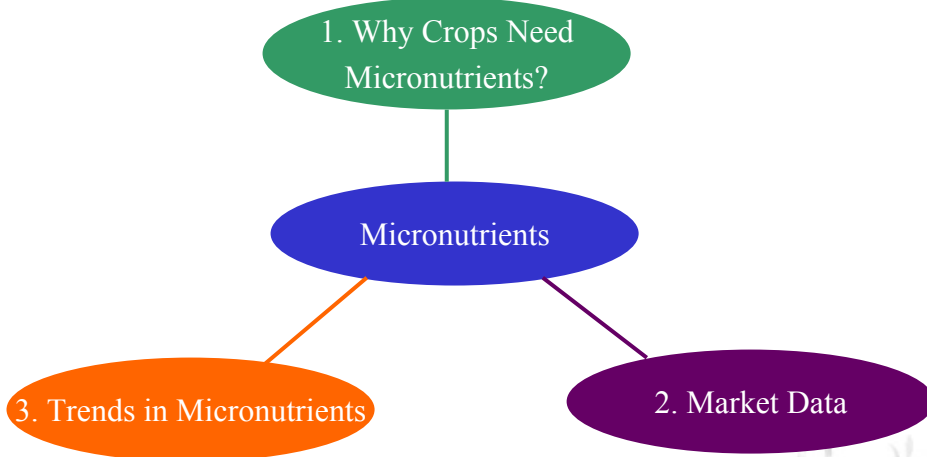


Market for Micronutrients: Production, Trade, Consumption

IFA Conference
New Delhi 23-25 Feb 2004

Sumitro Wijaya
Akzo Nobel Chemicals Pte Ltd



Cotton, Zinc Deficiency



Peanut - Iron deficiency



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Wheat, Copper Deficiency



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Citrus, Iron Deficiency



Soy Bean, Manganese Deficiency



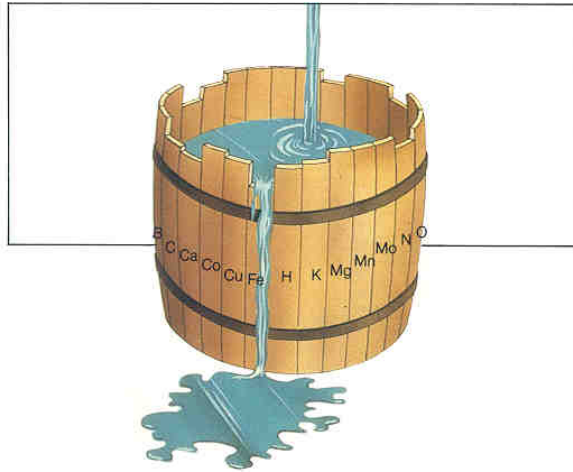
The susceptibility of some important food crops to six micronutrient deficiencies

	<i>Boron</i>	<i>Copper</i>	<i>Iron</i>	<i>Manganese</i>	<i>Molybdenum</i>	<i>Zinc</i>
Wheat		**	*	**	*	*
Rice			*	*		**
Maize	*	*			*	**
Potato	*			**		*
Barley		**	*	*		*
Soya bean			**	**	**	**
Oats		**		**	*	
Sorghum		*	**	**		**
Sugar beet	**	*		**	*	
Groundnuts	**		**		*	*
Field beans			**	**	*	**
Chick peas					*	
Pigeon peas					*	
Bananas	*					
Coconuts						*



** Highly susceptible * Moderately susceptible

Why Crops Needs Micronutrients?



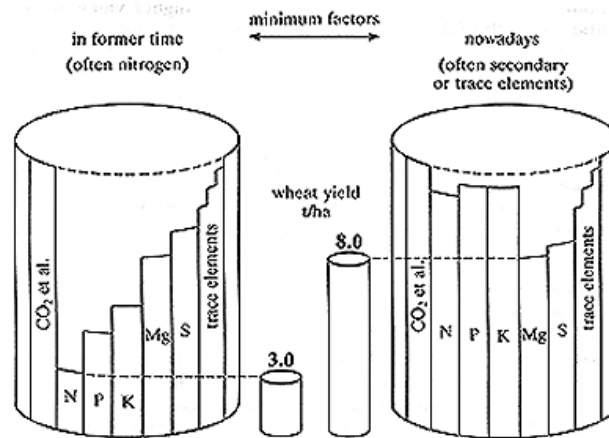
Liebig's barrel: Yield-Limiting Factors

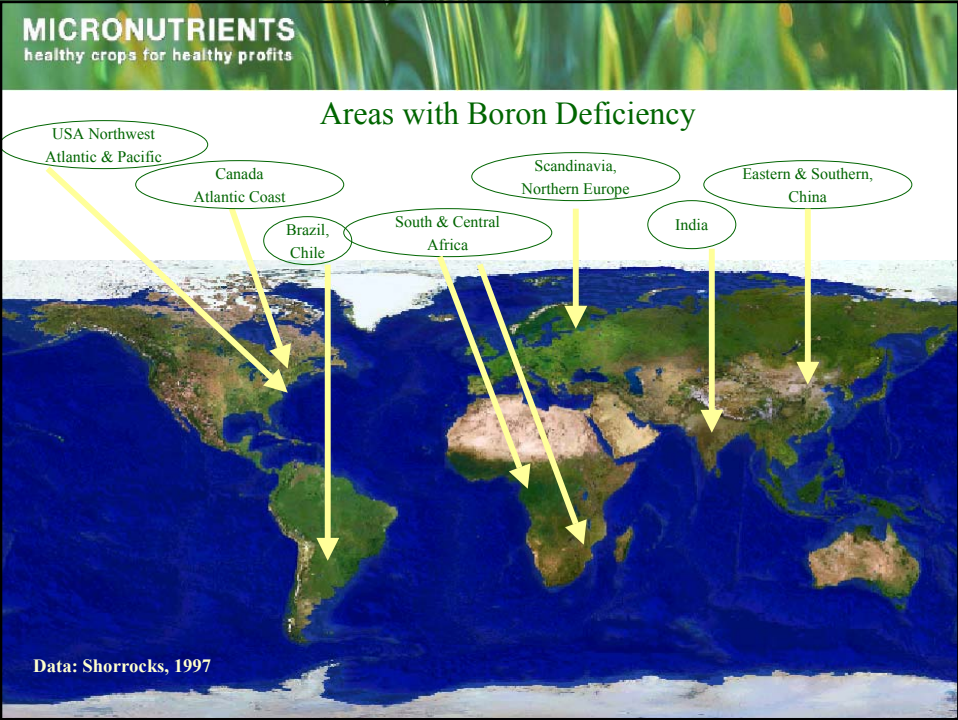
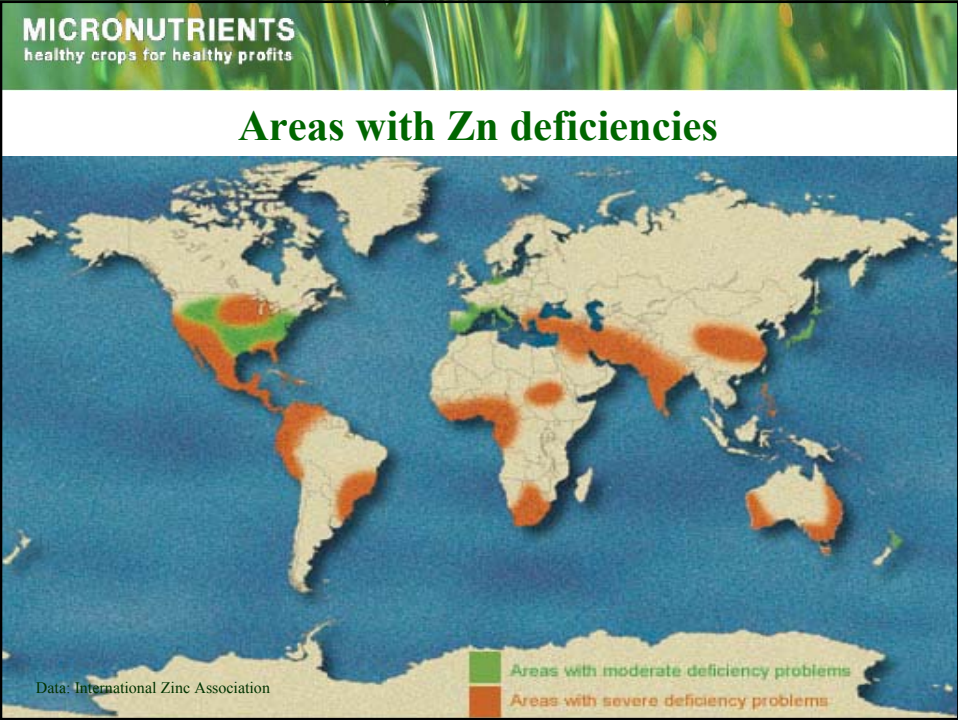


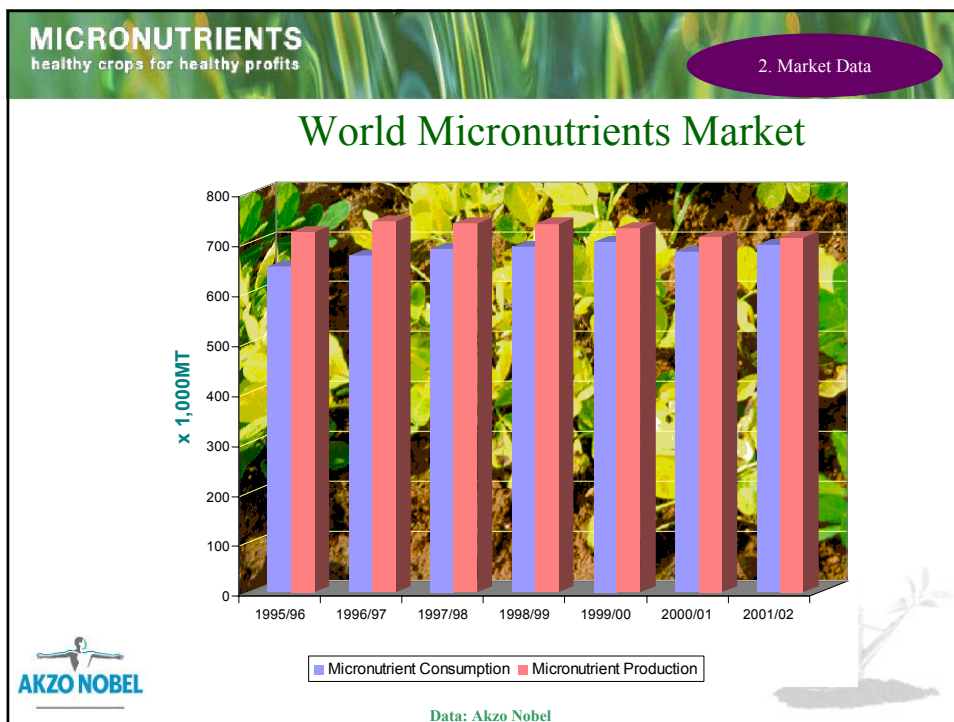
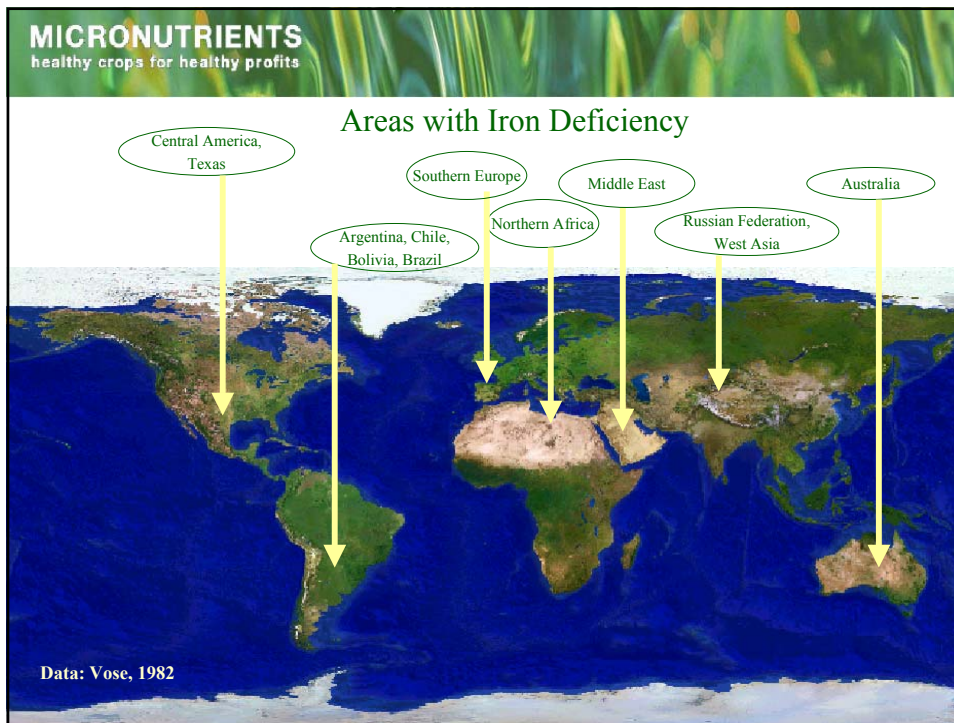
MBH-0104.98

Why Crops Needs Micronutrients?

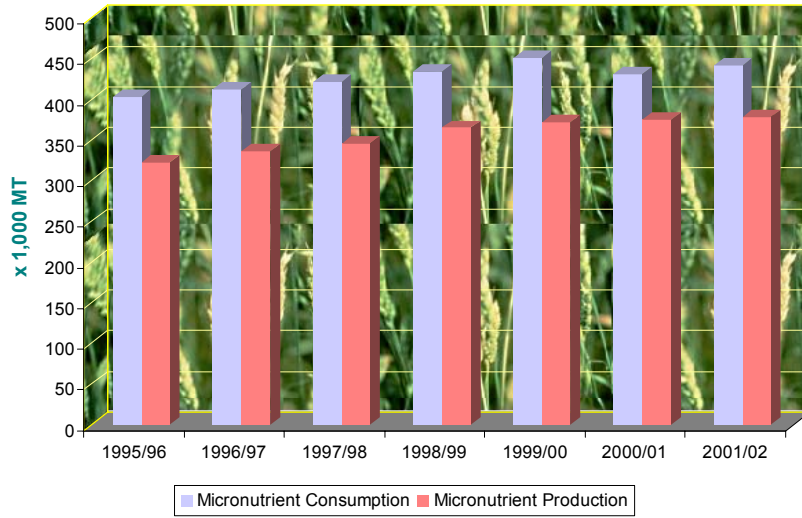
Examples of yield-limiting minimum factors presented as "minimum barrel"
(the nutrient in shortest supply limits the yield, here N respectively Mg)





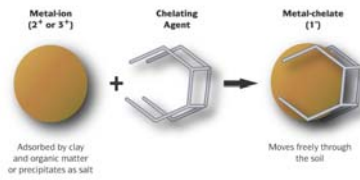


Asia Micronutrients Market

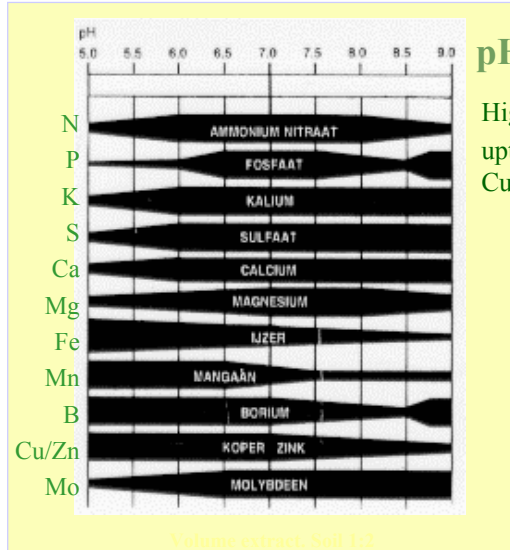


Data: Akzo Nobel

Niche Micronutrients Market: Chelated Micronutrients



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pH and uptake

High pH soil affects uptake of Fe, Mn, Cu, Zn.

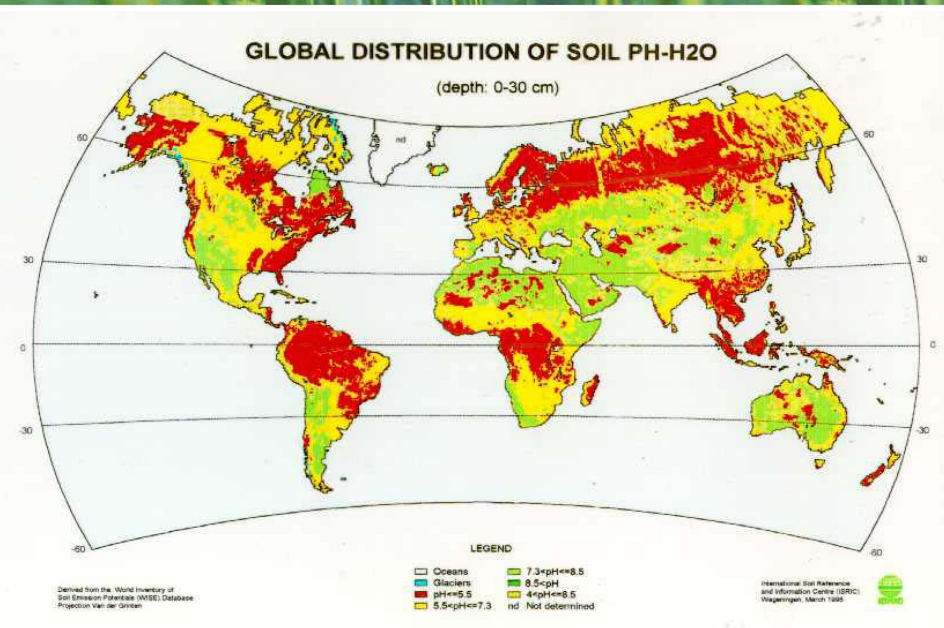


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Areas with high pH

GLOBAL DISTRIBUTION OF SOIL PH-H2O

(depth: 0-30 cm)

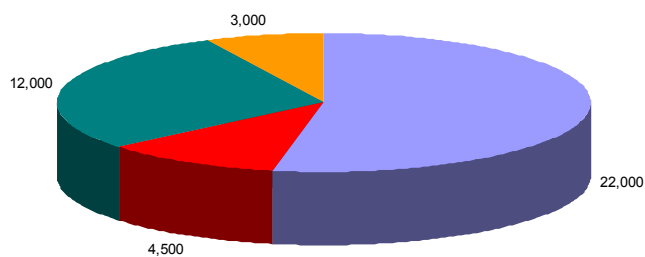


Why Use Chelated Micronutrients?

- In Soil Application:
 - To avoid blocking metal to soil
 - To avoid precipitation of metal
 - To keep the metal soluble
 - To avoid interference with P (in the NPK or in the soil)
- In Foliar Application:
 - Chelating agent promotes transport in the leaves after penetration
 - Avoids precipitation in hard water (e.g: take Fe-DTPA in hard water)
 - Can be mixed with almost all pesticides, except Cu based products



Chelated Micronutrients Market (MT)

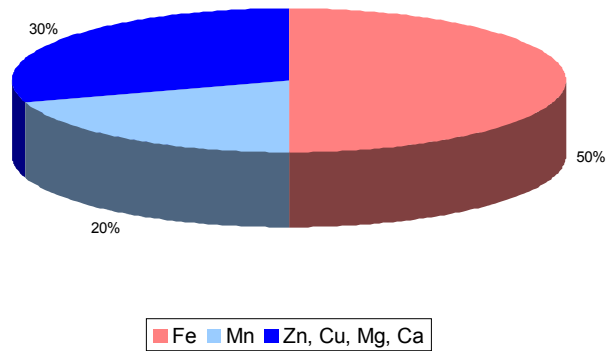


■ Europe ■ M.East/Africa ■ America's ■ Far East Asia

Data: Akzo Nobel



Chelated Micronutrients Market by Elements



Trends in Micronutrients

- Enriched fertilizers
 - Increasing market for NPK + micronutrients
- Environmental aspects (over-fertilization)
 - E.g. 500 ppm Cu in Malaysian peat soil
- Increasing demand for micronutrients
 - Increasing yield requirement
 - Growth of soilless culture
 - Precision agriculture
- Legislation of heavy metals in fertilizers
 - E.g. Washington & California State Law
- Biofortification
 - Requires more bioavailable micronutrients



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Thank You

