

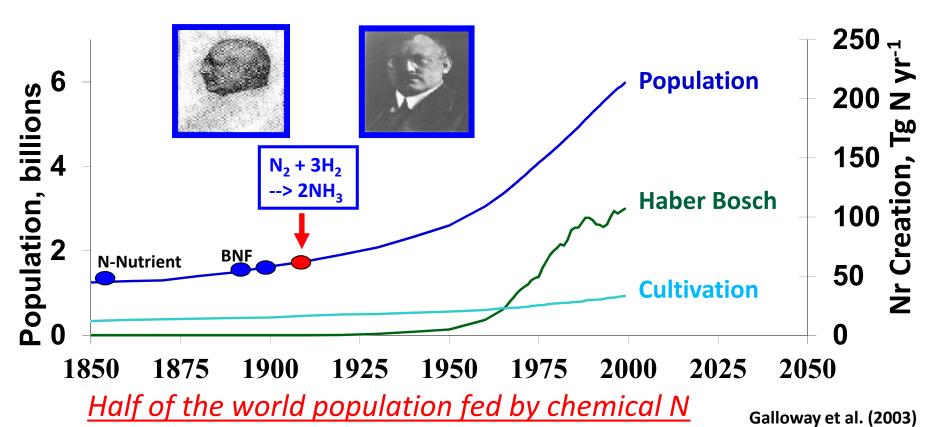


- 1. Is soil test useful for N management?
- 2. Should we mine soil nitrogen?
- 3. Is NUE as low as perceived?

<u>Deli Chen</u><sup>1</sup>\*, Shu Kee Lam<sup>1</sup>, Arvin R Mosier<sup>1</sup>, Richard Eckard<sup>1</sup>, Rob Norton<sup>2</sup>, Peter Vitousek<sup>3</sup>

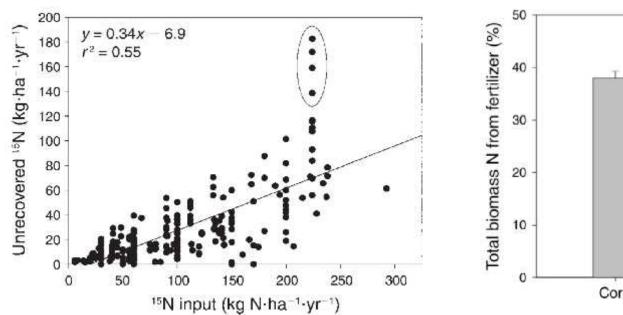
<sup>1</sup> Crop and Soil Science Section, Faculty of Veterinary and Agricultural Sciences, The University of Melbourne, Australia \*delichen@unimelb.edu.au
<sup>2</sup> International Plant Nutrition Institute, Australia
<sup>3</sup> Department of Biological Sciences, Stanford University, USA

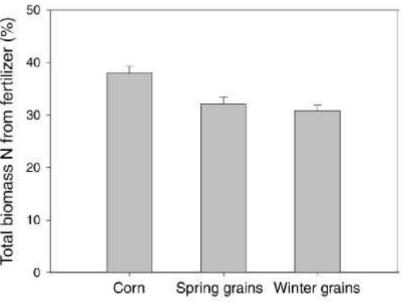
# Timeline of Global Reactive N Creation by Human Activity 1850 to 2000





#### Soil N plays an important role in soil fertility





Based on <sup>15</sup>N studies, even in well-fertilised fields about 50 % of plant N uptake is from the soil N pool



#### Too much N vs. too little N





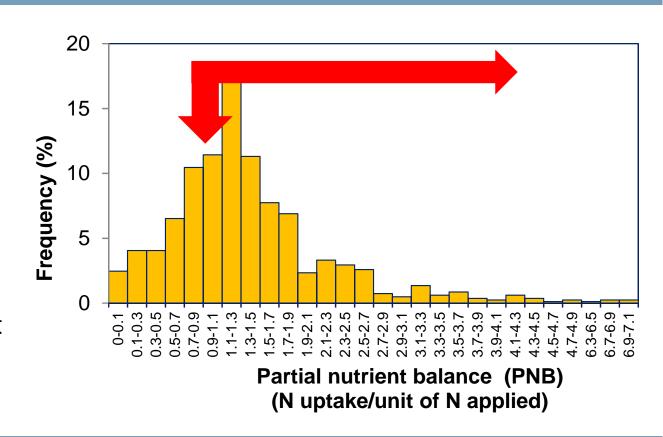
**Example: intensive dairy in Australia** 

Case 2: Inadequate N input

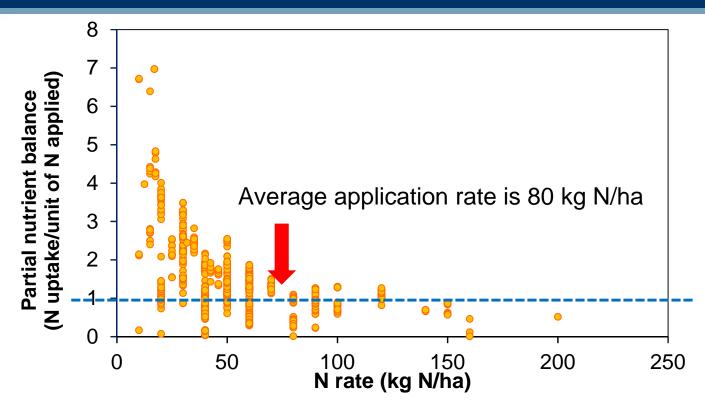


#### **Australian wheat system**

- PNB > 1 = soil N being mined
- 67% of PNB > 1
- "Autumn break":
   Although soil test
   may indicate soil N
   is available, it is not
   sustainable without
   N input.



#### **Effect of N rates**



'PNB > 1' occurs mostly when N rate < 100 kg N/ha



## N lost / kg agricultural products

**Wheat** 

Australia China US

0.3

43.9

25.7



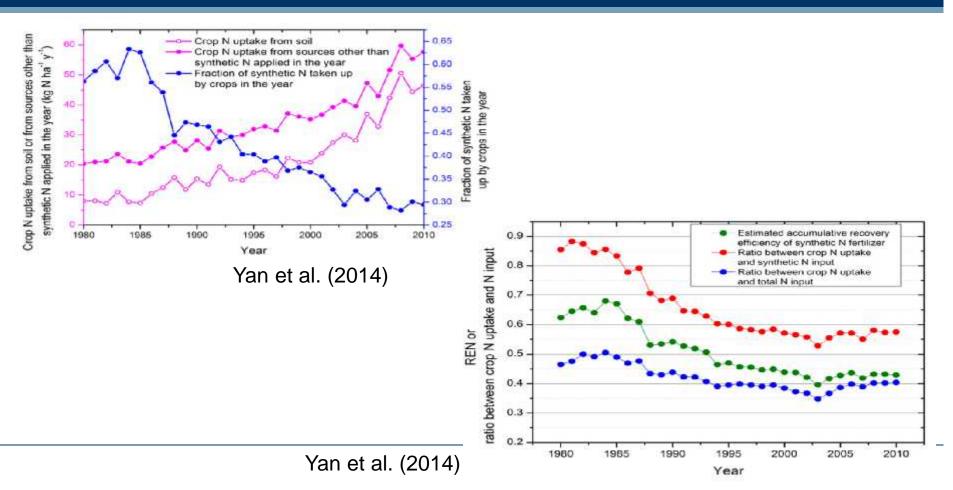
#### Australian pasture system, excessive N input

N source	1990	2000	2012
N inputs (average per farm) kg N ha <sup>-1</sup>			
Cattle	1	1	1
Forage	10	24	31
Concentrates	24	54	81
Fertiliser	18	39	71
Legume N inputs	31	27	26
Atmosphere	6	6	5
N input total	<u>91</u>	<u>151</u>	<u>214</u>
N outputs (average per farm) kg N ha <sup>-1</sup>			
Cattle	9	9	8
Milk	28	40	49
N output total	<u>36</u>	<u>48</u>	<u>57</u>
N input – output (kg N ha <sup>-1</sup> )	<i>54</i>	<i>103</i>	<i>158</i>
N use efficiency (%)	40	<i>32</i>	<b>26</b>
Dutch dairy farms: N input – output (kg N ha <sup>-1</sup> )			<b>210</b>

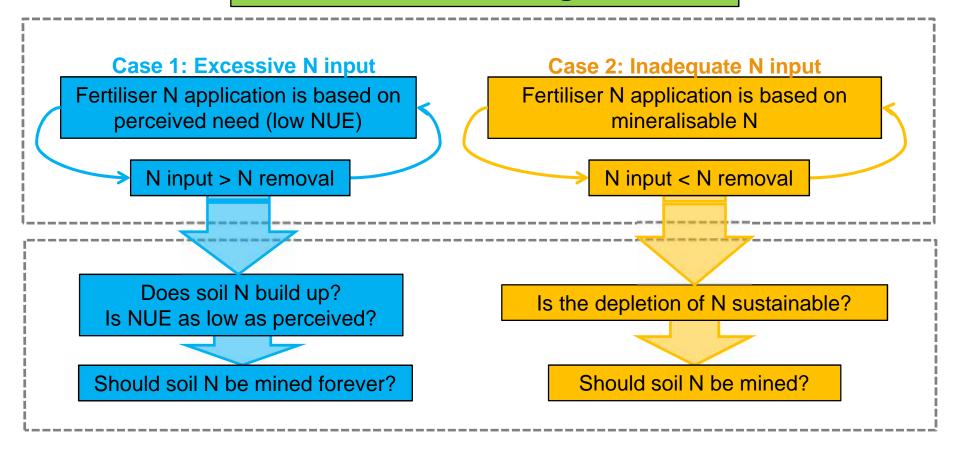
Stott and Gourley (2016); Schulte-Uebbing (2016)



## Is NUE as low as perceived?



#### Paradox of mining soil N



## How long can soil N be mined?

#### High yield maize production in the North China Plain

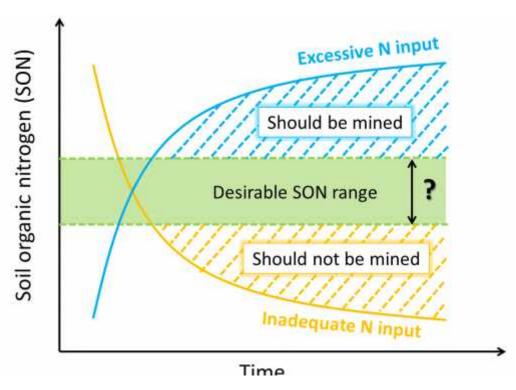
	ISSM	High yield
Maize grain yield (tonnes/ha)	13	15.2
N input (kg N/ha)	237	747
N removed in harvest (kg N/ha)	250	292
Input – harvest (kg N/ha)	-12	457

ISSM: integrated soil-crop system management

Chen et al. (2010)

#### **Framework**

- Excessive N additions need to be halted, and the surplus N should be mined, at least for some time.
- For low N input systems,
   N should not be mined.



#### Challenges---Benchmarking & N footprint

- So far, no evidenced-based index for "<u>Green</u>"/sustainable agriculture products
- - To encourage and reward the more sustainable practices?
  - To give more efficient producers marketing, pricing advantages
  - To develop true environmental cost of agriculture products production leading to payment/trading (*Environmental Offset*), Environmental (N) Credit



# 7th International Nitrogen Initiative Conference (INI 2016)

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# Thank you



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