Committee on World Food Security

FAO, Rome, Italy

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IPNI
INTERNATIONAL
PLANT NUTRITION
INSTITUTE

Fertilizing for Food that Improves Human Health

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CF Industries Holdings, Inc.

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Incitec Pivot

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K+S KALI GmbH

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PotashCorp

Qatar Fertiliser Company (QAFCO)

Simplot

Sinofert Holdings Limited

SQM

Toros Tarım

Uralchem

Uralkali

Formed in 2007 from the Potash & Phosphate Institute, the **International Plant Nutrition Institute** is supported by leading fertilizer manufacturers.

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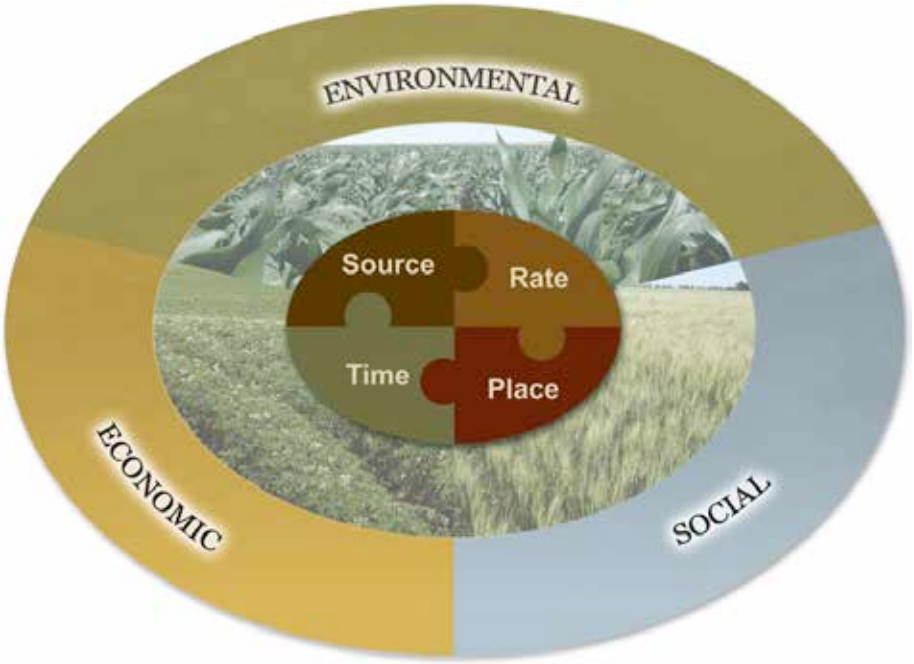
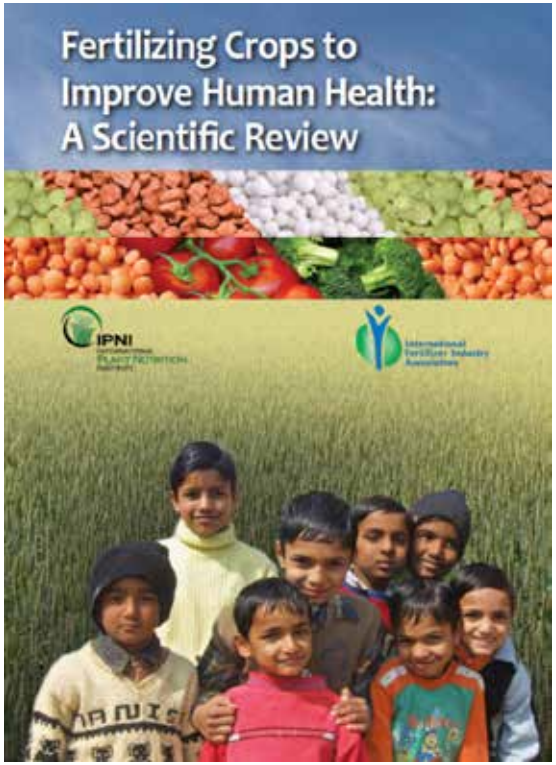
4R Nutrient Stewardship supports human health



4 nutrient stewardship



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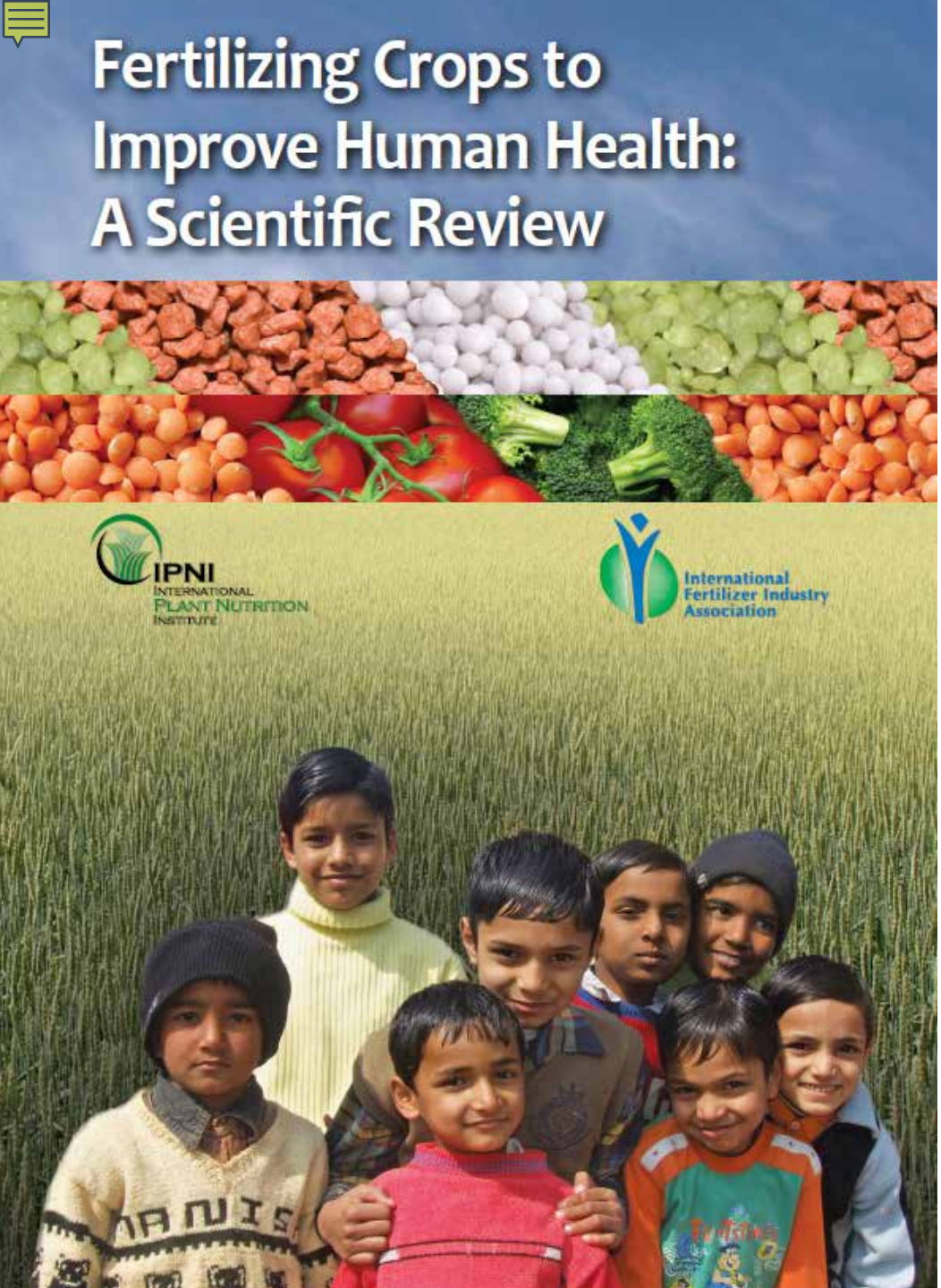

Topics

- Food security
- Micronutrients
- Vitamins
- Functional foods
- Proteins, oils and carbohydrates
- Plant disease
- Farming systems
- Remediation of soil contaminated with radionuclides
- 11 chapters

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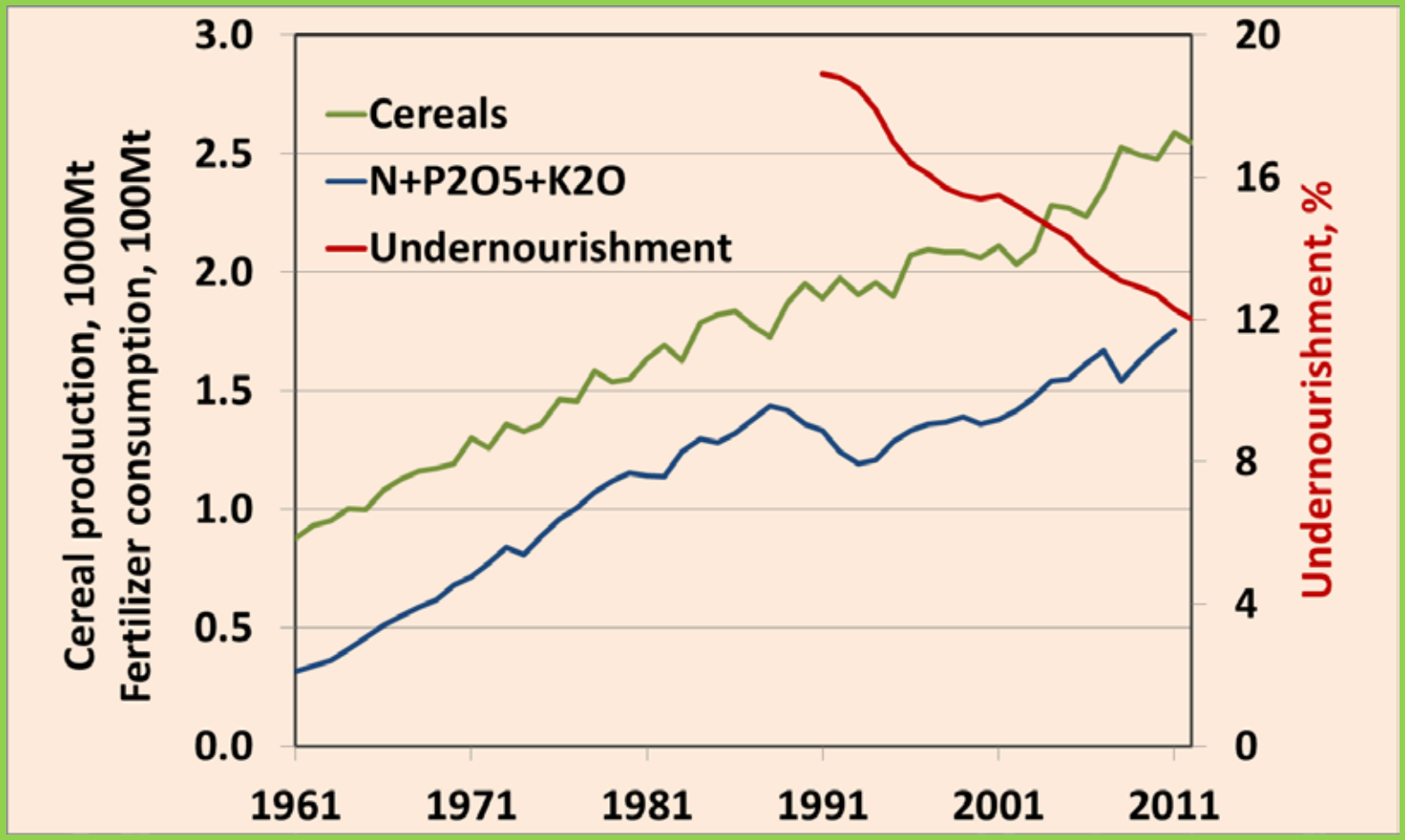
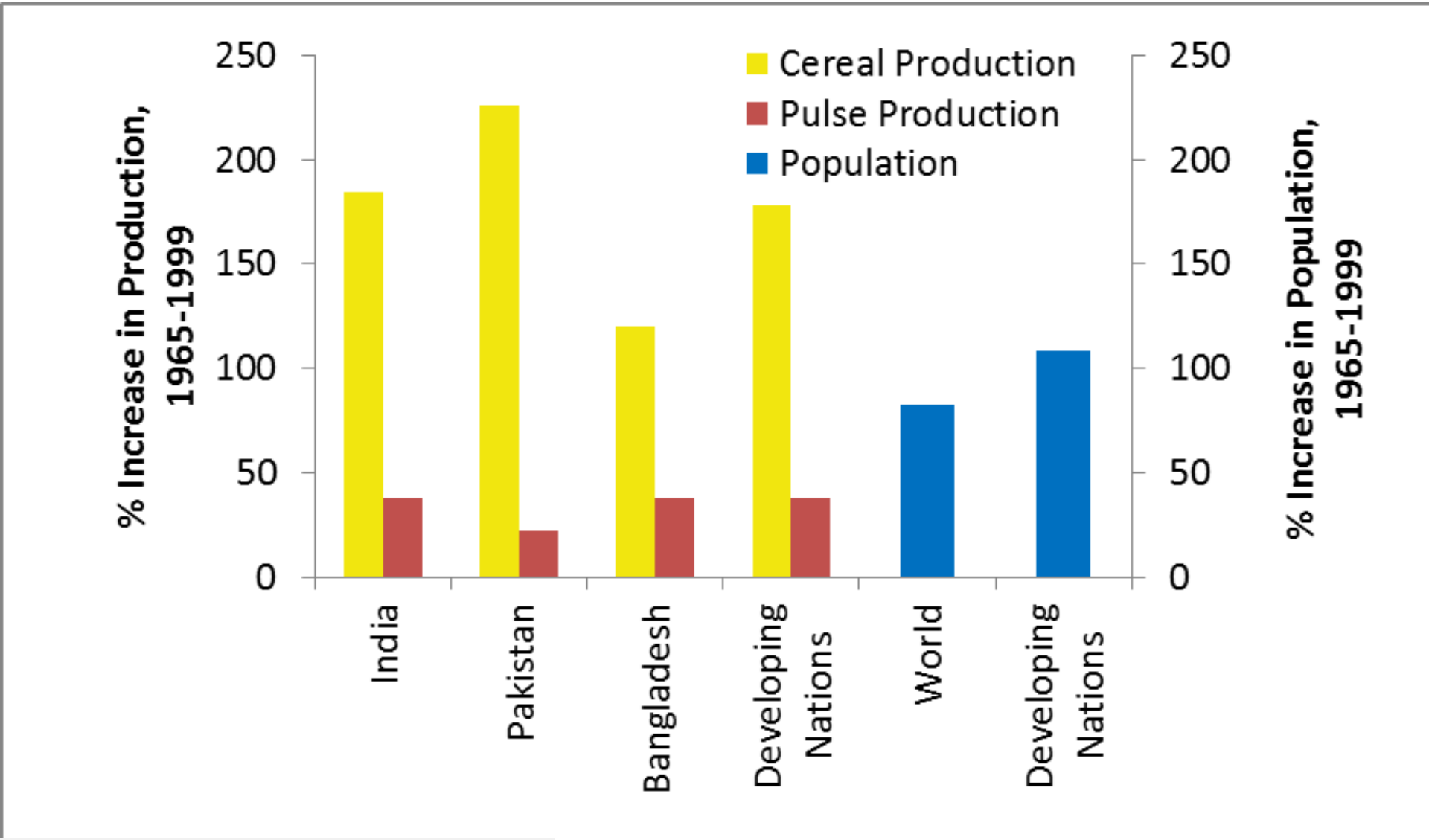
Increased fertilizer use has contributed to cereal production growth and reduced undernourishment



Data sources: FAO, IFA.

1986 – Bangladeshi farmers: *rabi* soybeans or *boro* HYV rice?

Trend 1965 to 1999: more cereals per capita, less pulses



Bouis, Boy-Gallego & Meenakshi

Prevalence (%) of micronutrient malnutrition is high in developing regions and substantial in developed

Region	Zn	Fe	I	Vitamin A
North America	8-11	18-29	11	2-16
Latin America	13-37	18-29	11	2-16
Europe	6-16	19-25	52	12-20
Sub-Saharan Africa	13-43	48-66	44	14-44
Southeast Asia	27-39	46-66	30	17-50
South Asia	18-36			
Global	**10-32**	**30-47**	**32**	**15-33**

Bouis, Boy-Gallego & Meenakshi

Almost as many soils are deficient in Zn as in K

Table 1. Proportion of agricultural soils deficient in mineral elements (based on a survey of 190 soils worldwide – Sillanpaa, 1990).

Element	%
N	85
P	73
K	55
B	31
Cu	14
Mn	10
Mo	15
Zn	**49**

"...it is imperative that fertilizer technology be used to improve the nutritional quality of staple food crops that feed the world's malnourished poor. "

Welch and Graham

Potassium (K) improves functional quality of fruits and vegetables

- Foliar K with S enhanced sweetness, texture, color, vitamin C, beta-carotene and folic acid contents of **muskmelons**
- In pink **grapefruit**, supplemental foliar K resulted in increased lycopene, beta-carotene, and vitamin C concentrations
- Several studies have reported positive correlations between K nutrition and **banana** fruit quality parameters such as TSS, reducing sugars, non-reducing sugars, total sugars and ascorbic acid, and negative correlations with fruit acidity

Jifon, Lester, Stewart, Crosby & Leskovar

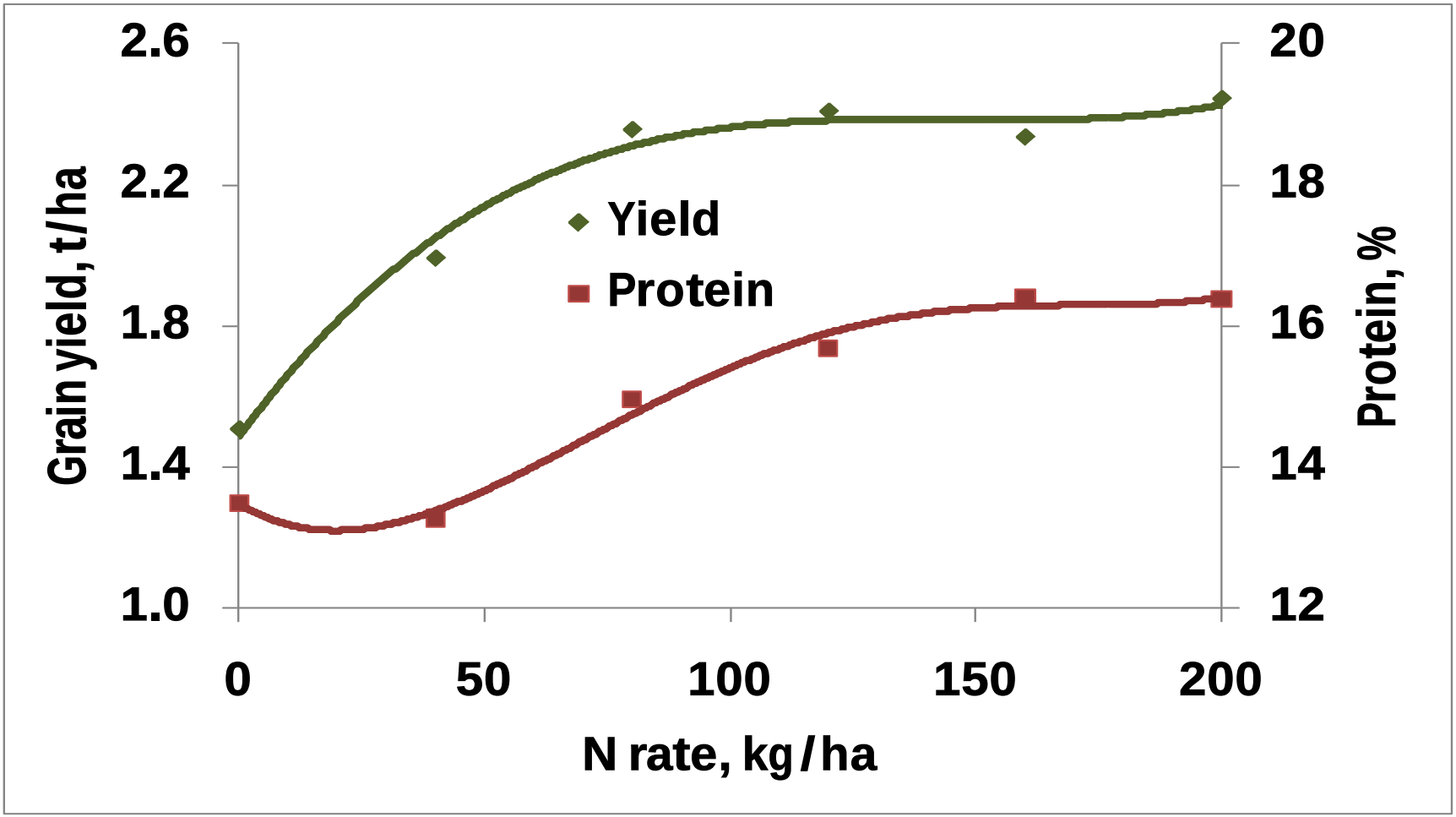
Applying potassium (K) fertilizer increased the concentration of isoflavones in soybeans

K_2O application	Genistein	Daidzein	Glycitein	Total[1]
Spring banded	938	967	146	2,051
None	831	854	130	1,851
Increase due to K, %	13	13	12	13

[1] Total isoflavone concentration expressed as aglycone; sum of three components; parts per million (ppm)

Vyn et al., 2002. Journal of Agricultural and Food Chemistry, 50: 3501-3506.

Optimum protein requires more N than optimum yield



Katepwa hard red spring wheat

Grant & Bruulsema

Potato starch and protein influenced by NPKS

N-P-K-S	Potato yield, g/pot	Starch, %	Crude protein, %	Protein biological value, %
2-3-3-3	124	70	8.3	89
4-3-3-3	**317**	**72**	**12.9**	**80**
6-3-3-3	266	69	15.9	75
4-1-3-3	134	68	14.9	74
4-4-3-3	**454**	**74**	**10.3**	**81**
4-3-1-3	50	59	22.9	65
4-3-4-3	**332**	**68**	**11.5**	**82**
4-3-3-0	173	65	14.7	45

Eppendorfer and Eggum, 1994

Plant nutrition suppresses plant diseases, reducing mycotoxins and increasing food safety

Crop	Disease	Toxin	Nutrient
Cereals	Ergot (*Claviceps sp*)	Ergotamine (alkaloid)	Cu
Grain, peanuts	*Aspergillus*	aflatoxin	Mn + ?
Cereals	*Fusarium graminearum* (*Gibberella zeae*)	deoxynivalenol zearalenone trichothecene	Mn + ?

Huber

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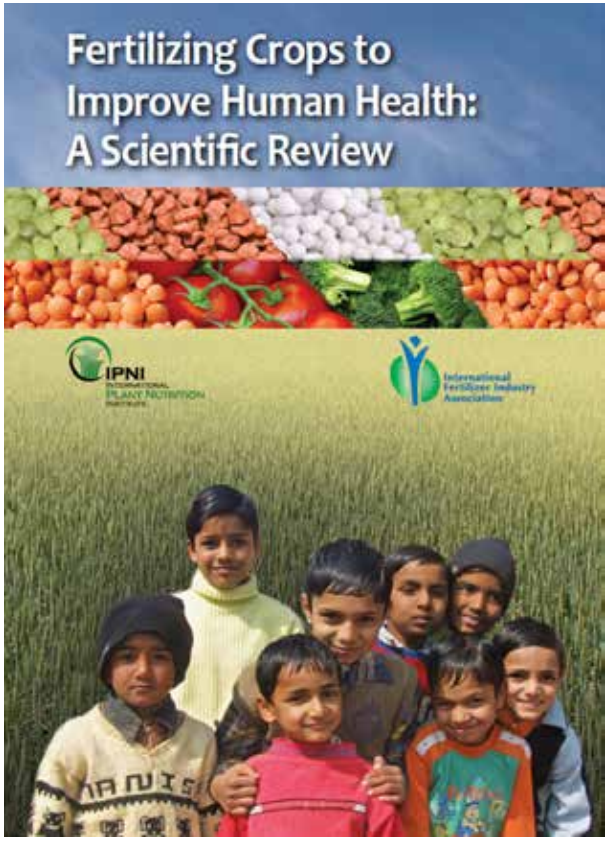
Benefits of this publication effort

1. Compilation of benefits for public awareness.
2. Foundation to build on for further research and investment.
3. Builds relationships with research scientists.

Continuing efforts:

1. Encourage evaluation of impacts on human health in research supporting 4R Nutrient Stewardship.
2. Include human health impacts in messaging related to food and nutrition security.



4R nutrient stewardship

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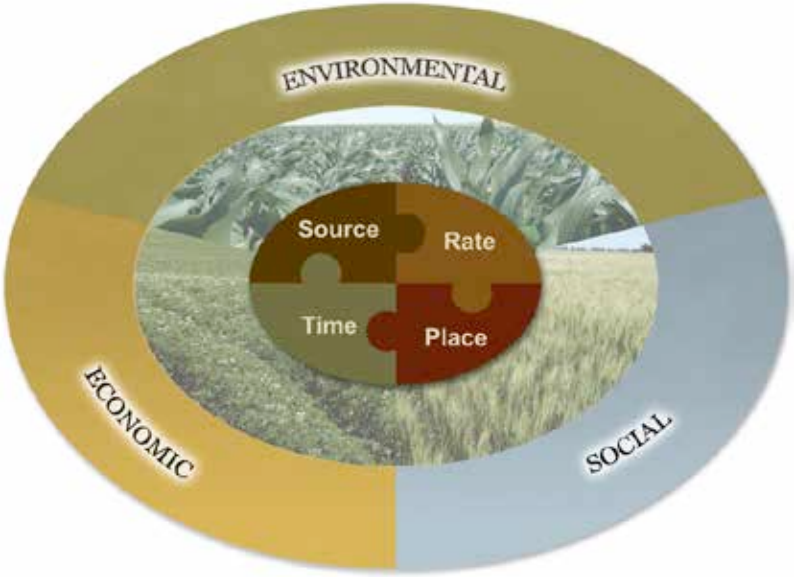
Summary

- Fertilizer contributes immensely to the health and well being of humanity.
  - Quantity and quality
  - Protein, minerals, vitamins and nutraceuticals
- Research and investment supporting 4R Nutrient Stewardship has great potential to improve human health.



4R nutrient stewardship

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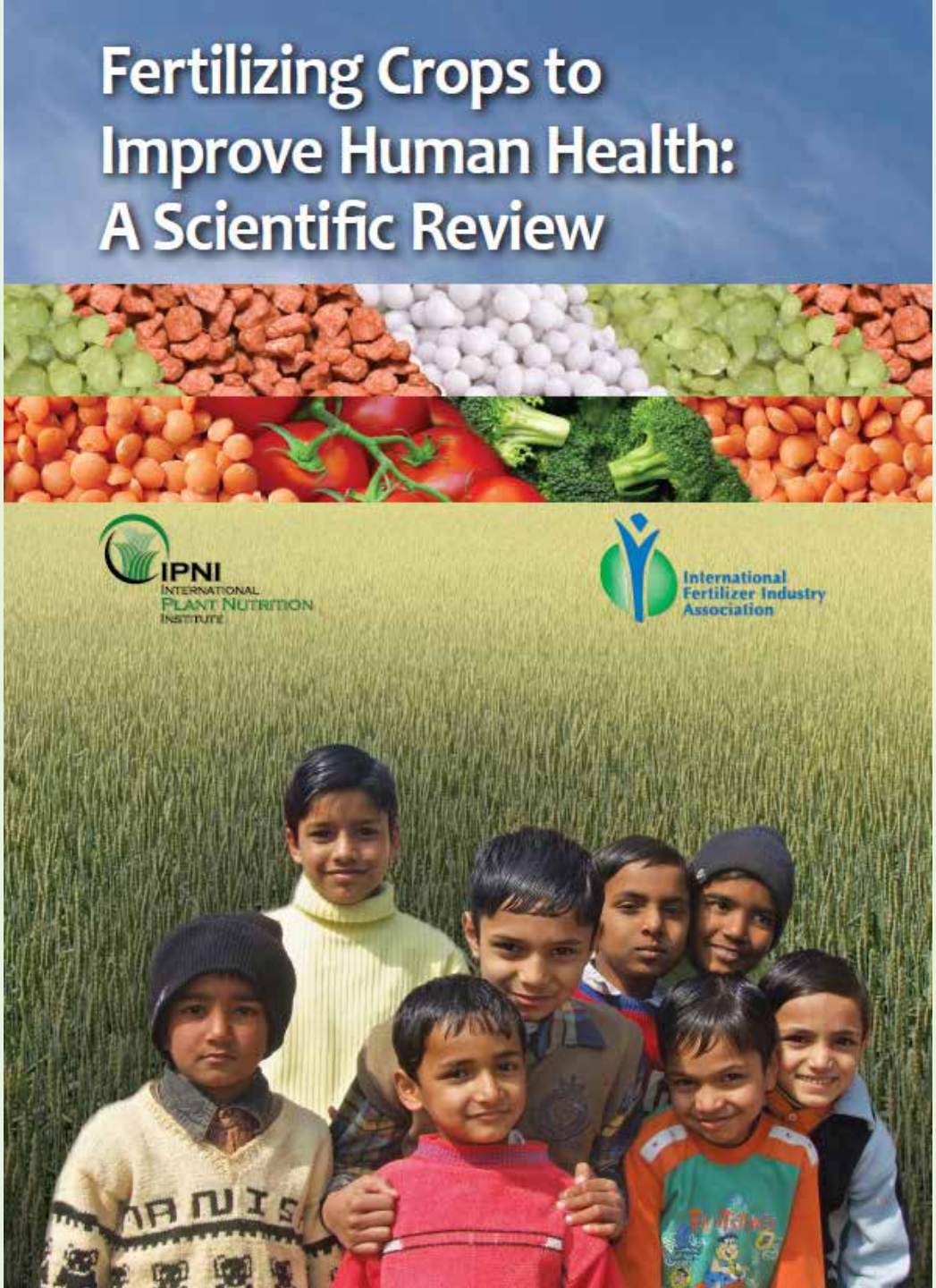

Thank You

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