energy use, processing losses reduced
- Known phosphate and potash reserves will last over 1000 years – increased efficiency and recycling of nutrients will extend this
- Lower grade phosphate and potash ores will become economic through improved technology

WHY FERTILIZERS ARE IMPORTANT

- The core contribution of fertilizers to agriculture is enabling sustainable intensification – growing more food, fibre and fuel on less land

- This is central to alleviating hunger and malnutrition whilst at the same time protecting bio-diversity