THE STORY OF PHOSPHORUS

All living things require phosphorus to grow

energy?  
ethical? 
chemicals?  sustainable? 
geopolitical? 
pollution?  
future availability? 
waste?  cost-effective?

BACKGROUND: THE CURRENT SITUATION

> Chemical fertilizers (N,P,K) have contributed to feeding billions by boosting crop yields
> Today, modern agriculture is dependent on continual inputs of phosphate rock as fertilizer to sustain high yields
> Phosphate rock is a non-renewable resource and current global reserves depleted in 50-100 years
> 90% of mined phosphate rock for food production
> long-term: increased P demand because:
  • increased population & demand for food
  • Increased meat-based diets (eg. China & India)
  • Increased biofuel demand
> short term price rise in 2007-08: US$50/tonne to US$400/tonne
HISTORICAL GLOBAL SOURCES OF P FERTILIZERS

PHOSPHATE ROCK: REMAINING RESERVES

> All farmers need phosphorus, yet just 5 countries control around 90% of the world’s remaining phosphate rock reserves

- China: 27% of the world’s reported reserves; imposed a 135% export tariff in 2008
- Morocco: occupies Western Sahara (contrary to UN resolutions) & controls its reserves
- US: previously world’s largest producer, consumer, importer, exporter. Now has ~25 years left of own reserves
PHOSPHATE ROCK: ENVIRONMENTAL COSTS

> Mining, processing and transport (ocean freight) is energy intensive - 30 million tonnes transported each year

> every tonne of phosphate generates 5 tonnes of radioactive phosphogypsum waste (stockpiled)

> Phosphate rock is naturally radioactive, yet accepted in organic agriculture

www.epa.gov

PEAK PHOSPHORUS

• Like oil, P rock is finite resource and will reach a production peak - estimated peak P around 2030

• No alternatives on market today could replace demand for P rock: significant institutional and physical infrastructure will be required

• Timing of peak uncertain, but industry recognises:
  • quality is declining;
  • costs increasing;
  • environmental impacts (eg energy, Cadmium, phosphogypsum)
PHOSPHORUS FLOWS THROUGH GLOBAL FOOD PRODUCTION & CONSUMPTION SYSTEM

THE AUSTRALIAN STORY OF PHOSPHORUS

> Naturally phosphorus-deficient soils
> Simultaneously invested heavily in ‘phosphorus intensive’ agricultural export industries like beef, wheat, wool
  • High crop yields the past century made possible by mining phosphate-rich guano on Nauru

www.janeresture.com/nauru/home
PHOSPHORUS FLOWS THROUGH THE AUSTRALIAN FOOD PRODUCTION AND CONSUMPTION SYSTEM

> The good news is, unlike oil, phosphorus can be recovered once used:
  - Reuse crop residues, food waste (eg. supermarkets & household bins), excreta (pee and poo)

> Reduce the demand for phosphorus:
  - Efficiency in agriculture, food production, less ‘phosphorus-demanding’ diets

> Look for synergies – eg. from raw sewage we can get biogas energy AND use sludge as fertilizer

> Create healthy soils and ‘unlock’ phosphorus in agricultural soil?
Unlike water and energy, phosphorus scarcity is not on priority agenda within key discussions on global food security (e.g. UN FAO).

Currently no intentional and coordinated global governance of phosphorus:

- eg. no international policies, regimes, guidelines or organisations responsible for securing long-term availability of phosphorus for food production.
PHOSPHORUS SCARCITY: WHO’S RESPONSIBILITY?

We talk about global food security, water security, energy security, why not phosphorus security?

Phosphorus security:
How can we ensure all the world’s farmers have access to sufficient phosphorus in the long term to grow enough food to feed a growing world population, while ensuring farmer livelihoods and minimising environmental and ethical impacts?
SUMMARY: THE TAKE HOME MESSAGES (1)

> Phosphorus is vital for all life on earth – no substitute!
> Chemical phosphorus fertilizers have been responsible for feeding the world
> Today, substantial environmental, economic and ethical concerns means we need to reconsider how we source and use phosphorus for food production.
> Peak phosphorus within decades, remaining phosphate rock low quality and high cost
> Substantial phosphorus losses => increase efficiency & recovery, consider changing diets
> Consider local and renewable sources of phosphorus too – including pee and poo!
SUMMARY: THE TAKE HOME MESSAGES (2)

> No coordinated, equitable and timely governance of global phosphorus resources for food security by default

> Need to integrate phosphorus security into international discussion on global food security

> Continue a national discussion on implications for Australia, and what policy, infrastructure and social changes would need to occur?

> Look for synergies that can simultaneously address phosphorus scarcity, pollution, climate change, water scarcity, peak oil etc.

GLOBAL PHOSPHORUS RESEARCH INITIATIVE

For more information visit:

www.phosphorusfutures.net
or
www.isf.uts.edu.au

or email: Dana.Cordell@uts.edu.au

THANK YOU!
Most publications available for download on the Global phosphorus Research Initiative website: www.phosphorusfutures.net


OTHER RESOURCES


Jönsson, H (2001), Urine separation - Swedish experiences, SLU, Swedish University of Agricultural Sciences, EcoEng Newsletter 1, October 2001


SEI (2005), Sustainable Pathways to Attain the Millennium Development Goals - Assessing the Role of Water, Energy and Sanitation, For the UN World Summit' September2005, Stockholm Environment Institute (September 2005)
