Canadian Council of Ministers of the Environment
Nutrients as a Resource
Webinar
18 March 2013

IPNI
INTERNATIONAL
PLANT NUTRITION
INSTITUTE

Supply and Demand of Phosphorus

Tom Bruulsema, PhD, CCA
Director, Northeast Region, North America Program

World Phosphate Rock Reserves and Resources

"…at current rates of production, phosphate rock reserves to produce fertilizer will be available for 300-400 years."

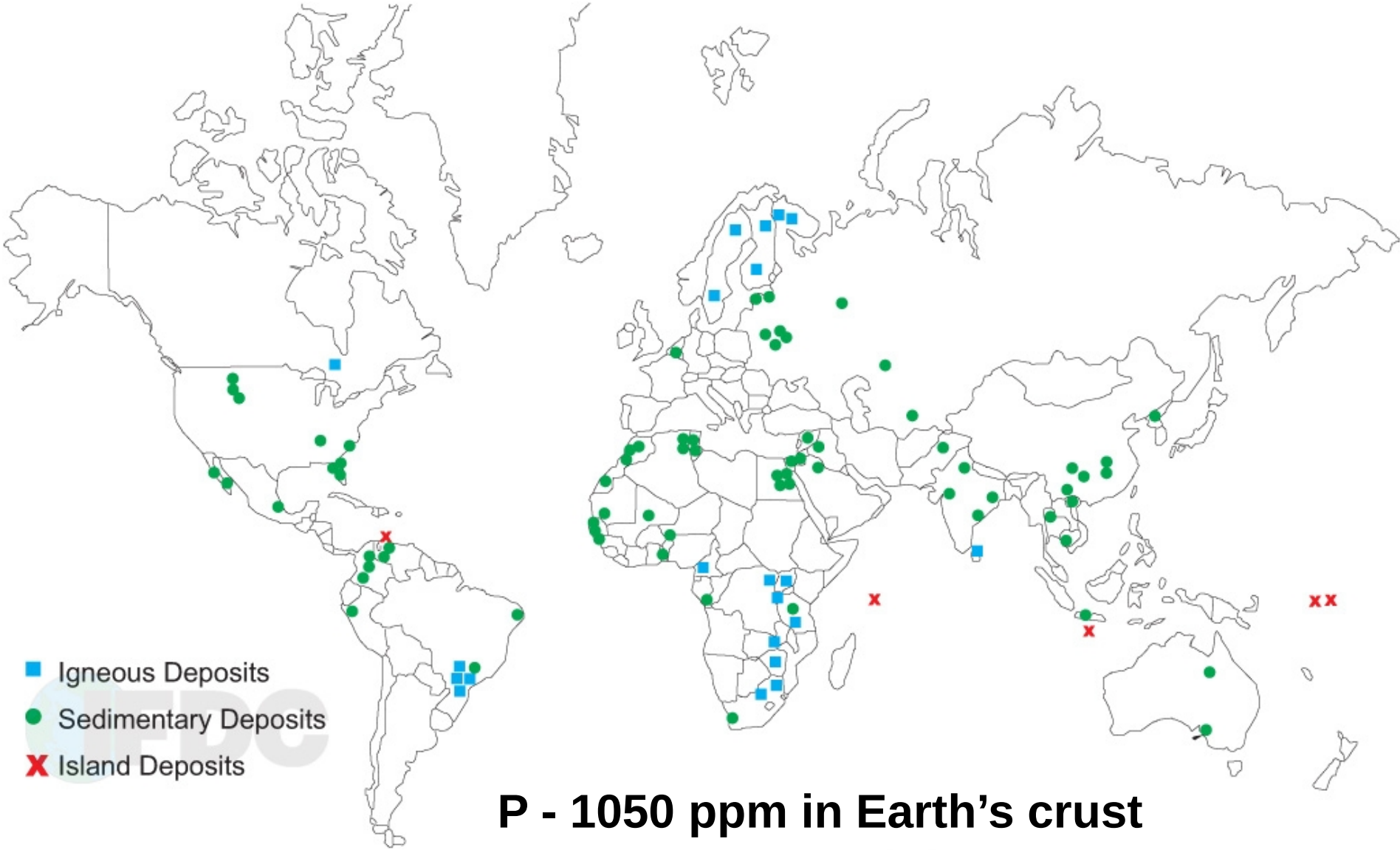
"No matter how much phosphate rock exists, it is a non-renewable resource"

IFDC, 2010

Phosphate Rock

- ***Reserves*** – phosphate rock that can be economically produced at the time of the determination using existing technology; reported as tons of recoverable concentrate *(usually contain ~25% to ~34% P_2O_5)*
- ***Resources*** – phosphate rock of any grade, including reserves, that may be produced at some time in the future; reported as tonnage and grade *in situ* *(can contain ~10% to ~30% P_2O_5 with some as low as 5%)*
  - Only a fraction of the resources are technically and economically suitable for production at any point in time.

World P Resources



P - 1050 ppm in Earth's crust
60 ppb in oceans

Source: IFDC

World Phosphate Rock Reserves

Country	2011-12 Production	Reserves	Reserve Life	Resources (IFDC 2010)
	Mt		Years	Mt
Algeria	1.5	2,200	1470	--
China	85	3,700	43	16,800
South Africa	2.5	1,500	600	7,700
Jordan	6.5	1,500	230	1,800
Morocco	28	50,000	1790	170,000
Russia	11	1,300	115	4,300
USA	29	1,400	49	49,000
World Total	204	67,000	328	290,000

Source: USGS, 2013

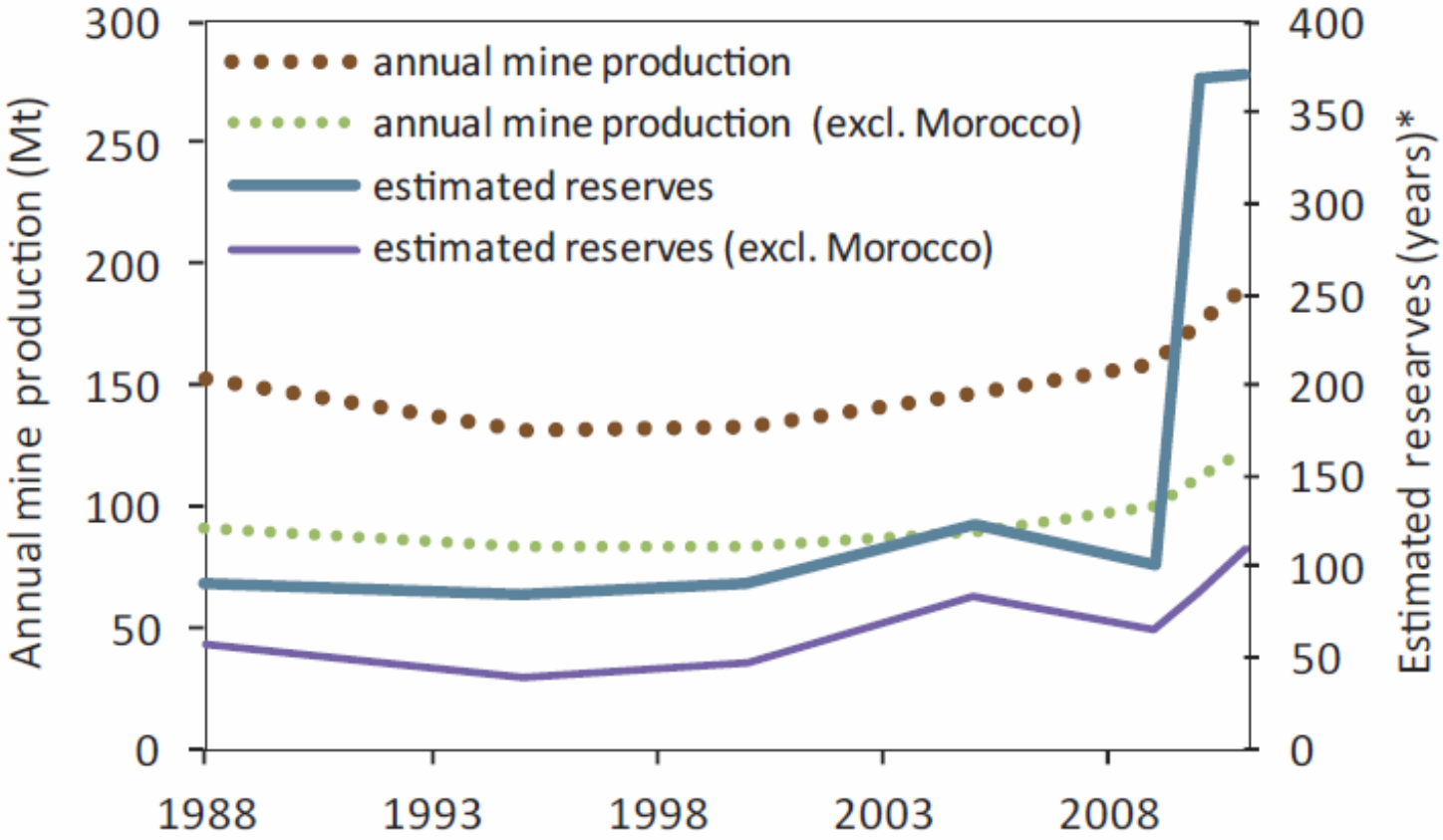
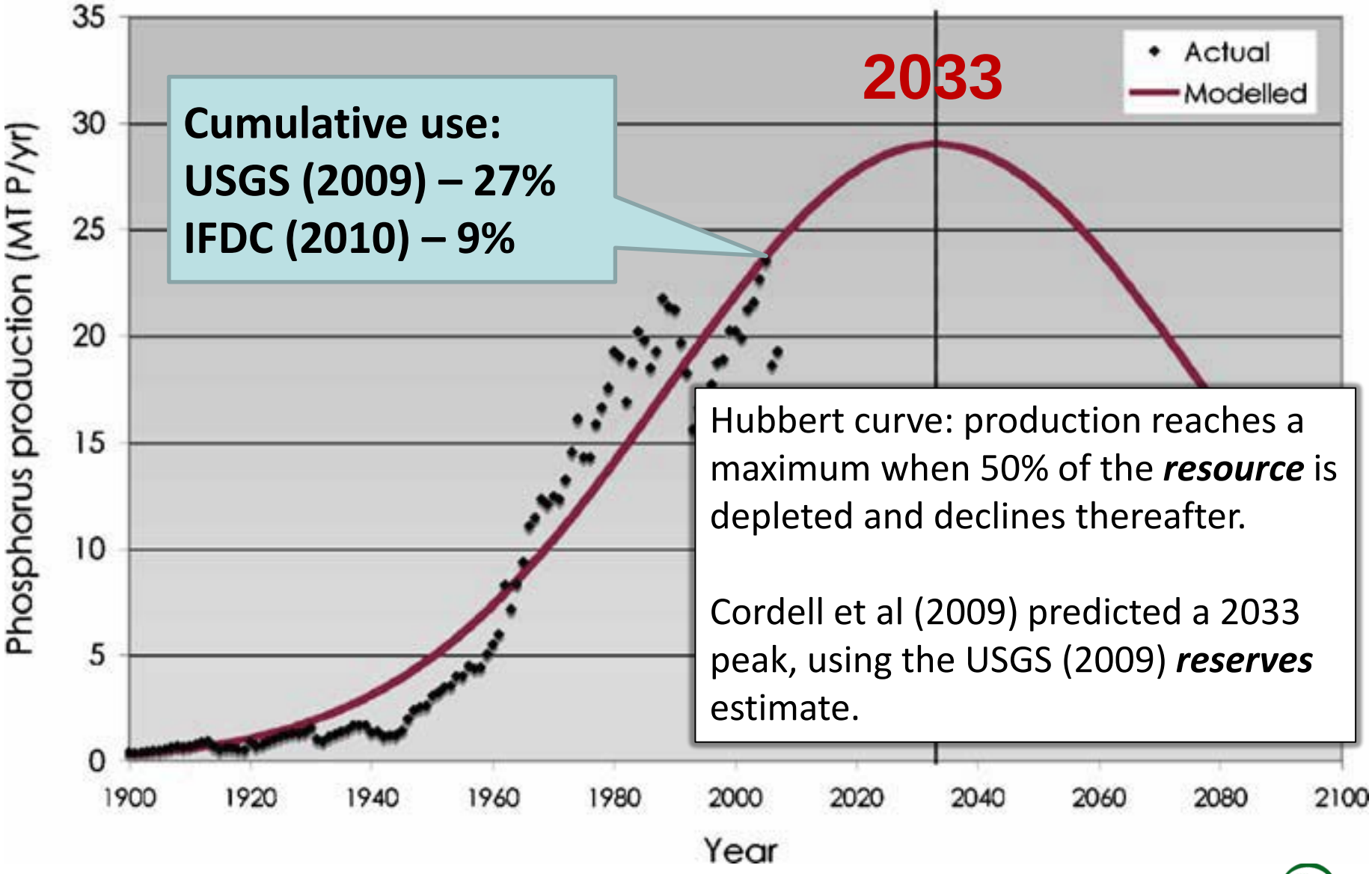


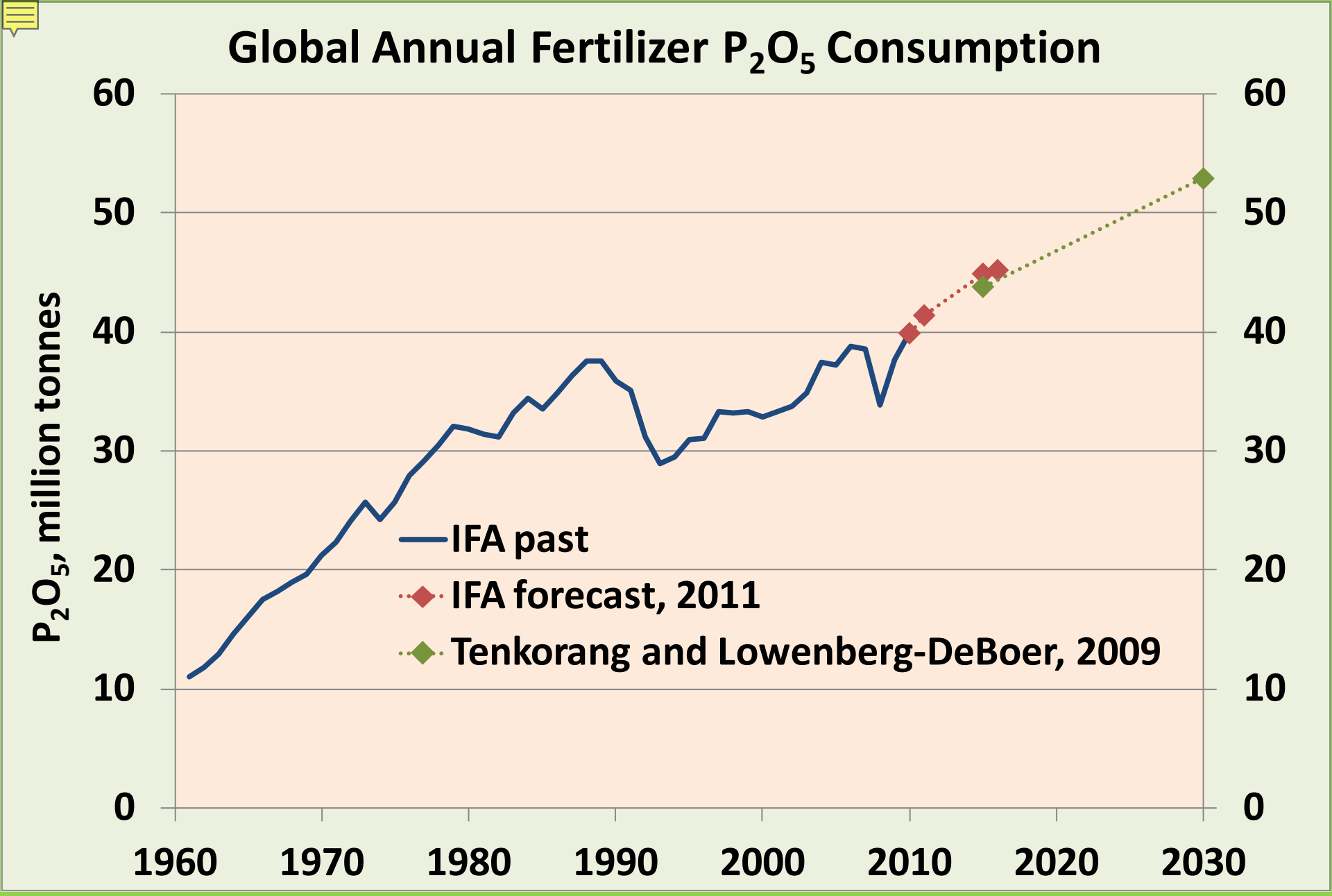
Figure 2.8 Time course of global annual mine production of phosphate rock and estimated reserves at current rates of mine production, also showing the estimates without including Morocco. Based on Scholz and Wellmer (Scholz & Wellmer, 2013), from the series of USGS reports (e.g., U.S. Geological Survey, 2012a). The estimated reserves without Morocco are shown based on current total global production, assuming that this is market driven. * Calculated as the ratio of global estimated reserve to annual mine production.

Sutton et al. 2013. *Our Nutrient World: The challenge to produce more food and energy with less pollution.* Global Partnership on Nutrient Management.

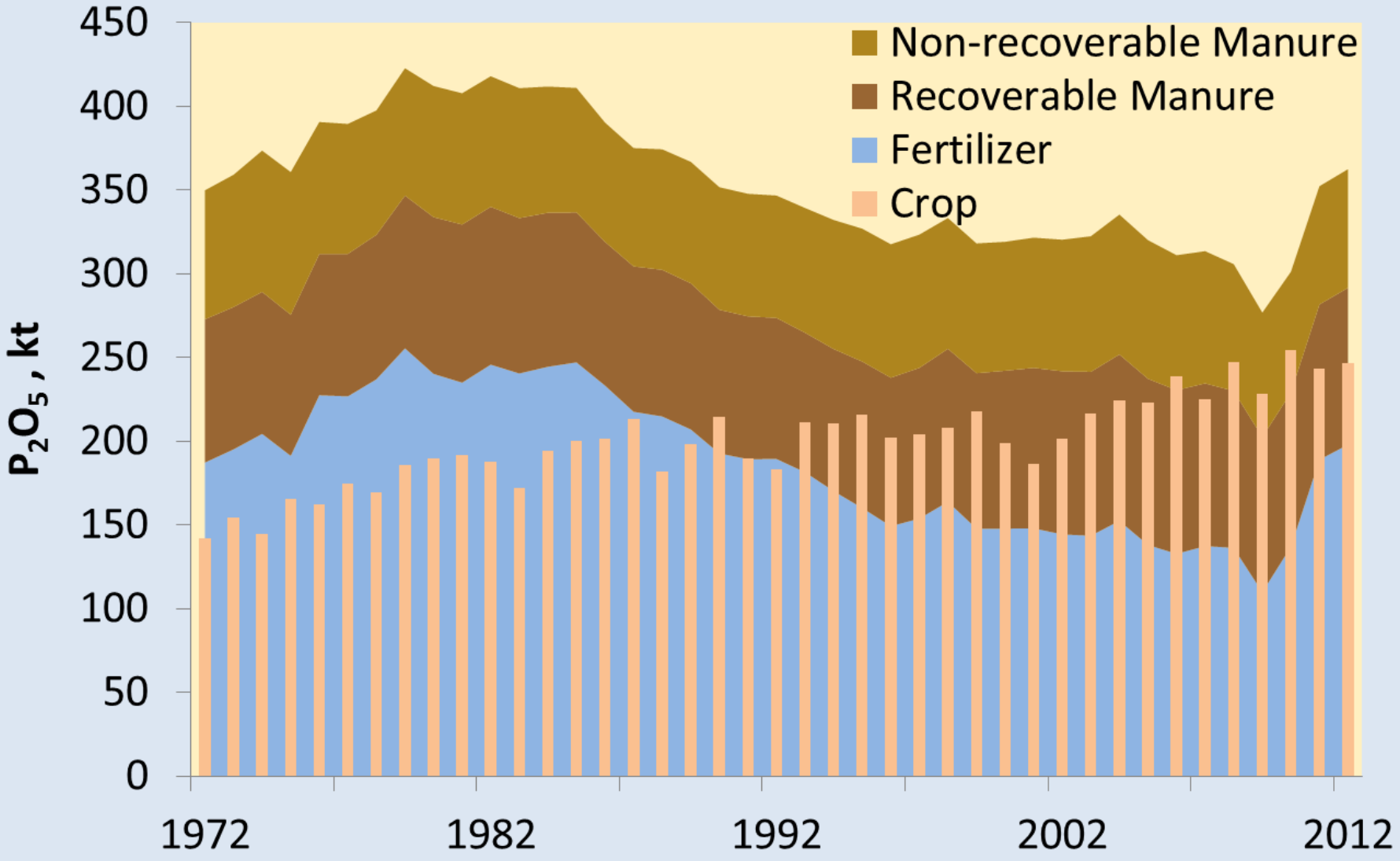
Peak phosphorus … like peak oil??



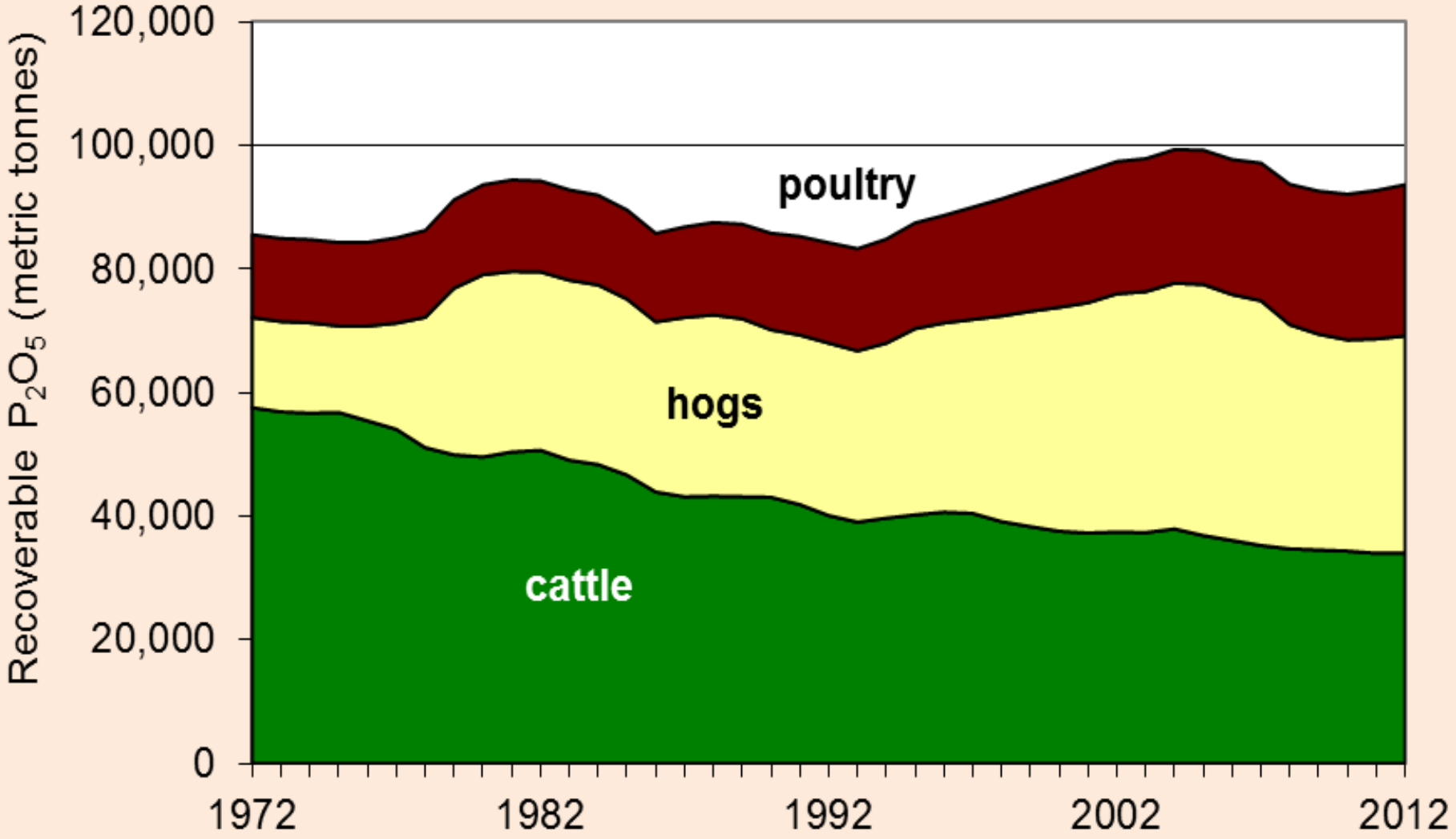
Cordell et al, 2009.


Global Annual Fertilizer P_2O_5 Consumption
P_2O_5, million tonnes
60
50
40
30
20
10
0
1960
1970
1980
1990
2000
2010
2020
2030
IFA past
IFA forecast, 2011
Tenkorang and Lowenberg-DeBoer, 2009

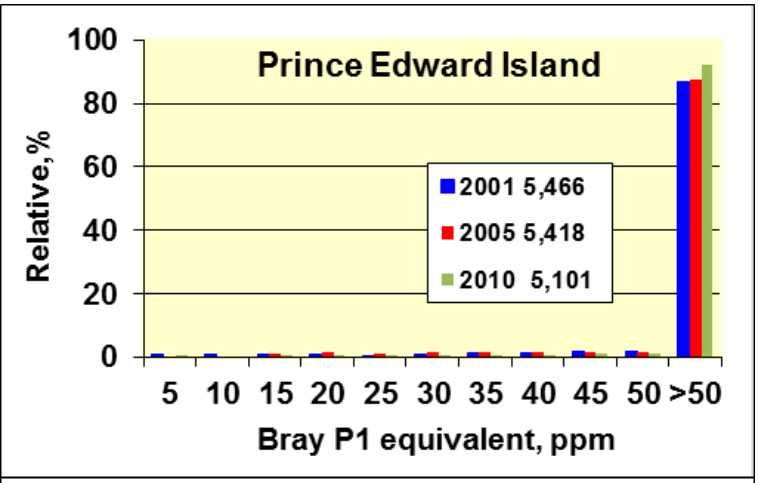
Eastern Canada Cropland Phosphorus Balance

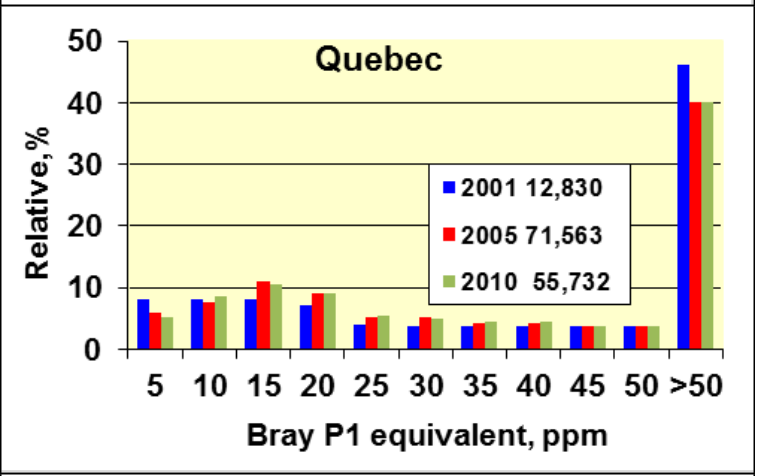


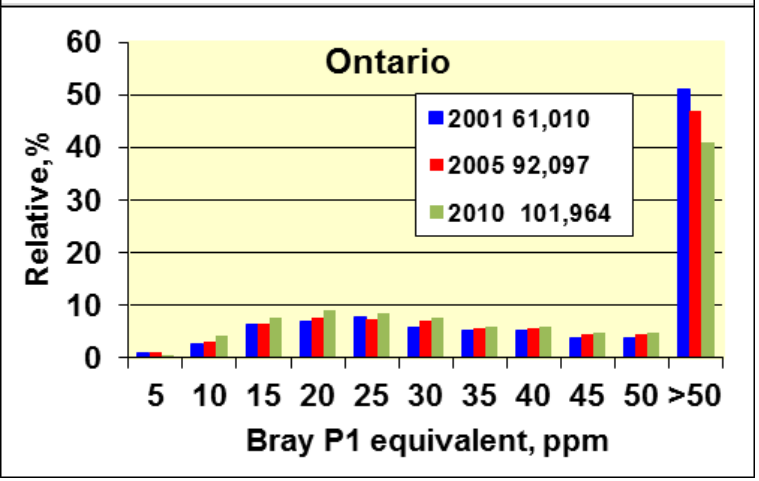
Available P in Recoverable Manure - Eastern Canada

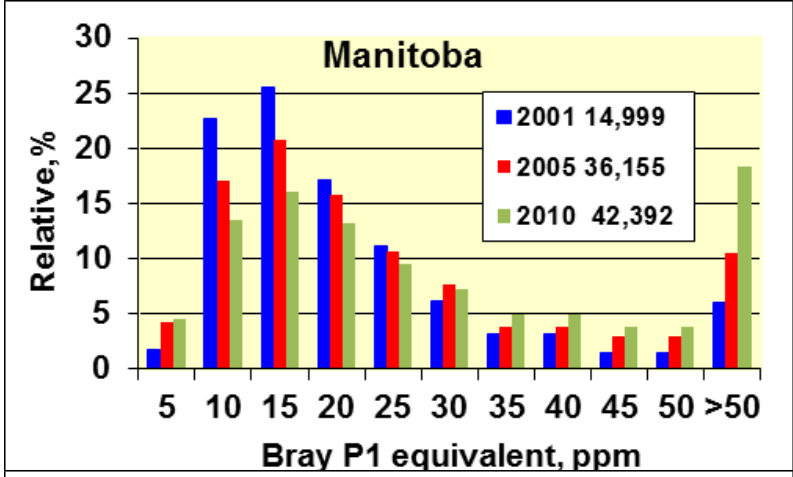


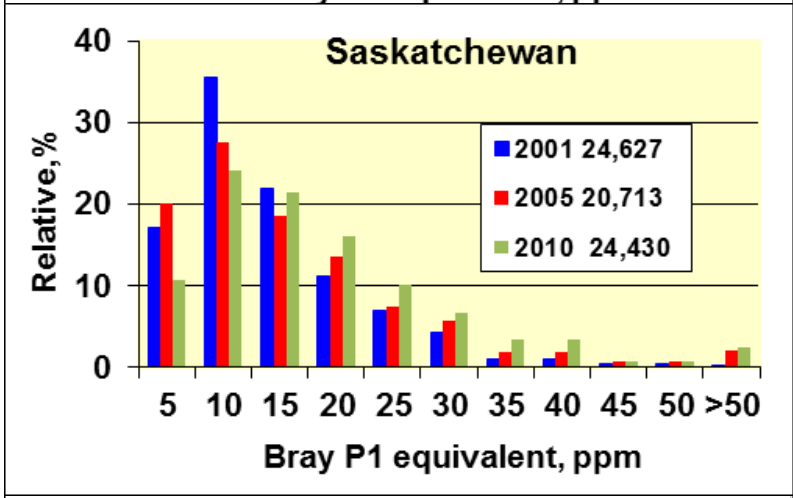
IPNI Soil Test Levels in Canada

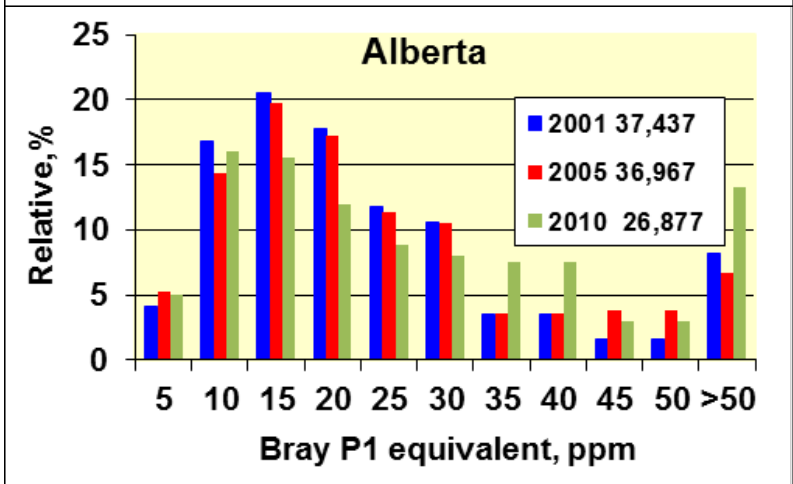












Summary – P Supply & Demand

1. Reserves of phosphate rock available for 100-400 years
   - Finite resource concentrated geopolitically
2. Global agricultural demand likely to increase to 2050
3. Current fertilizer/manure use balances crop P removal in Eastern (and Western) Canada
4. Most agricultural soils of Eastern Canada are high in P
   - Require P sources that can be blended and placed
   - Limited need for bulky sources of P for building soil fertility
5. Western Canadian soils are lower in available P
   - Require low-cost forms of P for extensive agriculture

4 nutrient stewardship

http://nane.ipni.net